



May 27, 2011

Mr. Craig Hoffman
Compliance Project Manager
California Energy Commission
Siting, Transmission and Environmental Protection Division
1516 Ninth Street, MS 15
Sacramento, CA 95814

RUSSELL KAGEHIRO
President
Division V

Subject: Mariposa Energy Project (09-AFC-3C), BBID Water Conservation Program, Condition of Certification SOIL&WATER-4

TIM MAGGIORE
Vice President
Division III

Dear Mr. Hoffman:

LARRY J. ENOS
Director
Division I

This letter is written on behalf of Byron Bethany Irrigation District (BBID) regarding the voluntary water conservation program that BBID will implement on its existing Canal 45 to offset the maximum allowable annual water use by the Mariposa Energy Project.

JIM PANAGOPOULOS
Director
Division II

BBID and Mariposa Energy have agreed to the water conservation program described and analyzed in the attached Technical Memorandum: *BBID Canal 45 Conservation Project Concept, May 20, 2011*. To formalize the agreement, BBID Board action is required. This action is scheduled to occur at the next regular board meeting on June 21, 2011.

FELIX MUSCO
Director
Division IV

CHARLES TUSO
Director
Division VI

If you have any questions, please don't hesitate to contact me.

JEFF BROWN
Director
Division VII

Very truly yours,

RICK GILMORE
General Manager

A handwritten signature in blue ink, appearing to read "Rick Gilmore", is written over a large, stylized blue flourish.

Rick Gilmore
General Manager

C: Board of Directors
Sandra Dunn, General Counsel
Bo Buchynsky, Diamond Generating Corporation

Enclosure: Technical Memorandum: *BBID Canal 45 Conservation Project Concept, May 20, 2011*

BBID Canal 45 Conservation Project Concept

PREPARED FOR: Rick Gilmore/Byron Bethany Irrigation District

PREPARED BY: Jerimy Borchardt/CH2M HILL
Jeff Smith/CH2M HILL

REVIEWED BY: Mark Leu/CH2M HILL

DATE: May 20, 2011

Mariposa Energy, LLC plans to construct, own, and operate an electrical generating plant in unincorporated Alameda County, California, near the intersection of Bruns and Kelso Roads. The Mariposa Energy Project (MEP) will be a natural gas-fired, simple-cycle electrical generating facility rated at a nominal generating capacity of 200-megawatts. The California Energy Commission (CEC) licensing process is near completion and construction is expected to begin in June 2011.

Operation of this facility will require source of water for plant operations. The water supply source will be the Byron Bethany Irrigation District's (BBID) Canal 45 South Section (Canal 45). The maximum allowable water use at the facility is 187 acre-feet per year. Mariposa Energy has voluntarily committed to implement a water conservation program to offset water used for plant process requirements. Based on discussions with BBID, water use efficiency improvements on Canal 45 are proposed to achieve the necessary water conservation. These improvements include lining a portion of Canal 45 and eliminating a reach of Canal 45 that remains full during the winter.

This Technical Memorandum (TM) summarizes the evaluation of water conservation measures on Canal 45. The TM is organized into the following sections:

- Existing Facilities
- Seepage Analysis
- Proposed Water Conservation Measures
- Cost Estimate
- Attachments
 1. Vicinity Map

Existing Facilities

The south section of Canal 45 is located in Contra Costa and Alameda Counties to the north and east of the BBID Headquarters facility located on Bruns Road (see Attachment 1). The canal is earth lined with broken concrete rip rap in some locations and is approximately $\frac{3}{4}$ of a mile in length. Pump Station 1 delivers water to the canal and is located on the west end. Pump Station 2 is located on the east end of the canal and is used to lift water to Canal 70. Historically, Canal 45 was only filled with water during the irrigation season. However, the recent addition of BBID's new headquarters requires the use of Canal 45 as a source of water for fire suppression, so Canal 45 is now continuously filled with water to meet this need.

As part of this analysis, the cross sectional area dimensions of Canal 45 were provided by BBID staff. The length (distance from Pump Station 1 to Pump Station 2) was estimated from aerial photography. The following canal dimensions were used in calculating the seepage rate for Canal 45:

- Canal top width = 26 feet
- Canal depth = 5.75 feet
- Depth of water in Canal = 4.5 feet
- Bottom width = 8.5
- Canal side slope = 1:1
- Canal 45 length = 3,830 feet
- Wetted perimeter = 21 feet

Seepage Analysis

To establish a reasonable quantification of seepage from Canal 45, historical pump data from Pump Station 1 was used. The Pump Station 1 control scheme maintains a set water surface elevation within Canal 45. Using the historical pump data, the volume of water required to maintain the set water surface elevation over twelve months was determined. The general assumption is that pumped water replaces water lost to canal seepage.

Seepage Rate using Pump Data

Table 1 below presents actual pump data obtained from BBID staff for the volume of water pumped in October 2009 through March 2010 and October 2010 through March 2011. Because there were no diversions for irrigation or other needs from the canal during these months, it was assumed that all loss in the canal was a result of seepage and evaporation. It should also be noted that contributions from rainfall were conservatively not included in the calculated seepage loss for this evaluation. It was assumed that evaporation losses were very small (5% of total volume) given that October through March are typically cool weather months. As a result, it is assumed that 95 percent of all water pumped into the canal from Pump Station 1 was used to offset seepage losses during these 12 months, with the exception of water used by BBID indicated in the 'Usage' column.

TABLE 1
Summary of Pump Station 1 Pumping

Month	Pumped Volume (acre-feet)	Usage (acre-feet) ^a	Net Loss (acre-feet) ^b	Net Loss by Seepage (acre-feet) ^c
October 2009 ^d	72.98	14.23	58.75	55.81
November 2009 ^d	60.54	8.40	52.14	49.53
December 2009	41.74	5.07	36.67	34.84
January 2010	32.02	9.08	22.94	21.79
February 2010	25.86	3.78	22.08	20.98
March 2010	35.41	6.36	29.05	27.60
October 2010 ^e	216.25	184.55	31.70	30.12
November 2010	29.60	4.19	25.41	24.14
December 2010	29.34	6.24	23.10	21.95
January 2011	31.38	6.74	24.64	23.41
February 2011	29.27	8.97	20.30	19.29
March 2011	42.20	11.54	30.66	29.13
Monthly Average				29.88

^a BBID Irrigation and Miscellaneous usage.

^b Includes evaporation and seepage losses.

^c Evaporation assumed as 5% of Net Loss.

^d SCADA programming and integration work performed during these months may explain higher numbers.

^e Canal 45 drained for maintenance this month.

For the purposes of this investigation, it is determined that a net loss of 30 acre-feet per month was appropriate. Using the total volume of 30 acre-feet and assuming the seepage is uniform throughout the entire 3,830 foot length of Canal 45, the seepage rate was calculated to be 0.008 acre-feet per month per lineal foot (LF). This is equivalent to an annual loss of about 0.096 acre-feet per LF each year.

Proposed Conservation Measures

Based on discussions with BBID, the proposed conservation measures are a combination of 1) lining a portion of Canal 45, and 2) significantly reducing the amount of canal that is kept full of water during the non-irrigation season by installing a check structure on Canal 45. Additional detail on the proposed conservation measures is provided below along with a summary of the estimated water conserved in Table 2.

Check Structure

Canal 45 is kept full in the non-irrigation season to provide domestic and fire suppression water to the BBID Corporate Headquarters. Installation of a check structure just downstream of the fire suppression pump station will reduce the length of canal requiring lining and provide operational flexibility to BBID. The check structure would keep a short

reach of Canal 45 fully charged year round to meet any fire flow demands that arise as well as meet MEP water demands. The remaining length of the canal would only be charged during irrigation season (approximately 9 months out of the year) effectively eliminating three months of seepage for that remaining length.

The check structure will span the entire width and height of the canal and will serve two functions. The first is to serve as a gate that effectively stops flow past the structure, which is the winter operating condition. The second function is to provide level control upstream in the canal, which provides more consistent turnout flows and pump operational conditions. BBID installed a similar level control check structure in their system in 1995. This existing structure serves only as a level control structure and does not have the ability to stop all flow because of design tolerances at the joints. Making the level control equipment provide a water tight joint is not possible due to the concern that installing seals would create too much friction for the equipment to work properly (balance is critical with this type of equipment). Therefore, the water tight feature will require the installation of a large slide gate on the upstream face of the structure. Installation of the check structure will require some canal lining for about 20 feet upstream and 40 feet downstream to mitigate any scour that may occur associated with hydraulic and velocity changes in the canal as it enters and exists the structure. Below are photos of the existing level control structure that demonstrates the type of structure anticipated in Canal 45 for this project.

As stated earlier, the watertight requirement for this structure will require installation of a single slide gate that spans the width of the level control gate entrance. The slide gate is anticipated to be made of aluminum material since fiberglass is not a good option for gate of this size. The gate will be operated using either a single or two hand operated openers that will be mounted on the concrete deck of the check structure. The gate is anticipated to be about 8 feet wide and 5 feet high. The top of the gate may be designed at the overflow elevation to maintain a minimum amount of freeboard in the canal in the event the pumps providing water to the canal overflow the canal. The final gate dimensions will be determined in the next phase of design. Photo 5 shows a similar style gate anticipated for this project.

Assuming the check structure is installed approximately 60 feet downstream of the fire suppression pump station (approximately 175 feet southeast of the Bruns Road centerline) the remaining length of canal that would be dry between irrigation seasons is approximately 3,145 feet.

Photo 1 – Upstream End of Check Structure



Photo 2 – Downstream End of Check Structure



Photo 3 – Side of Check Structure - Level Control Gate



Photo 4 – Leakage Past Level Control Gate in Closed Position

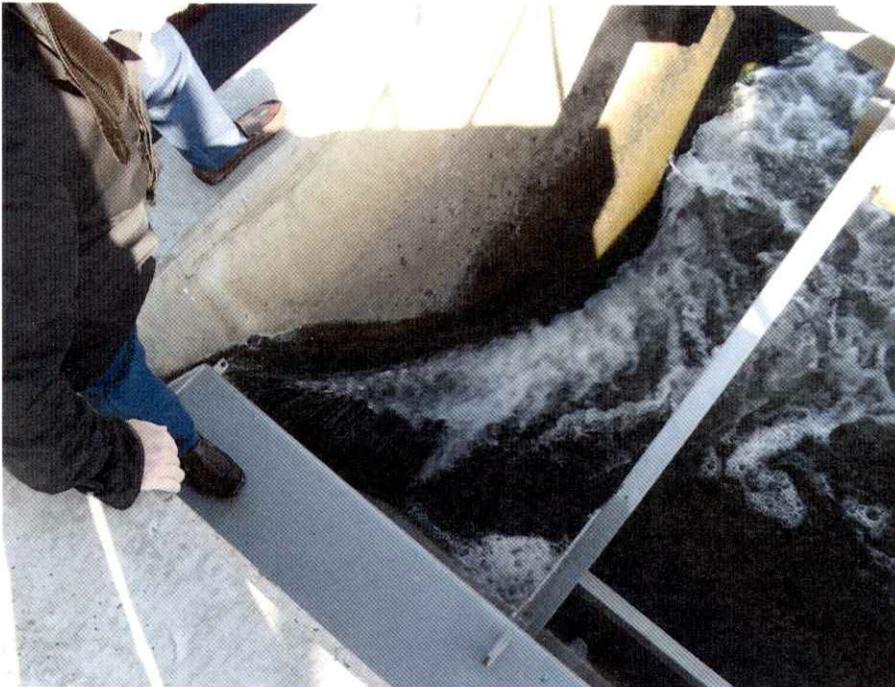


Photo 5 – Similar Style Slide Gate



Canal Lining

To meet the water conservation goal of 187 acre-feet per year, approximately 1,755 feet of canal would need to be lined. Two separate reaches of Canal 45 have been identified for lining: 510 foot reach upstream of the new check structure between the Pump Station 1S discharge and Bruns Road box culvert; and 1,245 foot reach upstream of Pump Station 2. The 510 foot reach lining was selected to help reduce possible scour issues associated with the Pump Station 1S discharge and the 1,245 foot reach lining was selected to provide a smoother transition into the pump station and improve the pump station hydraulics. Lining the 1,245 foot reach will require the replacement of an existing timber bridge located approximately 570 feet upstream of Pump Station 2. The bridge will be replaced with a precast reinforced concrete box culvert. The canal cross section will be reshaped to provide a smooth transition upstream and downstream of the box culvert.

TABLE 2
Canal Water Conservation Summary

Canal 45 Reach	Length	Post-project Condition (Lined/Unlined)	Months of Use	Water Conserved due to Seepage Reduction (acre-feet/year)
Pump Station 1S discharge to the Bruns Road box culvert inlet	510	Lined	12	49
Bruns Road box culvert outlet to new check structure	155	Unlined	12	0
Canal Lining upstream of new check structure	20	Lined	12	2
Canal Lining downstream of new check structure	40	Lined	9	3
New check structure to Pump Station 2	1,860	Unlined	9 ^a	45
Pump Station 2 Reach Lining	1,245	Lined	9	90
			Total Annual Water Conserved	189

^a Conservation based on 3 months of empty canal.

Cost Estimate

This is considered a Class 4 cost estimate, developed in accordance with the guidelines of the Association for the Advancement of Cost Engineering. This estimate is prepared based on limited information, where the preliminary engineering is from 1 to 5 percent complete. The expected accuracy ranges for this class estimate are -15 to -30 percent on the low side and +20 to +50 on the high side.

A canal lining consisting of 4-inch thick wire mesh or steel reinforced concrete section is recommended as this is a typical section used for canals of similar size and is the standard section that BBID has used in previous canal lining projects. Three methods are available for completing these improvements: Cast-in-place concrete, Shot Crete, or a lining machine. Based on the length of canal lined the lining machine is not likely economical.

The unit cost of lining per lineal foot for Canal 45 is based on a canal lining project of Canal 70 (another reach of BBID's canal system) that was completed in the Fall of 2010. Unit costs were adjusted for cross-section geometry of Canal 45. For the Canal 70 project, the total construction cost for a 4-inch thick reinforced concrete lining and associated earthwork (complete canal reshaping) was \$9.81/square foot of canal surface or \$285/LF. Adjusting for the cross-section of this reach of Canal 45 the unit cost is established to be \$245/LF.

Table 3 provides a line item estimate for the improvements discussed in this TM.

TABLE 3
Canal 45 Improvements Cost Estimate

Item	Qty.	Unit Cost	Total Cost
Canal Lining	1,755	\$245	\$430,000
Check Structure ^a	1	\$220,000	\$220,000
Box Culvert	1	\$50,000	\$50,000
SCADA Integration	1	\$20,000	\$20,000
Subtotal			\$720,000
Contingency (25%)			\$180,000
Construction Total Cost			\$900,000
Admin., Engineering, Construction Management (20%)			\$180,000
Project Total			\$1,080,000

^a Includes lining upstream and downstream of structure

Attachment 1

Vicinity Map



FIGURE 1
CANAL 45 SOUTH SECTION
VICINITY MAP
 BBID Canal 45 Water Conservation Program

Aerial courtesy of Google™ Earth, 2009. Image: Contra Costa County.

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