

POE TUNNEL ADIT FEASIBILITY STUDY

**Pacific Gas and Electric Company
Hydro Generation**

PREFEASIBILITY LEVEL SIZING AND COST ESTIMATE SUMMARY MEMORANDUM

FINAL

May 16, 2005

MEMORANDUM

Black & Veatch
Hydropower Services

B&V File: 133626.0163
May 16, 2005

To: Ken Leung, Pacific Gas & Electric

Prepared By: Keane Sommers and Roy Loftin, Black & Veatch

Reviewed: Bruce Duncan, Black & Veatch

Subject: **Poe Adit**
Prefeasibility Level Sizing and Cost Estimate Summary Memo

Introduction

The Poe Tunnel Adit 1 is approximately 4.5 miles downstream from Poe Dam. This study develops a prefeasibility level cost estimate for designing and constructing the facilities required to install a new pipeline from the adit to accomplish an instream flow release of 50 cfs at Bardee's Bar. In January of 2005 Black & Veatch completed calculations which looked at the feasibility of delivering water from the adit through an 18-inch pipeline. The estimated maximum flow through the 18-inch line was 35 cfs.

This study will expand the scope of the previous study to include a brief hydraulic analysis to determine the required outlet size to pass 50 cfs, and develop a prefeasibility level cost estimate. Initially, two alternatives were addressed. The first addressed the size of pipe that would be required to pass the necessary flow downstream of the existing outlet pipe through the adit plug. This alternative was discounted early on in the assessment as it caused excessive velocities in the 18-inch portion of the outlet. The second alternative evaluated the possibility of providing a new tap and outlet sized to pass the necessary flow.

Analysis

The estimated energy grade line in the tunnel at the adit of 1349.2 feet was taken from the January 23, 2005 summary memo. Based on this assumption it was determined that a flow of 50 cfs could be obtained with the existing 18-inch outlet through the adit plug if a 24-inch line was provided from the existing valve to the river and a 12-inch fixed cone valve were used. However, at a flow of 50 cfs the velocity in the 18-inch section would be approximately 30.8 ft/sec and the velocity in the 24-inch section would be approximately 15.9 ft/sec. These values are in excess of those that are recommended for facilities that are operated continuously. Consequently no further analysis or cost estimation for this alternative was undertaken as directed in an email from Ken Leung on April 29, 2005.

Outlet sizes of 24 and 30-inches were considered for this project. An outlet diameter of 24 inches results in an estimated velocity of 15.9 ft/s at a flow of 50 cfs. A velocity in this range is above the maximum that should be considered acceptable for continuous operation. An outlet diameter of 30 inches results in an estimated velocity of 10.2 ft/s at a flow of 50 cfs. Both of these pipe diameters will have a maximum capacity in excess of 50 cfs. Maximum flow rate through the pipes is largely dependant on the size of the outlet valve and the maximum allowable velocity in the pipeline. For costing purposes an outlet diameter of 30-inches was considered as directed in the April 29th email. The 30-inch line would provide for the possibility of increased flows if it is considered necessary in the future. Based on a maximum desirable

CWA Number: 350062749
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sustained velocity of 15 ft/s the maximum allowable flow in a 30-inch outlet would be approximately 73.6 cfs.

The proposed outlet alignment is the same as that shown in the January 23 memo and is shown in Figure 1. The line would be run out of the adit, along the spoil pile, under the railroad, down the Poe Powerhouse access road to a point near the rocky south abutment of the access road bridge and discharge directly into the North Fork of the Feather River.

Cost Analysis

The estimated cost for this project was based on the following conceptual design.

- ▼ Increase the size of the existing bore through the adit plug from 18-inches to approximately 36 inches. The bore will be steel lined and have an inside diameter of approximately 30 inches. A new, 30-inch butterfly valve will be placed at the end of the bore.
- ▼ Install approximately 940-feet of pipeline inside the existing adit tunnel. The new pipe will be steel and buried with a minimal amount of cover in the invert.
- ▼ Install Approximately 1,450 feet of cut and cover pipeline with one section bored under the existing railroad track. Based on the layout shown in Figure 1, it is anticipated that there will be 1-22.5 degree elbow, 7-45 degree elbows and 2-90 degree elbows.
- ▼ Install an outlet structure with a 12-inch Howell-Bunger Valve at approximately elevation 1,055 near the existing access bridge. The structure will be the minimum to protect and anchor the valve. The valve will be manually controlled and no provisions for power, remote communication or flow measurement were provided.

The estimated cost for this project is approximately \$15,124,000. An overall contingency of 50 percent was used for this cost estimate due to the extremely preliminary nature of the design. The cost of the project has been based on a mid-point of construction of 2010. Permitting costs of 10 percent of the construction cost have been included. It is assumed that the construction will take approximately 30 weeks. Owner Administrative and Overhead (5.5 percent) and financial cost for funds during construction (23% for the project duration) have also been included in the final cost. The table below summarizes the total costs (rounded to thousands of dollars) for various parts of the project. For details of the estimated cost and quantities refer to the attachments to this report.

Poe Adit 1 Flow Bypass Prefeasibility Study Construction Cost Breakdown Summary	
Description	Cost
General Requirements	1,898,000
Open Trench Cut Form Bardee's Bar and Railroad Tunnel	6,142,000
Railroad Horizontal Tunneling	1,607,000
Outside Adit Tunnel	481,000
Inside Adit Tunnel	3,722,000
Modification in Adit Tunnel to Poe No. 1 Tunnel	1,274,000
Total Project Cost	\$15,124,000

Attachments

- Figure 1 – Potential Pipeline Layout
- Cost Estimate Data Sheets

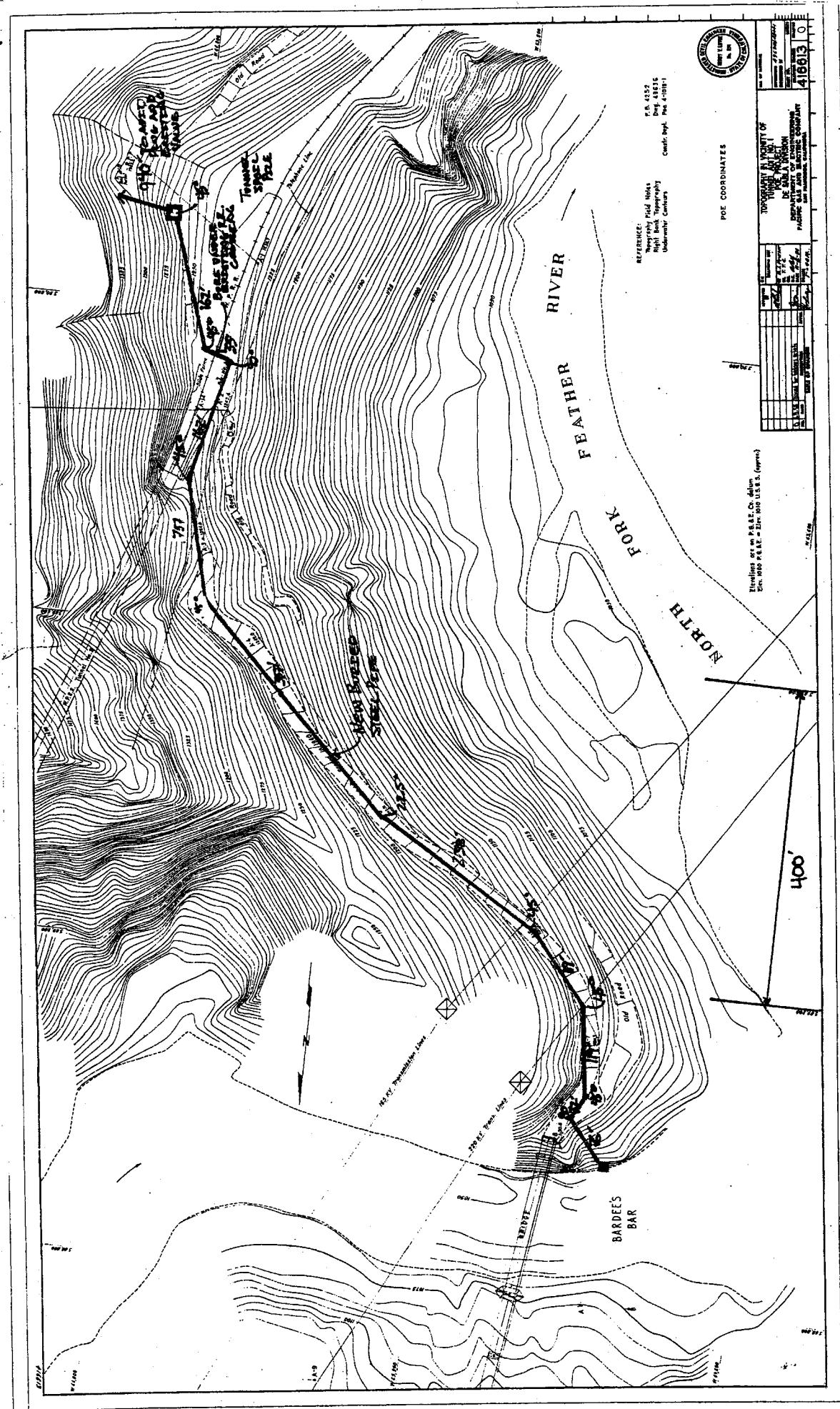


Figure 1

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Project: Poe Adit Tunnel By-Pass Flow
Project No.: 136962.0163
Revision No.: 5
Date: 05/09/05

Opinion Of Probable Cost
Pipeline Tunneling and Trenching

Item No.	Description	Quantity	Unit	Unit Price	Price Total
1	General Requirements				
	Mobilization & Demobilization	1	LS	21,240	21,240
	Site Indirects	1	LS	556,951	556,951
2	Open Trench Cut Form Bardee's Bar and Railroad Tunnel	1	LS	1,871,212	1,871,212
3	Railroad Horizontal Tunneling	1	LS	489,535	489,535
4	Outside Adit Tunnel	1	LS	146,601	146,601
5	Inside Adit Tunnel	1	LS	1,133,965	1,133,965
6	Modification in Adit Tunnel to Poe No. 1 Tunnel	1	LS	388,001	388,001
Construction Subtotal (Direct Costs)					\$4,607,505
Indirect Costs					
	General Requirements	0%	of construction cost (included in General Requirements)		0
	Sales Tax	8%	of purchased materials		104,754
	Ocean Shipping	0%	of purchased off-shore materials		0
	Ocean Shipping	0%	of purchased off-shore Rental Equipment		0
	Overhead and Profit	12%	of construction cost + general requirements		552,901
	Bonds and Insurance	4%	of construction cost + general requirements + sales tax + overhead and profit		210,606
	Escalation	9.15%	of construction cost		501,033
	Contingency	50%	of construction cost + general conditions + sales tax + overhead and profit + bonds and insurance + escalation		2,988,399
Construction Subtotal Indirects					\$4,357,693
Total Construction (directs and indirects)					\$8,965,198
	Permits	10%	of construction cost		\$896,520
	Design	10%	of construction cost		\$896,520
	Construction Management	10%	of construction cost		\$896,520
PG&E					
	Owner Admin. & Overhead	5.5%	of construction cost + permits + design + construction management		\$641,012
	FCFFDC	23.0%	of constr. cost + permits + design + constr. mgt +PG&E owner admin. & overhead		\$2,828,027
Total					\$15,123,797

PG&E

Project: Poe Adit Tunnel By-Pass Flow
 Project No. 136962.0163
 Revision No.: 4
 Date: 05/09/05

Opinion Of Probable Cost
Pipeline Tunneling and Trenching

CSI Div.	DESCRIPTION	Quantity	Unit	Unit Cost	Man-Hours	Labor Cost	Material Cost	Equipment Cost	Subcontract Cost	Other Cost	Total Cost
1	General Requirements										
	Mobilization				0	0	0	0	0	10,126	10,126
	Site Indirects				0	0	0	0	0	546,825	546,825
	Subtotal General Requirements				0	\$0	\$0	\$0	\$0	\$556,951	\$556,951
2	Site Work										
	Site Work				27,553	2,009,031	722,143	586,094	0	728,677	4,045,945
	Subtotal Site Construction				27,553	\$2,009,031	\$722,143	\$586,094	\$0	\$728,677	\$4,045,945
3	Concrete										
	Materials & Methods				58	3,423	598	588	0	0	4,609
	Subtotal Concrete				58	\$3,423	\$598	\$588	\$0	\$0	\$4,609

Construction Subtotal (Direct Costs) 27,611 \$2,012,454 \$722,741 \$586,682 \$0 \$1,285,628 \$4,607,505

Indirect Costs

General Requirements	0%	of construction cost (included in Division 1)	0
Sales Tax	8%	of purchased materials	104,754
Ocean Shipping	0%	of purchased off-shore materials	0
Ocean Shipping	0%	of purchased off-shore Rental Equipment	0
Overhead and Profit	12%	of construction cost + general requirements	552,901
Bonds and insurance	4%	of construction cost + general requirements + sales tax + overhead and profit	210,606
Escalation (FY2010)	9.15%	of construction cost + general conditions + sales tax + overhead and profit + bonds and insurance	501,033
Contingency	50%	of construction cost + general conditions + sales tax + overhead and profit + bonds and insurance + escalation	2,988,399

Construction Subtotal Indirects \$4,357,693

Total Construction (directs and indirects) \$8,965,198

Permits	10%	of construction cost	896,520
Design	10%	of construction cost	896,520
Construction Management	10%	of construction cost	896,520
PG&E			
Owner Admin. & Overhead	5.5%	of construction cost + permits + design + construction management	641,012
FCFDC	23.0%	of constr. cost + permits + design + constr. management +PG&E owner admin. & overhead	2,828,027

Total \$15,123,797

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Opinion Of Probable Cost
 Pipeline Tunneling and Trenching

CSI Div./Sect.	DESCRIPTION	Quantity	Unit	Unit Cost	Labor				Material			Equipment			Sub-contract	Other	Total Cost	Remarks
					Crew Code	M-H per Unit	Man Hours	Duration Days	Average Wage Rate	Labor Cost	Unit Cost	Material Cost	Code	No.				
1	General Requirements																	
	Mobilization	1	LS	10,126													10,126	
	Supervision	1	LS	202,528													202,528	
	Temporary construction facilities	1	LS	101,264													101,264	
	Temporary utilities	1	LS	60,758													60,758	
	Safety	1	LS	101,264													101,264	
	Miscellaneous	1	LS	81,011													81,011	
	Subtotal Mobilization																596,951	
2	Site Work																	
02050	Basic Site Materials & Methods																	
02060	Aggregate																	
	Borrow																	
	Crushed Stone 1/2"	538	CY	33.09	C6	0.047	25	0.9	73.27	1,852.62	26.50	14,257.00	3f	3	66.90	1,691.57	0	17,801
	Crushed Stone 1/2"	2	CY	33.09	C6	0.047	0	0.0	73.27	5.61	26.50	43.19	3f	3	66.90	5.12	54	
	Crushed Stone 1/2"	48	CY	33.09	C6	0.047	2	0.1	73.27	165.29	26.50	1,272.00	3f	3	66.90	150.92	0	1,588
	Crushed Stone 1/2"	272	CY	33.09	C6	0.047	13	0.5	73.27	936.64	26.50	7,208.00	3f	3	66.90	855.22	0	9,000
	Hauling (50 Miles)	646	CY	5.05	C1	0.052	34	4.2	71.88	2,413.00	0.00	0.00	3e	2	25.23	846.83	0	3,260
	Hauling (50 Miles)	58	CY	5.05	C1	0.052	3	0.4	71.88	215.29	0.00	0.00	3e	2	25.23	75.55	0	281
	Hauling (50 Miles)	326	CY	5.05	C1	0.052	17	2.1	71.88	1,219.95	0.00	0.00	3e	2	25.23	428.14	0	1,648
02080	Utility Materials																	
	Valves																	
	Butterfly	1	EA	13,225.25	B5d	96.428	96	1.7	69.11	6,664.51	6,485.00	6,485.00			75.74	75.74	0	13,225
	12" Dia. (Manual Operator)	1	EA	11,665.60	B5d	23,810	24	0.4	69.11	1,645.60	10,000.00	10,000.00			20.00	20.00	0	11,666
02225	Site Demolition																	
	Remove Pavement & Curb	269	SY	5.92	B4d	0.067	18	0.4	68.13	1,222.41	0.00	0.00			1.38	371.22	0	1,594
	Remove Gravel Shoulder	3	SY	5.92	B4d	0.067	0	0.0	68.13	3.70	0.00	0.00			1.38	1.12	0	5
	Remove Gravel Shoulder	24	SY	5.92	B4d	0.067	2	0.0	68.13	109.06	0.00	0.00			1.38	33.12	0	142
	Remove Gravel Shoulder	156	SY	5.92	B4d	0.067	9	0.2	68.13	618.02	0.00	0.00			1.38	187.66	0	806
	Dump Charges																	
	Rubbish Handling																	
	20 Mile Round Trip 0.4 Loads/hr.	5	CY	35.04	C1	0.267	1	0.2	71.88	95.42	0.00	0.00	3d1	1	59.62	79.14	0	175
	20 Mile Round Trip 0.4 Loads/hr.	0	CY	35.04	C1	0.267	0	0.0	71.88	8.51	0.00	0.00	3d1	1	59.62	7.06	0	16
	20 Mile Round Trip 0.4 Loads/hr.	3	CY	35.04	C1	0.267	1	0.1	71.88	48.24	0.00	0.00	3d1	1	59.62	40.01	0	88
	Mechanical Demolition																	
	Valves																	
	Butterfly	1	EA	587.21	B5d	8,496	8	0.2	69.11	587.21	0.00	0.00			0.00	0.00	0	587
02230	Site Clearing																	
02305	Equipment Mobilization Or Demobilization																	
	Dump Truck (26 Tons)	5	EA	544	C1	2,000	10	1.3	71.88	718.77	0.00	0.00	3e1	2	25.23	252.25	1,748	2,719
	Tractor Loader, Wheel, 1.5 to 1.7;	1	EA	1,095	C1	2,667	5	0.7	71.88	383.39	0.00	0.00	3g	2	74.70	398.45	1,407	2,189
	Dozers (Above 150 HP)	2	EA	1,095	C2	2,667	5	0.7	71.88	383.39	0.00	0.00	3g	2	74.70	398.45	1,407	2,189
	Crawler Type Drill, 4"	2	EA	818	C2	6,000	12	1.5	62.90	754.83	0.00	0.00	3h	2	30.40	364.80	81	1,200
	Air Compressor, 600 CFM	1	EA	818	C2	8,182	16	2.0	62.90	1,029.34	0.00	0.00	3h	2	30.40	497.47	110	1,637
	50 Ft Air Hose, 3" Dia.	2	EA	0	C2	0,000	0	0.0	62.90	0.00	0.00	0.00			0.00	0.00	0	0
	Excavator, 1 - 1.5 CY Diesel Hydr.	1	EA	4,378	C1	10,667	21	2.7	71.88	1,533.42	0.00	0.00	3g	2	74.70	1,593.65	5,629	8,758
	25 Ton Truck Mounted Hydraulic	1	EA	912	C1	2,222	3	0.3	71.88	159.71	0.00	0.00	3g	2	74.70	165.98	586	912
	Rubber tired backhoe-loader, 3/4	1	EA	1,095	C1	2,667	3	0.3	71.88	191.70	0.00	0.00	3g	2	74.70	199.22	704	1,095
	Water Truck (6,000 Gal.)	1	EA	544	C1	2,000	2	0.3	71.88	143.75	0.00	0.00	3e1	2	25.23	50.45	544	818
	Grading																	
	Finish Grading	0	LS	0	A1	0,000	0	0.0	58.08	0.00	0.00	0.00			69.81	0.00	0	0
02315	Excavation & Fill																	
>>>>	Hauling																	

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Project: Poe Adit Tunnel By-Pass Flow
 Project No. 136662.0163
 Revision No.: 4
 Date: 05/09/05

Opinion Of Probable Cost
 Pipeline Tunneling and Trenching

CSI Div./Sect.	DESCRIPTION	Quantity	Unit	Unit Cost	Labor				Material				Equipment				Sub-contract	Other	Total Cost	Remarks
					Crew Code	M-H per Unit	Man Hours	Duration Days	Average Wage Rate	Labor Cost	Unit Cost	Material Cost	Code	No.	Avg. Cost (\$/hr)	Equipment Cost				
>>>>	16 Ton (12 CY) Dump Truck																			
2	20 Mile Round Trip 0.4 Loads/Hr.	9,742	CY	35.04	C1	0.267	2,596	324.5	71.88	186,612.06	0.00	0.00	3d1	1	59.62	154,780.93	0	341,393	35% Swell Factor	
4	20 Mile Round Trip 0.4 Loads/Hr.	851	CY	35.04	C1	0.267	227	28.3	71.88	16,301.99	0.00	0.00	3d1	1	59.62	13,520.80	0	29,822	35% Swell Factor	
5	20 Mile Round Trip 0.4 Loads/Hr.	4,936	CY	35.04	C1	0.267	1,315	164.4	71.88	94,551.44	0.00	0.00	3d1	1	59.62	76,423.44	0	172,975	35% Swell Factor	
6	20 Mile Round Trip 0.4 Loads/Hr.	0	CY	0.00	C1	0.267	0	0.0	71.88	0.00	0.00	3d1	1	59.62	0.00	0	0	0	35% Swell Factor	
>>>>	Excavation, Trenching																			
>>>>	Common Earth																			
2	1 CY Truck Mounted Hydr. Excav 6' To 10' Deep	1,289	CY	6.81	B5b	0.052	67	4.2	72.28	4,842.98	0.00	0.00	1e1	1	60.67	4,065.08	0	8,908		
4	1 CY Truck Mounted Hydr. Excav Rock (Hydraulic Jackhammer)	113	CY	6.81	B5b	0.052	6	0.4	72.28	423.17	0.00	0.00	1e1	1	60.67	355.20	0	778		
2	1 CY Truck Mounted Hydr. Excav 6' To 10' Deep	1,289	CY	12.27	B5b	0.092	119	7.4	72.28	8,596.30	0.00	0.00	1e1	1	60.67	7,215.52	0	15,812		
4	1 CY Truck Mounted Hydr. Excav Rock (Drill & Blasted Materials)	225	CY	12.27	B5b	0.092	21	1.3	72.28	1,502.27	0.00	0.00	1e1	1	60.67	1,260.96	0	2,763		
2	1 CY Truck Mounted Hydr. Excav 6' To 10' Deep	2,577	CY	138.37	B6	1.091	2,812	117.2	87.22	245,244.74	5.50	14,174.52	6h	4	34.57	97,188.30	0	356,608		
4	1 CY Truck Mounted Hydr. Excav 6' To 10' Deep	113	CY	138.37	B6	1.091	123	5.1	87.22	10,714.58	5.50	619.28	6h	4	34.57	4,246.09	0	15,580		
5	1 CY Truck Mounted Hydr. Excav Backfill Trench	2,613	CY	138.37	B6	1.091	2,851	118.8	87.22	248,683.98	5.50	14,373.30	6h	4	34.57	98,551.24	0	381,609		
>>>>	5 500' Haul Average	1,043	CY	54.76	B5	0.600	626	52.2	75.12	47,010.74	0.00	0.00	2e	1	16.15	10,106.85	0	57,118		
2-1/2	2 CY Bucket Wheel Mid. Front End Loader	2,062	CY	5.23	B5	0.052	107	8.9	75.12	8,054.63	0.00	0.00	2e3	1	25.44	2,728.26	0	10,783		
4	Minimal Haul	180	CY	5.23	B5	0.052	9	0.8	75.12	703.12	0.00	0.00	2e3	1	25.44	238.16	0	941		
>>>>	Excavation, Utility Trenching																			
>>>>	Utility Bedding																			
2	Crushed Stone 3/4" To 1/2"	1,629	CY	42.89	B4b	0.208	339	10.6	67.70	22,939.52	27.50	44,797.50	2a	1	6.76	2,292.06	0	70,029		
4	Crushed Stone 3/4" To 1/2"	143	CY	42.89	B4b	0.208	30	0.9	67.70	2,013.72	27.50	3,932.50	2a	1	6.76	201.21	0	6,147		
5	Crushed Stone 3/4" To 1/2"	826	CY	54.88	B5	0.300	248	20.7	75.12	18,614.65	27.50	22,715.00	2e	1	16.15	4,001.97	0	45,332		
2	Hauling (50 Miles)	1,629	CY	5.05	C1	0.052	85	10.6	71.88	6,088.56	0.00	0.00	3e	2	25.23	2,136.76	0	8,225		
4	Hauling (50 Miles)	143	CY	5.05	C1	0.052	7	0.9	71.88	534.48	0.00	0.00	3e	2	25.23	187.57	0	722		
5	Hauling (50 Miles)	826	CY	5.05	C1	0.052	43	5.4	71.88	3,067.26	0.00	0.00	3e	2	25.23	1,083.46	0	4,171		
02376	Erosion & Sedimentation Control																			
2	Silt Fence	4,079	LF	4.61	C2a	0.068	277	8.7	61.70	17,112.39	0.42	1,696.78			0.00	0.00	0	18,809		
3	Silt Fence	160	LF	4.61	C2a	0.068	11	0.3	61.70	671.27	0.42	66.56			0.00	0.00	0	738		
4	Silt Fence	421	LF	4.61	C2a	0.068	29	0.9	61.70	1,767.12	0.42	175.22			0.00	0.00	0	1,942		
02400	Tunneling, Boring & Jacking																			
02441	Microtunneling																			
	Horizontal																			
	Existing 18" Dia. Increased to 30" Dia. Hole X 20 Long Construction																			
6	Increase 18" Dia. to 30" Dia. Hole	20	LF	1,140.66	B5d	12.800	256	4.6	69.11	17,693.15	0.00	0.00			493.27	5,120.00	0	22,813		
2-1/2	2 CY Bucket Wheel Mid. Front End Loader	2	CY	15.69	B5	0.155	0	0.0	75.12	27.10	0.00	0.00	2e3	1	25.44	9.18	0	36		
6	Minimal Haul																			
6	16 Ton (12 CY) Dump Truck																			
6	20 Mile Round Trip 0.4 Loads/Hr.	3	CY	41.78	C1	0.318	1	0.1	71.88	71.75	0.00	0.00	3d1	1	59.62	59.51	0	131	35% Swell Factor	
6	Ventilation for Tunnel Construction																			
6	48" Dia. 20 Gp. Duct Spun on site	1,100	LF	23.93	A2	0.000	0	0.0	58.98	0.00	0.00	0.00		0.00	0.00	0.00	0	26,318	Equipment & Labor	
6	48" Dia. 125 HP Fan including sta	1	EA	31,900.00	A2	0.000	0	0.0	58.98	0.00	0.00	0.00		0.00	0.00	0.00	0	31,900	Equipment & Labor	
6	Prepare jacking anchoring, including mob. & demob.	1	LS	261,000.00	AZ	0.000	0	0.0	58.98	0.00	0.00	0.00		0.00	0.00	0.00	0	261,000	Equipment & Labor	
6	Set-ups																			
02445	Boring & Jacking Conduits																			
	Horizontal																			
	Pit Construction																			
	Vertical Shaft (2 Pit)																			
	Earth Excavation																			

PG&E

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 Opinion Of Probable Cost
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CSI Div./Sect.	DESCRIPTION	Quantity	Unit	Unit Cost	Labor				Material				Equipment				Total Cost	Remarks		
					Crew Code	M-H per Unit	Man Hours	Duration Days	Average Wage Rate	Labor Cost	Unit Cost	Material Cost	Code	No.	Avg. Cost (\$/hr)	Equipment Cost			Sub-contract	Other
xxx	Common Earth																			
3	1 CY Truck Mounted Hydr. Excav	28	CY	6.91	B5b	0.052	1	0.1	72.28	104.29	0.00	0.00	1e1	1	60.67	87.54	0	192 10' x 10' x 15 VLF		
3	Rock (Hydraulic Jackhammer)	28	CY	7.77	B5b	0.073	2	0.1	72.28	145.41	0.00	0.00	1a	1	34.90	70.22	0	216 10' x 10' x 15 VLF		
3	Rock Drill & Blasted Materials) 6' To 10' Deep	56	CY	60.35	B5	0.480	27	1.1	87.22	2,323.61	1.89	104.90	6h	4	34.57	920.83	0	3,349		
	SPILL HAULING & REMOVAL																			
2-1/2	CY Bucket Wheel Mkd. Front End Loader	126	CY	13.13	B5	0.052	7	0.5	75.12	493.59	7.90	998.24	2e3	1	25.44	167.19	0	1,659		
3	Minimal Haul																			
	Spill Hauling & Disposal																			
	16 Ton (12 CY) Dump Truck																			
3	20 Mile Round Trip 0.4 Loads/Hr.	171	CY	35.04	C1	0.267	45	5.7	71.88	3,267.58	0.00	0.00	3d1	1	59.62	2,710.22	0	5,978 35% Swell Factor		
3	Ventilation for Tunnel Construction																			
3	48" Dia. 20 Cx. Duct Spun on site	100	LF	23.93	A2	0.000	0	0.0	59.08	0.00	0.00	0.00			0.00	0.00	2,393	Equipment & Labor		
3	48" Dia. 125 HP Fan including sta	1	EA	31,900.00	A2	0.000	0	0.0	59.08	0.00	0.00	0.00			0.00	0.00	31,900	Equipment & Labor		
3	Prepare jacking pits, including mob. & demob.																			
3	Sec-ups	1	LS	321,900.00	A2	0.000	0	0.0	59.08	0.00	0.00	0.00			0.00	0.00	321,900	Equipment & Labor		
3	Backfill																			
	Borrow & Hauling																			
	Backfill & Compacted																			
3	Crushed Stone 3/4" To 1 1/2"	111	CY	54.88	B5	0.300	33	2.8	75.12	2,501.48	27.50	3,052.50	2e	1	16.15	537.80	0	6,092		
3	500' Haul Average	128	CY	54.76	B5	0.600	77	6.4	75.12	5,753.42	0.00	0.00	2e	1	16.15	1,236.93	0	6,990		
3	20 Mile Round Trip 0.4 Loads/Hr.	128	CY	35.04	C1	0.267	34	4.3	71.88	2,445.16	0.00	0.00	3d1	1	59.62	2,028.08	0	4,473 35% Swell Factor		
	Jack Boring Construction																			
	Horizontal Boring Casing Only (Steel)																			
3	48" Dia. 1/2" Wall Thickness w/C	33	LF	723.05	B5d	8.266	273	4.9	69.11	18,853.08	0.00	0.00			151.75	5,007.59	0	23,861 (For Steel Casing see below)		
02500	Utility Services																			
02510	Water Distribution																			
	Water Supply																			
	Concrete Pipe																			
	Black Steel Pipe																			
2	30" Dia.	1,854	LF	460.51	B5d	4.000	7,416	132.4	69.11	512,546.36	170.60	316,292.40			13.45	24,936.30	0	853,777 Coal Tar Coated		
3	30" Dia.	33	LF	590.96	B5d	5.800	191	3.4	69.11	13,228.39	170.60	5,629.80			19.50	643.58	0	19,502 Coal Tar Coated		
4	30" Dia.	162	LF	460.51	B5d	4.000	648	11.6	69.11	44,785.78	170.60	27,637.20			13.45	2,178.90	0	74,502 Coal Tar Coated		
5	30" Dia.	940	LF	460.51	B5d	4.000	3,760	67.1	69.11	259,668.10	170.60	160,364.00			13.45	12,643.00	0	432,875 Coal Tar Coated		
6	30" Dia.	20	LF	619.95	B5d	6.200	124	2.2	69.11	8,570.12	170.60	3,412.00			20.85	416.95	0	12,399 Coal Tar Coated		
3	48" Dia. 1/2" Wall Thickness w/C	33	LF	777.43	B5d	7.110	235	4.2	69.11	16,215.18	262.16	8,651.28			23.87	787.71	0	25,655 Coal Tar Coated		
	Black Steel Pipe Fittings																			
2	30" Dia. 90 Degree Elbow	1	EA	5,240.05	B5d	53.333	53	1.0	69.11	3,686.05	1,375.00	1,375.00			179.00	179.00	0	5,240 Coal Tar Coated		
2	30" Dia. 45 Degree Elbow	5	EA	5,240.05	B5d	53.333	267	4.8	69.11	18,430.25	1,375.00	6,875.00			179.00	895.00	0	26,200 Coal Tar Coated		
2	30" Dia. 22-1/2 Degree Elbow	1	EA	5,240.05	B5d	53.333	53	1.0	69.11	3,686.05	1,375.00	1,375.00			179.00	179.00	0	5,240 Coal Tar Coated		
3	30" Dia. 90 Degree Elbow	1	EA	6,854.32	B5d	77.333	77	1.4	69.11	5,344.77	1,250.00	1,250.00			259.55	259.55	0	6,854 Coal Tar Coated		
3	30" Dia. 45 Degree Elbow	1	EA	6,854.32	B5d	77.333	77	1.4	69.11	5,344.77	1,250.00	1,250.00			259.55	259.55	0	6,854 Coal Tar Coated		
4	30" Dia. 22-1/2 Degree Elbow	1	EA	5,015.05	B5d	53.333	53	1.0	69.11	3,686.05	1,150.00	1,150.00			179.00	179.00	0	5,015 Coal Tar Coated		
02890	Traffic Signs & Signals																			
2	Signage	1	LS	34,356.82	A4	260	260	8.1	58.08	15,129.46	6,818.31	6,818.31			5,534.74	5,534.74	6,874	34,357		
02950	Site Restoration & Rehab																			
3	Clean-Up & Repairs	0.66400	LS	171,784.10	A4	1,302	605	18.9	58.08	35,130.58	34,091.55	15,832.11			27,674	12,851.66	15,962	79,776		
3	Clean-Up & Repairs	0.121493	LS	171,784.10	A4	1,302	158	4.9	58.08	9,190.65	34,091.55	4,141.90			27,674	3,362.17	4,176	20,871		
4	Clean-Up & Repairs	0.036394	LS	171,784.10	A4	1,302	67	1.5	58.08	2,752.31	34,091.55	1,240.37			27,674	1,006.87	1,251	6,250		
5	Clean-Up & Repairs	0.281429	LS	171,784.10	A4	1,302	367	11.5	58.08	21,269.34	34,091.55	9,594.35			27,674	7,788.18	9,673	48,345		
6	Clean-Up & Repairs	0.096295	LS	171,784.10	A4	1,302	125	3.9	58.08	7,284.42	34,091.55	3,282.83			27,674	2,664.63	3,310	16,542		
3	Concrete																			
	Subtotal Site Construction									2,009,031	722,143							0	2,731,174	
03310	Structural concrete									27,563									728,677	
																			4,045,845	

PG&E

Project: Pos Adit Tunnel By-Pass Flow

Project No. 136982.0163

Revision No. 4

Date: 05/09/05

Opinion Of Probable Cost
Pipeline Tunneling and Trenching

CSI Div./Sect.	DESCRIPTION	Quantity	Unit	Unit Cost	Labor				Material			Equipment			Sub-contract	Other	Total Cost	Remarks		
					Crew Code	M/H per Unit	Man Hours	Duration Days	Average Wage Rate	Labor Cost	Unit Cost	Material Cost	Code	No.					Avg. Cost (\$/hr)	Equipment Cost
6	Placing Conc Foundation	2	CY	624.85	D7b	6.455	15	0.1	57.25	875.92	115.00	272.59	8g1	4	6.25	95.58	0	1,244	Crane w/ Conc Bucket	
6	Placing Conc Walls	2	CY	866.88	D7b	13.306	27	0.2	57.25	1,523.51	122.00	244.00	8g1	4	6.25	166.25	0	1,934	Crane w/ Conc Bucket	
6	Placing Conc Roof	1	CY	866.88	D7b	13.306	9	0.1	57.25	507.84	122.00	81.33	8g1	4	6.25	55.42	0	843	Crane w/ Conc Bucket	
6	Concrete Delivery	5	CY	188.15	C6a	1.440	7	0.1	71.09	518.61	0.00	0.00	8h1	6	37.35	270.90	0	787	Crane w/ Conc Bucket	
	Subtotal Concrete	0	LS	0	A1	0.000	58	0.0	58.08	3,423	0.00	0.00	1	69.81	0.00	568	0	4,898		
	Construction Subtotal (Direct Costs)						27,811			2,012,454		722,741				586,682	0	1,285,628	4,637,805	

Indirect Costs

Sales Tax	8%	of purchased materials + Rental Equipment.	104,754
Ocean Shipping	0%	of purchased off-shore materials	0
Overhead and Profit	0%	of purchased off-shore Rental Equipment	0
Bonds and Insurance	12%	of construction cost + general requirements	552,901
Escalation (FY2010)	4%	of construction cost + general requirements + sales tax + overhead and profit	210,606
Contingency	9.15%	of construction cost	501,033
Construction Subtotal Indirects	50%	of construction cost + general conditions + sales tax + overhead and profit + bonds and insurance + escalation	2,988,389
Total Construction (Directs and Indirects)			4,357,893

Total Construction (Directs and Indirects)

Permits	10%	of construction cost	896,520
Design	10%	of construction cost	896,520
Construction Management	10%	of construction cost	896,520
PG&E			
Owner Administration and Overhead	5.5%	of construction cost + permits + design + construction management	641,012
FC/FDC	23.0%	of constr. cost + permits + design + constr. management + PG&E owner admin. & overhead	2,828,027
Total			15,123,787