GWF Henrietta Combined Cycle Amendment

Soils and Water Resources Data Response Clarifications

The following clarifications are responses to comments provided by Mark Lindley on February 19, 2009 and discussion held between the CEC and GWF on March 3, 2009.

Data Response 24

GWF has created an Equivalent Annual Cost (EAC) estimate as suggested by the CEC comparing the cost of utilizing secondary treated water from the Lemoore Naval Air Station Sewage Treatment Plant as the primary water source for GWF Henrietta versus the proposed use of State Water Project and Central Valley Project water rights. The analysis is attached as Attachment DR3.2-24.

Siemens Water Technologies Corporation provided engineering guidance and capital cost estimates for the equipment required to treat the recycled water and the resultant waste streams. The Turlock Irrigation District was contacted for operational and maintenance costs for recycled water treatment and use. These values were scaled to account for differences in system sizing, operational conditions, and water source quality.

The EAC analysis estimates the use of recycled water for GWF Henrietta would cost approximately $13.32 per MWh. The proposed water source is estimated to cost approximately $2.60 per MWh. The difference of $10.72 per MWh shows that the use of recycled water at GWF Henrietta is economically infeasible.

GWF also analyzed the severe drought scenario where the facility would only be granted 15% of the water allocated to the project. Under this scenario GWF would purchase land with the associated water rights to make up the water shortfall of 31.4 acre-ft. GWF assumed the water purchased with the land would also be subject to a 15% allocation, so the required land would total approximately 81.7 acres. The total cost to exercise that option is $694,056. The capital cost of the land was spread over 9 years and the equivalent cost per MWh was estimated to be $0.26. Under this scenario the total cost per MWh of the proposed water source increases to $2.86. The difference of $10.46 per MWh demonstrates that the use of recycled water at GWF Henrietta is economically infeasible when compared to the proposed water source with severe allocation restrictions imposed.

Data Response 29

The contributing watershed has been highlighted in Attachment DR3.2-29. All areas within the permanent fence shall drain to the new stormwater retention basin.

Areas outside of the permanent fence shall be routed away from the site and will not discharge to the stormwater retention basin. Runoff from the construction parking and laydown areas shall be handled under the Construction SWPPP.

The storm water retention basin in service at GWF Henrietta is exempt from the Industrial Activities Storm Water General Permit requirements because of criteria 4 under **Types of Discharges Not Covered By This General Permit:** Facilities Which Do Not Discharge Storm Water To Waters of the United States: 4b. Facilities That Do Not Discharge Storm Water To Surface Waters or Separate Storm Sewers: ... "storm water that disposed of to evaporation ponds, percolation ponds, or combined sewer systems are not required to obtain a storm water permit."

As a Best Management Practices, GWF Henrietta will maintain a Storm Water Pollution Prevention Plan that will identify pollution prevention controls and monitoring activities of storm water discharges. The levels of oil and grease, pH, TSS and metals that have been reported from the current monitoring activities are insignificant and below any threshold limits that would be required by an NPDES permit were this facility subject to waste discharge orders for surface water discharges.

Data Response 30

Based on the scaled drawing in Attachment DR3.2-29 it was estimated that the shaded area totaled approximately 409,940 square ft. The stormwater retention basin was sized for a drainage area of 431,244 square ft. The 10 yr – 10 day storm runoff of 4 inches across the site was calculated to total 142,310 cubic feet as shown in Attachment DR3.2-30. The stormwater retention basin volume was sized to contain this volume with 1 foot of freeboard. The final design volume of the basin is 222,278 cubic feet. As a final step, the storm water retention basin was verified to be able to contain the 100 yr-10 day storm runoff event.

With respect to the vector management, the retention basin at Hanford has been in active use for nearly 20 years and the retention basin at Henrietta has been in operation for nearly 5 years without a single incident related to vector management. Based on this extensive history of operation over a range of conditions, there is no evidence to suggest that vector management is a significant concern. The potential for occurrence of a vector management issue is extremely low and can be adequately addressed (in the unlikely event of occurrence) through means other than designing the retention basin's capacity to drain within three to five days. Options could include application of an

approved vector control agent to the surface of the pond or if necessary, removal of standing water for discharge to an approved offsite facility using a properly licensed hauler. Since neither of these actions has been necessary at GWF's operations in the area, GWF does not anticipate the need for them in the future.

GWF Henrietta Combined Cycle Project

Capital Cost Estimate

Category	Item	Hours	Rate	Estimated Cost	Notes
Environmental Study/ Permitting				$ 40,000	
Easements				$ 50,000	
Water Purchase Agreement				$ 50,000	
Legal				$ 10,000	
Engineering		480	125	$ 60,000	
Pump Station					
	Equipment Cost			$ 100,000	
	Install			$ 60,000	
Pipeline					
	Material cost			$ 100,000	
	Install			$ 400,000	
Tertiary Treatment Unit					
	Equipment Cost			$ 1,980,000	Based on quote from Siemens
	Foundation			$ 54,000	
	Installation			$ 1,188,000	
	OEM T/A			$ 38,000	$200/hr for 3 man-weeks + 3x$1000 flights + 15x$100 per diem
	Training			$ 9,500	$200/hr for 1 man-week + $1000 flight + 5x$100 per diem
	Startup and Testing			$ 19,000	$200/hr for 2 man-weeks + 2x$1000 flight + 10x$100 per diem
Zero Liquid Discharge System					
	Equipment Cost			$ 5,760,000	Based on quote from Siemens + 1.5M for Crystallizer and auxiliaries
	Foundation			$ 90,000	
	Installation			$ 3,456,000	
	OEM T/A			$ 38,000	$200/hr for 1 man-month + 4x$1000 flights + 20x$100 per diem
	Training			$ 9,500	$200/hr for 1 man-week + $1000 flight + 5x$100 per diem
	Startup and Testing			$ 19,000	$200/hr for 2 man-weeks + 2x$1000 flight + 10x$100 per diem
Total				$ 13,531,000	

Attachment DR3.2-24 GWF Henrietta Recycled Water Cost Analysis

Operational Cost Estimate

Fixed O&M					
	Labor - Operators	8760	52.5	$ 459,900	$35/hr with 50% burden
	Labor - Ops./Maint Supervisor	2080	75	$ 156,000	$50/hr with 50% burden
	Labor - Maintenance	4160	60	$ 249,600	$40/hr with 50% burden
	Environmental/Safety			$ 40,000	
	Electricity			$ 392,500	estimated load of 700 kW for Tertiary treatment and ZLD
	Fixed regular maintenance			$ 93,020	
	Other				
	Contingency			$ 208,653	
Subtotal				$ 1,599,673	
Variable O&M					
	Variable regular maintenance			$ 329,799	
	Chemicals			$ 122,869	
	Water				
	Waste removal/disposal			$ 327,652	
	Resin Bottle charge			$ 368,608	
Subtotal				$ 1,148,927	
Total Annual Cost				$ 2,748,601	

Attachment DR3.2-24 GWF Henrietta Recycled Water Cost Analysis

Equivalent Annual Cost

Cost of Capital		8%
Equivalent Annual Capital Cost	$	2,113,875
Annual Operating Cost	$	2,748,601
Total Equivalent Annual Cost	$	4,862,475

Assume 9 years financing

Estimated Electricity Generated

Hours of operation per year	3500	hours
Generation Capacity	120	MW
Annual MWh generated	420,000	MWh

Cost per MWh Comparison

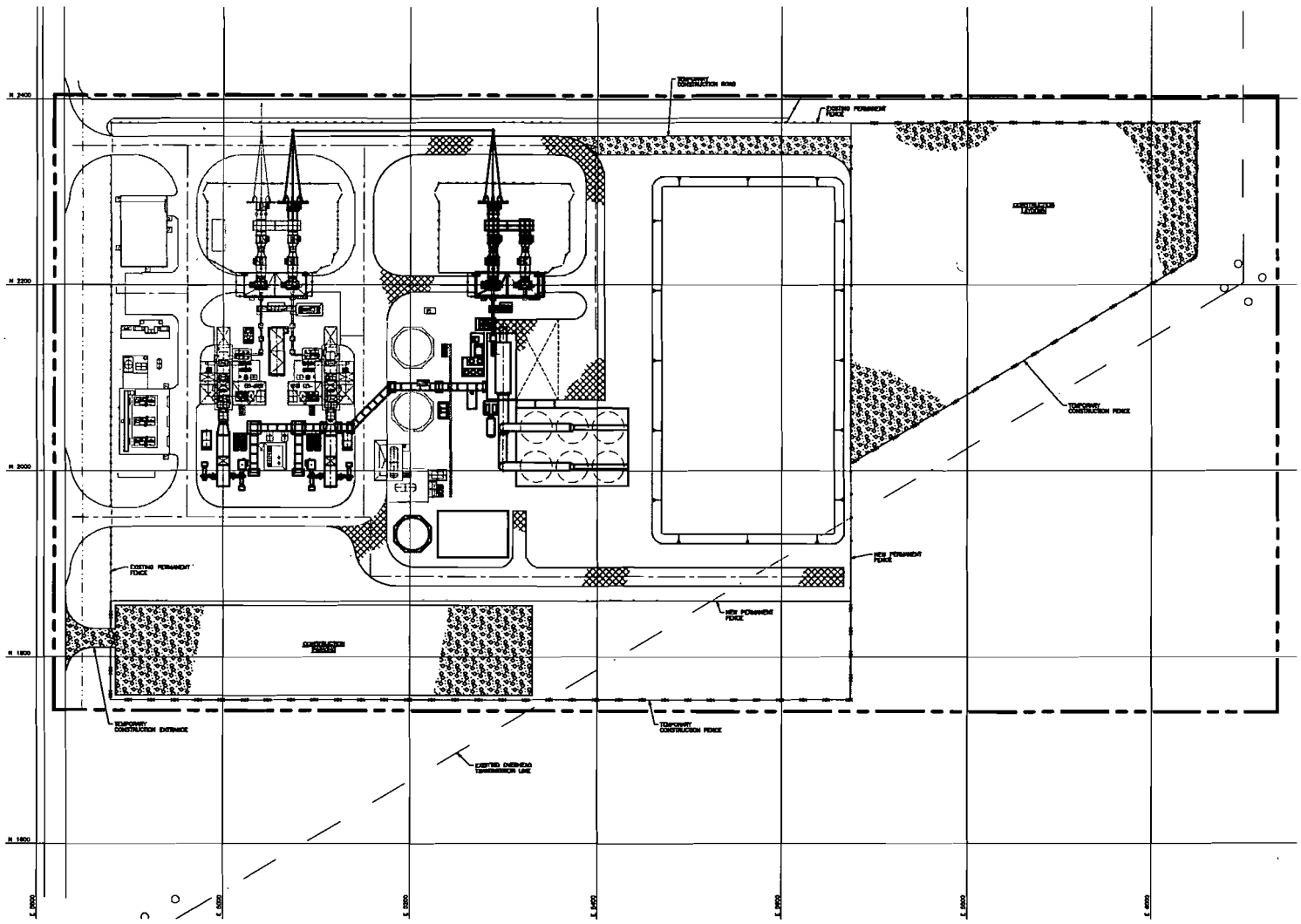
Cost per MWH for option	$	11.58
Cost per MWh for Ion Exchange (no sewer)	$	1.74
Estimated Cost per MWh total (recycled water option)	$	13.32
Cost per MWH for base water	$	0.86
Cost per MWh for Ion Exchange (Henrietta actual 2007)	$	1.74
Total Cost per MWh (proposed option)	$	2.60
Cost increase for recycled water	$	**10.72** per MWH

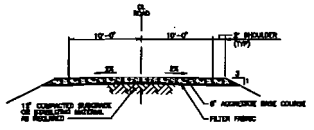
15% Allocation Scenario

Cost of Capital		8%
Cost of Land Option for 15% allocation scenario	$	694,056
Equivalent Annual Capital Cost	$	108,429
Cost per MWh for land option	$	0.26
Cost per MWh for base water	$	0.86
Cost per MWh for Ion Exchange	$	1.74
Total Cost per MWh (proposed option)	$	2.86
Cost increase for recycled water	$	**10.46** per MWh

Assumptions

1) Capital costs for tertiary treatment and ZLD were based on Siemens Water Technologies quote and discussions.
2) Operational Costs were based on conversations with operating plants utilizing recycled water as a major water source.
3) Operational Costs were scaled to account for differences in system size and operational conditions.
4) ZLD operational costs were used as a proxy for tertiary treatment operational costs based on conversations with Siemens and operating companies.
5) Cost estimates for water and Ion Exchange were based on actual costs from Henrietta Peaker and other GWF operating plants.
6) Assumed zero cost for recycled water.
7) Assumed 9 year financing and a cost of capital of 8%.
8) Assumed 3,500 hours of operation, based on historical California grid operational data for equivalent heat rate plants.
9) Assumed water right with purchased land option would also be subject to a 15% allocation during that scenario.





TYPICAL CONSTRUCTION ROAD SECTION

NO SCALE

The shaded are, which includes all areas within the permanent fence, shall drain to the new storm water retention basin.

NOTES

1. SEE DWG SS-3000 FOR GENERAL NOTES, LEGEND AND ABBREVIATIONS.

LEGEND

PERMANENT ROAD
6" GRAVEL SURFACING
3" ASPHALT (LATER)

CONSTRUCTION ROAD
6" GRAVEL SURFACING

CONSTRUCTION FENCE

NOT TO BE USED FOR CONSTRUCTION

PLANT NORTH / TRUE NORTH

SCALE: 1"=40'

REV	DATE	REMARKS AND RECORD OF ISSUE	ORIGINATOR	CHK
A	05/09/2006	ISSUED FOR CLIENT REVIEW		

BLACK & VEATCH CORPORATION

GWF HENRIETTA COMBINED CYCLE POWER PLANT

SITE CONSTRUCTION FACILITIES

PROJECT 161761-SS-1002

REV A

Owner	**GWF**	Computed By	**Leroy Kashka**	Date	**05/16/08**
Plant	**Henrietta**	Checked By		Date	
Project #	**160129**			Page	**#REF!**

POST-CONSTRUCTION RETENTION POND DESIGN

The pond shall be designed to provide storage for a 100-year, 10 day storm. Calculate the volume of runoff for the 2 yr. - 24 hr., 5 yr. - 24 hr., 25 yr. - 24 hr. and a 100 yr. - 24 hr. storms and compare to the volume of storage available.

Compute Runoff Coefficient:

	C	Area (ac)	Product A*C
paved	0.95	2.03	1.93
aggregate	0.75	6.05	4.88
pond	1.00	1.82	1.82
	Total Area	9.90	acres
	Wt C	0.87	

Volume Required :

Sources: Kings County, CA Department of Public Works Improvement Standards, and Technical Paper No. 40, Rainfall Frequency Atlas of the United States, US Department of Commerce Weather Bureau, 1961.

Volume of Runoff to be Contained: Vreq (ft3) = C A R (Based on Kings County Public Works)
Design for 10 yr - 10 day storm (4 in.), Check for 100 yr - 10 day storm (6 in.)

C = Runoff Coef.	0.87
A = Drainage Area (ft2)	431,244.00
R = Rainfall (ft) for 10 yr, 10 day	0.33
R = Rainfall (ft) for 100 yr, 10 day	0.50

Vrunoff (10 yr - 10 day)=	142,310 ft3
Vrunoff (100 yr - 10 day)=	215,622 ft3

Volume of Runoff for the 5, 10, 25, and 100 yr storms

Storm	Rainfall (in)	Volume (ft3)	x 2*
5 yr, 24 hr	1.3	46,718.10	93,436.20
10 yr, 24 hr	1.5	53,905.50	107,811.00
25 yr, 24 hr	1.9	68,189.30	136,378.60
100 yr, 24 hr	2.3	82,655.10	165,310.20

** indicates the volume of runoff in the event of 2 storms back to back*

Calculate Volume of Pond :

Contour Elevation	Area of Contour (ac)	Average Area Volume (ft^3)	Cumm. Avg Volume (ft^3)
222.5	1.82	39,340	222,278
222	1.78	38,404	182,938
221.5	1.74	37,477	144,534
221	1.70	36,559	107,057
220.5	1.66	35,650	70,498
220	1.62	34,848	34,848
219.5	1.58	0	0

Required top of basin elevation = Water surface elevation for 10 yr -10 day storm + 1 ft.
Water surface elevation for 10 yr - 10 day storm event = 221.47 ft.
Required top of basin elevation = 222.47 ft.
Actual top of basin is approximately 221.5 ft. due to natural topography
Basin shall hold 100 yr. - 10 day event without overflowing
Water surface elevation for 100 yr. - 10 day event = 222.425 ft.

		Depth	Freeboard
Top of Basin Elevation	222.50		
Water Elevation for 10 yr. - 10 day storm	221.47 ft.	1.97 ft.	1.03 ft.
Water Elevation for 100 yr. - 10 day storm	222.425 ft.	2.925 ft	0.075 ft.
Water Elevation for 2 - 25 Yr, 24 Hr. Storms	221.1 ft.	1.6 ft.	1.4 ft.
Water Elevation for 2 - 100 Yr, 24 Hr. Storms	221.73 ft.	2.23 ft.	0.77 ft.