ISOLATED FACILITY, INCISED CANAL BAY-DELTA SYSTEM

ESTIMATE OF CONSTRUCTION COSTS

Prepared For

The STATE WATER CONTRACTORS

Washington Group International

August 2006

TABLE OF CONTENTS

Page

1.0 EXECUTIVE SUMMARY 1

2.0 INTRODUCTION 2

3.0 BASIS OF DESIGN AND QUANTITY TAKEOFFS 4
3.1 General 4
3.2 Unlined Canal 6
3.3 Concrete Structures 6
3.4 Rights-of-Way 6

4.0 PREPARE CONSTRUCTION COST ESTIMATES 7
4.1 General 7
4.2 Escalation of Historic Values Using USBR Construction Cost Trends 7
4.3 Development of Independent Unit Prices by WGI 9
4.3.1 General 9
4.3.2 Concrete in Inverted Siphons and Control Structures 10
4.3.3 Intake Facilities and Fish Screens 11
4.3.4 Embankments 11
4.3.5 Excavation and Dewatering 12
4.3.6 Land Rights 13
4.3.7 Pumping Plant 13
4.4 Other Adjustments to the Cost Estimates 14

5.0 CONCLUSION 14

LIST OF TABLES

Table No.

1 Summary of Alternatives and Physical Charateristics 5
2 Estimated Capital Costs Summary for 15,000 cfs IFIC Bay-Delta Conveyance Facility .. 8

LIST OF FIGURES

Figure No.

1 Isolated Facility, Incised Canal Proposed Alignments Sheet 1 of 9 16
2 Isolated Facility, Incised Canal Proposed Alignments Sheet 2 of 9 17
3 Isolated Facility, Incised Canal Proposed Alignments Sheet 3 of 9 18

LIST OF FIGURES (Continued)

Figure No.

4 Isolated Facility, Incised Canal Proposed Alignments Sheet 4 of 9 19
5 Isolated Facility, Incised Canal Proposed Alignments Sheet 5 of 9 20
6 Isolated Facility, Incised Canal Proposed Alignments Sheet 6 of 9 21
7 Isolated Facility, Incised Canal Proposed Alignments Sheet 7 of 9 22
8 Isolated Facility, Incised Canal Proposed Alignments Sheet 8 of 9 23
9 Isolated Facility, Incised Canal Proposed Alignments Sheet 9 of 9 24
10 Typical Canal Sections, Upstream of Disappointment Slough.....25
11 Typical Canal Sections, Downstream of Disappointment Slough.....26
12 Typical Siphon and Control Structure Plan and Section 27
13 Typical Siphon Cross-section 28
14 Route 1A Incised and Raised Canal Profiles 29
15 Route 1B Incised and Raised Canal Profiles 30
16 Route 2A Incised and Raised Canal Profiles 31
17 Route 2B Incised and Raised Canal Profiles 32

APPENDICES

APPENDIX A

Table A-1, Route 1A Incised Canal Invert Data From Reference Report
Table A-2, Route 1B Incised Canal Invert Data From Reference Report
Table A-3, Route 1A Ground Elevations as Interpreted from Reference Report
Table A-4, Route 1B Ground Elevations as Interpreted from Reference Report
Table A-5, Canal Cut-Fill Volumes Reference Table for Both Route #1 and Route #2
Table A-6, Canal Route #1 Quantity Calculation (Sacramento River to Disappointment Slough
Table A-7, Canal Route #1 Quantity Calculation (Disappointment Slough to Old River)
Table A-8, Canal Route #1A Quantity Calculation (Old River to Delta-Mendota Canal)
Table A-9, Canal Route #1B Quantity Calculation (Old River to California Aqueduct)...
Table A-10, Route #1 Incised Canal Quantities Comparison Summary
Table A-11, Route 1A Raised Canal Invert Data from Reference Report
Table A-12, Route 1B Raised Canal Invert Data from Reference Report
Table A-13, Incised and Raised Canal Route #1 Quantity Calculation (Downstream of Disappointment Slough)
Table A-14, Incised and Raised Canal Route #1A Quantity Calculation (Old River to Delta-Mendota Canal)
Table A-15, Incised and Raised Canal Route #1B Quantity Calculation (Old River to California Aqueduct)
Table A-16, Route #1 Incised and Raised Canal Quantities Comparison Summary
Table A-17, Route 2A Raised Canal Invert Data from Reference Report

Table A-18, Route 2B Raised Canal Invert Data from Reference Report
Table A-19, Route 2A Ground Elevations
Table A-20, Route 2B Ground Elevations
Table A-21, Canal Route #2 Quantity Calculation (Sacramento River to Disappointment Slough)
Table A-22, Incised and Raised Canal Route #2 Quantity Calculation (Downstream of Disappointment Slough)
Table A-23, Incised and Raised Canal Route #2A Quantity Calculation (Old River to Delta-Mendota Canal)
Table A-24, Incised and Raise Canal Route #1B Quantity Calculation (Old River to California Aqueduct)
Table A-25, Route #2 Incised and Raised Canal Quantities
Table A-26, 15,000 cfs Siphon Structure QTO - Box Culvert Barrel
Table A-27, 15,00 cfs Siphon Structure QTO - Approach Transition

APPENDIX B
Table B-3 Estimated Capital Costs, Isolated Delta Conveyance Facility, 15,000 cfs Alternative Cost Estimates
Table B- 4, USBR Construction Cost Trends 1960 to 2006
Table B-5, Labor, Equipment, and Materials Rates
Table B-6, Concrete Unit Prices for Inverted Siphon Structures and Transitions
Table B-7, Concrete Unit Price for Inverted Siphon Transitions
Table B-8, Unit Prices for Canal Embankment - Load, Place, & Compact w/0.5 Mile Haul
Table B-9, Unit Prices for Canal Excavation - Scraper w/1 Mile Haul
Table B-10, Unit Prices for Canal Excavation - Walking Dragline w/No Haul
Table B-11, Unit prices for Canal Excavation - Hydraulic Excavator w/0.5 Mile Haul
Table B-12, Unit Prices for Borrow Load & Haul - Hydraulic Excavator w/10 Mile Haul
Table B-13, Dewatering Costs for Canal Embankment Construction
Table B-14, IFIC Pumping Plant Cost Estimate

1.0 EXECUTIVE SUMMARY

Washington Group International Inc. (WGI) has performed a conceptual due diligence review and prepared construction cost estimates in 2006 dollars for the proposed Isolated Facility, Incised Canal, Bay-Delta System. WGI's scope of work was specifically directed to review the information available, layout the proposed facilities on current maps, adjust the canal alignment to avoid recent land developments, and prepare a re-estimate of the proposed project costs. During the review process WGI senior estimators, geotechnical and hydraulics engineers, mechanical engineers, and design support personnel provided technical input on the engineering design assumptions (related to cost impact), completeness of estimates, selection of productivity factors, and independent development of selected unit prices. The results of the review and estimating process are presented in both narrative text (the body of this report) and tabular form (cost estimate, quantity takeoffs, and unit price sheets). WGI used a combination of escalating unit prices and lump sum amounts developed by others and an independent "bottoms up" calculation of unit pricing for selected major and important construction activities to estimate the construction cost of four alternative schemes in current 2006 dollars.

The cost estimates for four alternative canal configurations were prepared and presented as a comparison to the previously identified reference schemes. The four alternatives in this report consist of two separate north-south canal alignments and two alternative pumping station locations. The Canal Route 1 alignment most closely follows the Isolated Facility Alignment presented in the "Isolated Facility, Conceptual Analysis of Incised Canal Configuration" report, dated September 1999. The two alternative pumping plant locations include the **downstream end** location near Clifton Court Forebay (Alternative Route 1-1) and the **mid-point** location just downstream of the canal route crossing of Disappointment Slough (Alternative Route 1-2). The Canal Route 2 alignment incorporates a shift of portions of the canal to the west to avoid the Secondary Zone, a zone of higher land values and greater land development potential than the Primary Zone. Route 2-1 has its **downstream end** pumping plant location near Clifton Court Forebay and Route 2-2 has its **mid-point** pumping plant location just downstream of the canal route crossing of Disappointment Slough.

The estimated construction costs for the four alternative alignment schemes range from **$3.3 Billion** to **$3.7 Billion**, with the Route 2-1 and 2-2 alignment estimated costs being less than the comparative Route 1-1 and 1-2 alignment estimated costs. These estimated costs are all higher than the $2.0 Billion estimate (escalated from October 1996 to August 2006) value that was presented for a 15,000 cfs capacity canal in the "Facility Descriptions and Updated Cost Estimates for An Isolated Delta Conveyance Facility" dated October 1997 and prepared by the CALFED Storage and Conveyance Refinement Team.

2.0 INTRODUCTION

Members of the Washington Group International, Inc. (WGI) team reviewed the available reference reports prepared by DWR, CALFED, and the USBR and cost estimates prepared by CALFED. The reference reports, along with input and guidance from staff of the Metropolitan Water District of Southern California (MWD), were used to adjust alignments of the proposed 15,000 cfs canal route to ensure a long term viable water conveyance system that would function as intended and provide a reliable delivery system to the California State Water Project (SWP) and Central Valley Project (CVP) canals. Alignment adjustments were made to the original route, based on high resolution 2005 aerial photos that included new land developments and physical changes to land usage not evident during previous studies. In addition, the Route 2 alignment was selected to locate the IFIC canal west of the Secondary Zone, an area that has been identified as potential future housing development.

The design concepts, formulated by others in the three main reference reports (see references 4, 5 and 7 below), were reviewed by WGI to identify any fatal flaws or prudent modifications that could impact the construction cost of the proposed alignments. Two significant modifications to the original schemes were made for the WGI construction cost estimates: 1) based on DWR soils investigations and borings, the canal alignment south of the Disappointment Slough and north of the Old River Slough will require removal and replacement of organic material to an average depth of 10 feet below the footprint of any new embankment for the canal; and 2) based on existing ground surface topography and the presence of organic soils, a second optional location of the pumping plant at the mid-point (just downstream of Disappointment Slough) needs to be seriously considered as an alternative to the downstream end (at Clifton Court Forebay) in order to raise the canal above the existing ground elevations, thus protecting the canal from flooding and other potential surface water intrusions.

For pricing of project features that WGI had no basis for changing or modifying, the unit prices and lump sum amounts prepared by others were simply escalated to current (April 2006) dollar values by applying the appropriate ratio of current Construction Cost Trend (CCT) USBR index values to historic CCT USBR index values for specific categories of construction. For major and important selected items, that WGI considered should be looked at separately, build-up unit prices were prepared for performing the work. Items selected for built-up unit pricing included scraper excavation, dragline excavation, hydraulic excavator excavation, placing embankments, dewatering for embankment placement, and cast-in-place concrete for box culverts and concrete transitions (inverted siphons). Some additional lump sum items were also priced separately for addition to the estimates to provide for what appeared to be missing cost items. And finally, a contingency value of 30 percent was added to the subtotal cost of each alternative to allow for unknowns at this level of project design.

The main reference documents used by WGI in the review of information and preparation of construction cost estimates and this report included the following:

1) Bucyrus International Inc., Personal Communications with Bill Barkley Regarding Costs and Performance of Bucyrus Model 680W Dragline, July 2006;
2) Bureau of Reclamation Construction Cost Trends January 1960 to April 2006, Prepared by the US Department of the Interior, Bureau of Reclamation;
3) Caterpillar Performance Handbook, Edition 36, dated October 2005 by Caterpillar Inc., Peoria, Illinois;
4) Delta Water Facilities Peripheral Canal, Preliminary Design Report (Draft Copy), dated July 1973, Prepared by the State of California, Department of Water Resources, Division of Design and Construction; (***1973 Report***);
5) Facility Descriptions and Updated Cost Estimates for An Isolated Delta Conveyance Facility, dated October 1997, Prepared by CALFED Storage and Conveyance Refinement Team. (***1997 Report***);
6) General Prevailing Wage Determination Made by the Director of Industrial Relations Pursuant to California Labor Code Part 7, Chapter 1, Article 2, Sections 1770,1773, and 1773.1, For Commercial Building, Highway, Heavy Construction and Dredging Projects, various crafts in Sacramento and San Joaquin Counties 2006; and
7) Isolated Facility, Conceptual Analysis of Incised Canal Configuration, dated September 1999, Prepared by CALFED Bay-Delta Program, Water Management Planning Branch. (***1999 Report***).

3.0 BASIS OF DESIGN AND QUANTITY TAKEOFFS

3.1 General

The Isolated Facility, Incised Canal Bay-Delta System (IFIC) evaluated in this cost estimating study would transport up to 15,000 cfs of fresh water from the Sacramento River at Hood to the California State Water Project (SWP) and the Central Valley Project (CVP). The fresh water conveyance system will consist of over 46 miles of unlined earth canal with the following additional structures: an intake structure on the Sacramento River that incorporates flow control gates and fish screens; eleven inverted siphons for crossing rivers and sloughs; four flow control structures for controlling water surface elevations in the canal; road and railroad bridges for crossing the canal; and a pumping plant for lifting the canal water up 15 feet. The basis of design and sizing for this hydraulically isolated project is detailed in the two main reference reports, the 1997 Report and the 1999 Report. Table 1, Summary of Alternatives, provides a summary of the features for the four alternatives estimated by WGI plus the comparable characteristics of the 1997 Report 15,000 cfs scheme and the 1999 Report scheme. Figures 1 through 9 show the alignments of Route 1 and Route 2, including inverted siphons and control structures. Where the two routes follow the same alignment, the route is shown in red, where the two routes follow different alignments, Route 1 is shown in magenta and Route 2 is shown in green. Centerline stationing is shown for both alignments.

As indicated in the 1999 Report, sizing of the canal is based on the full flow design velocity of 1.6 feet per second with a depth of 23.5 feet. Since the 1999 Report was based on a design flow of 10,000 cfs, WGI had to establish the bottom width and canal cross-section for the 15,000 cfs capacity canal. Using the same design parameters and side slopes, WGI calculated the 15,000 cfs canal bottom width as 340 feet; and the top width varies from 500 to over 700 feet, depending on ground surface elevation and canal invert. See Figures 10 and 11 for typical canal cross-sections. These canal dimensions are different from the 1997 Report, which utilized a canal bottom width of 140 feet and a maximum depth of 36 for the 15,000 cfs canal. The size and configuration of the inverted siphons and flow control structures is based on the 1997 Report layouts and descriptions for those features. And the length of inverted siphons, as selected by WGI, is based on the location and lengths of crossings of rivers and sloughs along the Route 1 and Route 2 canal alignments. A typical plan and profile for the inverted siphon and control structure is shown in Figure 12 and a typical cross section of the inverted siphon is shown in Figure 13.

The water surface profiles for the proposed IFIC were assumed to be essentially the same as that presented in the 1999 Report, because the design velocity and canal characteristics are similar. Head losses that occur at the siphons and other canal features need to be further analyzed in subsequent studies and design work, but for the present purposes, the same water surface profile is a good approximation. Also, because the termination of the IFIC canal alignments was changed to include links to the CVP and SWP canals, WGI has prepared four canal profiles, including two for Route 1 and two for Route 2. The two profiles for each route include the additional branches (Branch A and Branch B) that connect the IFIC to the two existing canals. See Figure 14 for the Route 1A "Incised" and "Raised" canal profiles, Figure 15 for the Route

Table 1, Summary of Alternatives and Physical Characteristics

[1]	[2]	[3]	[4]	[5]	[6]	[7]
DESCRIPTION	Peripheral **15,000 cfs**	Orig Incised **10,000 cfs**	Route 1-1 **15,000 cfs**	Route 1-2 **15,000 cfs**	Route 2-1 **15,000 cfs**	Route 2-2 **15,000 cfs**
SOURCE -->	Oct '97 Report [1]	Sep '99 Report [2]	Aug '06 Est. [3]	Aug '06 Est. [3]	Aug '06 Est. [3]	Aug '06 Est. [3]
INTAKE FACILITIES						
Trashrack & Fishscreens (quantity)	18		18	18	18	18
PUMPING PLANTS						
Plant Location	U/S End	D/S End	D/S End	Midway	D/S End	Midway
11 Pumps (1 standby) (capacity per unit - cfs)	1,500 cfs		1,500 cfs	1,500 cfs	1,500 cfs	1,500 cfs
Total Dynamic Head (feet)	10	15	15	15	15	15
Total Plant Horsepower (hp)	25,080	24,300	36,450 [4]	36,450 [4]	36,450 [4]	36,450 [4]
EARTH CANAL						
Length (miles)	44.0	42.6	47.3	47.3	46.4	46.4
Length (Feet)	232,320	225,100	249,600	249,600	244,800	244,800
Type	Unlined	Unlined	Unlined	Unlined	Unlined	Unlined
Approx Max Top Width (feet)	513	367	507	650	581	712
Bottom Width (feet)	140	200	340	340	340	340
Depth	36	23.5	24	24	24	24
Side Slopes	3:1, 8:1	3:1, 8:1	3:1, 8:1	3:1, 8:1	3:1, 8:1	3:1, 8:1
Excavation Volume (million CY)	69.4	59.5	105	90	98	72
Compacted Embankment Volume (million CY)	31.0	14.4	9	24	12	28
Avg Right of Way Width (LF)	1,000	1,161	1,300	1,300	1,300	1,300
Right-of-way (acres)	5,330	6,000	7,400	7,400	7,300	7,300
INVERTED SIPHONS - BOXES	6 - 30' x 30'	4 - 20' x 20'	6 - 30' x 30'	6 - 30' x 30'	6 - 30' x 30'	6 - 30' x 30'
1 Stone Lake Siphon						
Length (feet)	N/A	1,200	1,200	1,200	1,200	1,200
1a Snodgrass Slough Siphon						
Length (feet)	225	N/A	N/A	N/A	N/A	N/A
2a Lost Slough Siphon						
Length (feet)	250	N/A	900	900	900	900
2b Mokelumne River Control Structure & Siphon						
Length (feet)	730	4,900	400	400	400	400
3 Beaver Slough Siphon						
Length (feet)	385	300	400	400	400	400
4 Hog Slough Siphon						
Length (feet)	190	N/A	400	400	400	400
5 Sycamore Slough Siphon						
Length (feet)	160	N/A	N/A	N/A	300	300
6 White Slough Control Structure & Siphon						
Length (feet)	205	400	400	400	800	800
7 Disappointment Slough Siphon						
Length (feet)	0	400	400	400	1,400	1,400
8 14-Mile Slough Siphon						
Length (feet)	375	600	600	650	N/A	N/A
9 San Joaquin River Control Structure & Siphon						
Length (feet)	712	800	800	850	1,400	1,450
10 Middle River Control Structure & Siphon						
Length (feet)	730	800	1,100	1,150	1,100	1,150
11 Old River Siphon						
Length (feet)	580	500	500	550	500	550
NEW FOREBAY STRUCTURE TO SWP						
Surface Area (Acres)	N/A	N/A	250	250	250	250
Volume of Excavation (Million CY)	N/A	N/A	7	7	7	7

Notes:

1) Facility Descriptions and Updated Cost Estimates for An Isolated Delta Conveyance Facility, Prepared by the CALFED Storage Refinement Team, October 1997 (Referred to as the Oct '97 Report).
2) Value arrived at by multiplying (or otherwise adjusting) the data given in the Isolated Facility, Conceptual Analysis of Incised Canal Configuration Report, Prepared by CALFED Bay-Delta Program, Water Management Planning Branch, dated September 1999 (Referred to as the Sep '99 Report).
3) An Estimate prepared by WGI, based on some quantities and unit pricing from the Oct '97 Report, some quantities and pricing from the Sep '99 Report, and some independent quantities and unit pricing prepared by WGI.
4) Value arrived at by multiplying (or otherwise adjusting) the data given in the Sep '99 Report.

1B "Incised" and "Raised" canal profiles, Figure 16 for the Route 2A "Incised" and "Raised" canal profiles, and Figure 17 for the Route 2B "Incised" and "Raised" canal profiles.

The "Incised" profile, in the figures is represented by the solid lines, while the "Raised" portion of the canal profile is shown in dashed lines and represents the portion of the canal south of Disappointment Slough and downstream of the "mid-point" pumping station location. Both solid and dashed lines end at the same elevations at the downstream connection to the SWP and CVP canals.

3.2 Unlined Canal

Quantity takeoffs for the unlined canal were prepared by WGI, based on ground surface elevations along the centerline of Routes 1 and 2, and proposed water surface profiles at these same points. The ground and canal invert elevations along the routes were taken from the 1999 Report Figure 3.5, Isolated Facility – Canal Profile, and modified, as appropriate, by using a National Geographic software package plotting (USGS topo maps of California field updated in 2005) of topography along the alignments. An Excel spreadsheet was utilized to calculate volumes of excavation and fill required, based on stationing at every one hundred feet along the canal alignments. Calculated quantities for scraper excavation, walking dragline excavation, embankment foundation excavation (for the portion of canal alignments south of Disappointment Slough – labeled as "Hydraulic Excavation"), embankment fill – local (embankment construction utilizing material from the scraper excavation), embankment fill – import (embankment construction utilizing material that requires importing from a source an average of 10 miles away), and net disposal volume (total excavation volume minus the usable volume) are shown in Appendix A, following this report.

3.3 Concrete Structures

WGI performed quantity takeoffs of the typical siphon sections and transitions approaching and leaving the siphons to be able to estimate the average unit price of concrete for the structures. Cross-sectional dimensions of the box culvert siphons were taken from the 1997 Report. Typical concrete transition structure dimension were taken from the 1999 Report, Figure 3.4, as adapted to the width of 15,000 cfs canal and siphon structure. Representative quantities were calculated for an 800-foot long siphon, yielding about 91.3 cubic yards per foot of siphon length. The calculated quantities and are shown in Appendix A, following this report.

3.4 Rights-of-Way

The Right-of-Way area, expressed in acres, was calculated based on the canal length times a width allowance of 1,300 feet.

4.0 PREPARATION OF CONSTRUCTION COST ESTIMATES

4.1 General

A summary of the estimated capital costs for the 15,000 cfs IFIC Bay-Delta Conveyance Facility is shown in Table 2. WGI's total estimated costs range from $3.3 billion to $3.7 billion. This summary estimate shows, in a side-by-side comparison, the estimated costs of the 1997 Report, Peripheral Canal in 1996 dollars and in 2006 dollars; and WGI's estimated costs for the four alternative IFIC alignment schemes, Route 1-1, Route 1-2, Route 2-1 and Route 2-2. Details of the estimates are shown in Appendix B, Table B-3.

The overall organization and format of the IFIC construction cost estimates is patterned after the 1997 Report, Tables 1 and 2c. This estimate format and basic content was used because it has a higher level of detail than the 1999 Report, appears more complete and is easy to follow. It also allows a side–by-side comparison of the quantities, unit prices, and major feature subtotals. Because of its level of detail and format to show USBR indexing of estimated costs from 1964 to 1996, it facilitates WGI's addition of USBR indices to escalate the appropriate historic costs to Year 2006 dollar values.

4.2 Escalation of Historic Values Using USBR Construction Cost Trends

After a review of the 1997 Report and the 1999 Report, it was clear that the 1997 Report had a more detailed and better organizational presentation of the estimated costs for the proposed canal and associated structures than the 1999 Report. The 1997 Report also included a provision for updating the referenced 1964 cost estimate pricing to 1996 dollars. WGI has used the same source, the USBR Construction Cost Trends (CCT) index values for escalating and updating water resources and hydroelectric project estimated costs for as long as the reference has been available. Beginning with a valid base estimate, the CCT index values are an excellent means of quickly and accurately changing historic western states construction cost values to current date values.

For the bulk of unit prices and lump sum allowances presented in the IFIC construction cost estimate, the USBR CCT index values were used to convert 1964 and 1996 values to 2006 dollars. WGI chose to index values based on our judgment of the relative accuracy and impact on the overall estimated project costs. In general, all costs and unit pricing for the 1997 Report estimate were accepted as being appropriate except for the following items, which WGI chose to address separately:

Intake Facilities and Fish Screens;
Main Canal Excavation (scraper, walking dragline, and hydraulic excavator);
Main Embankment construction;
Right-of-way Land costs;
Concrete for Inverted Siphons and Control Structures

These items together comprise about **78 percent** of the subtotal cost for all items.

Table 2, Estimated Capital Costs Summary for 15,000 cfs IFIC Bay-Delta Conveyance Facility

SUMMARY OF ESTIMATED CAPITAL COSTS (in Million Dollars)
15,000 cfs ISOLATED DELTA CONVEYANCE FACILITY

Ref No.	Cost Item	Oct. 1997 Report Oct 1996 $'s	Estimates in 2006 $'s				
			Oct. 1997 Report	August 2006			
				Route 1-1	Route 1-2	Route 2-1	Route 2-2
1	Intake Facilities	$235.1	$328.6	$401.7	$401.7	$401.7	$401.7
2	Bridges	$34.9	$48.1	$50.5	$50.5	$50.5	$50.5
3	Culverts	$1.9	$2.7	$2.9	$2.9	$2.9	$2.9
4	Pumping Plant	$57.8	$79.4	$206.4	$206.4	$206.4	$206.4
5	Earth Canal w/A&B	$253.3	$368.6	$701.5	$858.2	$525.5	$658.8
6	Mokelumne R. Siphon &CS	$29.6	$41.5	$63.7	$63.7	$63.7	$63.7
7	San Joaquin R. Siphon & CS	$40.1	$56.4	$74.7	$77.0	$102.4	$104.7
8	Old River Siphon	$23.8	$74.4	$36.3	$38.3	$36.3	$38.3
9	Middle Riv Siphon & CS	$33.4	$110.3	$98.4	$101.8	$98.4	$101.8
10	14-Mile Slough Siphon	$15.7	$21.9	$48.5	$51.6	$0.0	$0.0
11	White Slough Siphon & CS	$10.1	$14.2	$45.3	$45.3	$68.6	$68.6
12	Sycamore Slough Siphon	$8.0	$11.3	$0.0	$0.0	$29.0	$29.0
13	Hog Slough Siphon	$9.1	$12.8	$35.3	$35.3	$35.3	$35.3
14	Beaver Slough Siphon	$16.9	$23.7	$37.8	$37.8	$37.8	$37.8
15	Lost Slough Siphon	$9.8	$13.6	$57.8	$57.8	$57.8	$57.8
16	Snodgrass Slough Siphon	$10.2	$14.3	$82.7	$82.7	$82.7	$82.7
17	Disappointment Slough	$0.0	$0.0	$37.8	$37.8	$99.6	$99.6
18	Control Structure on Br "A"			$6.4	$6.4	$6.4	$6.4
19	Control Structure on Br "B"			$32.2	$32.2	$32.2	$32.2
20	Forebay Structure to SWP			$52.4	$52.4	$52.4	$52.4
21	SUBTOTAL	$789.7	$1,221.8	$2,072.3	$2,239.8	$1,989.6	$2,130.6
22	ROUNDOFF	$790.0	$1,222.0	$2,072.0	$2,240.0	$1,990.0	$2,131.0
23	Contingencies (20%)						
	20 % Contingency	$158.0	$244.0	--	--	--	--
	30% Contingency	--	--	$622.1	$672.0	$597.2	$639.0
24	ESTIMATED CONSTRUCT COST	$948.0	$1,466.0	$2,694.1	$2,912.0	$2,587.2	$2,770.0
25	Engineering, CM, Legal, and Project	@35% $332.0	@35% $513.0	@28% $754.0	@28% $815.0	@28% $724.0	@28% $776.0
26	ESTIMATED CAPITAL COST	1,280	1,979	$3,448	$3,727	$3,311	$3,546
		(Estimated Costs in Millions)					

Appendix B contains Table B-4, a table of CCT index values compiled by the USBR, covering the quarterly index values for 35 categories (plus a composite value) from 1960 to the present (April 2006). The October 1964, October 1996 and April 2006 index values for appropriate structure categories were used to convert historic values to 2006 values. Values selected from the CCT are shown in columns 5 through 10 in the detailed estimate (Appendix B, Table B-3).

4.3 Development of Independent Unit Prices by WGI

As was mentioned in the previous section, WGI chose to independently develop unit prices for some key items of work that are significant in the overall project cost estimates. These items, listed in order of cost significance are:

Concrete in Siphons & Control Structures;
Intake Facilities and Fish Screens;
Embankments;
Excavation & Dewatering;
Land Rights; and
Pumping Plant.

The following subsections discuss the development of unit prices and lump sum amounts for these major cost impact items that make up about 78 percent of all items combined.

4.3.1 General

Unit prices developed for this estimate are current for August 2006, based on available conceptual design, conceptual level drawings, and WGI's quantity takeoffs. These unit prices represent contractor bid values, assuming that the work would be bid and performed by one or more nationally recognized and qualified construction contractors working under a competitively bid contract award. Unit prices and extended amounts represent contractors' construction costs (including overhead and profit) only. Therefore, the following costs are not included in the construction cost estimate:

- Escalation for construction to be performed after August 2006;
- Allowance for funds used during construction;
- Contractor-furnished field offices, labs, vehicles, or special equipment for Owner's (or engineer's) use during construction; and
- Any outage or loss of project operation costs during construction.

Unit prices for all components of construction activities include the following five cost elements: **labor, permanent materials, construction equipment, contractor's expendable supplies**, and **overhead and profit**. The key ingredient in determining the cost of each of these elements and their related share of the unit price cost is productivity of the work force and the construction equipment used to perform the various work activities. Productivity rates for construction work activities were selected to reflect local weather, site conditions, work week hours, craft

experience and availability, appropriate construction techniques, schedule sequencing, and experience gained on various construction projects.

The hourly **labor** rates include Year 2006 prevailing wage and labor rates for Sacramento and San Joaquin Counties, California, salary fringe benefits, and other contractor's labor related costs. The **permanent materials** costs include the cost of materials that become a permanent part of the project modifications, such as cast-in-place concrete, reinforcing steel, rock surfacing materials, imported embankment materials, topsoil, and any other vendor or contractor furnished materials. The hourly **construction equipment** rates include the cost of ownership (or rental) and operating (labor excluded) construction equipment used in the excavation, placement, handling, and transportation of materials and supplies. The **contractor's expendable supply costs** include temporary supplies, such as concrete forms, form oil, lifting and rigging materials, temporary fill, dewatering pipes and pumps, etc., that are needed for construction, but do not become a permanent part of the project. The Contractor's **overhead and profit** includes an allowance (about 30% of the subtotal of labor, permanent materials, and equipment) to cover the contractor's costs of site office facilities, home office costs, supervision, engineering, permitting, timekeeping, and to provide a profit for the risk involved in performing the work. A cost contingency is not included in the unit prices. The resulting cost estimate unit prices reflect total contractor costs as would be displayed in a bid document. A spreadsheet containing wage and labor rates, construction equipment rates, and permanent materials rates selected for use in these estimates is contained in Appendix B, Table B-5.

For each of the major construction activities, there is one key piece of construction equipment identified in the estimate that establishes the productivity factor that controls the rate of material placement (or removal) in the construction work. The detailed elements of construction scheduling have not been optimized, but have been initially identified and used to set a pace of construction for the utilization and productivity of labor and equipment.

Excavation, loading, hauling, stockpiling, and placement of the construction materials require specific units to perform efficient cycling times for handling and placing materials. To go with this key equipment, or "prime equipment," a crew of labor and support construction equipment has been selected, based on WGI experience, to support the productivity of the prime equipment. If one crew set-up is not sufficient to perform the quantity of work in a reasonable amount of time, additional crew set-ups can be added (as long as space constraints allow) to reduce the overall duration of the work.

4.3.2 Concrete in Inverted Siphons and Control Structures

Concrete unit pricing is a function of concrete volume, formed surface areas to contain the placed concrete, rebar steel content, horizontal surface finishing, and rate (and means) of placing concrete. WGI performed quantity takeoffs of the typical inverted siphon sections and transitions approaching and leaving the siphons to be able to estimate the average unit price of concrete for the structures. Cross-sectional dimensions of the box culvert siphons were taken from the 1997 Report. Typical concrete transition structure dimension were taken from the 1999 Report, Figure

3.4, as adapted to the width of 15,000 cfs canal and siphon structure. Representative quantities were calculated for an 800-foot long siphon, yielding about 91.3 cubic yards per foot of siphon length. This information was inserted into a typical concrete pricing worksheet prepared for estimating the unit price of concrete in these structures. A ready-mix concrete purchase price of $90 per cubic yard was used for the material pricing, based on the current market value of ready-mix in the Stockton, California area. The average unit price per cubic yard of concrete for the structure was calculated to be $409. This unit rate, plus an allowance of $14 per cubic yard for earthwork yielded a composite unit rate of $423 per cubic yard to be applied to the volume of inverted siphon concrete in the IFIC estimate. The worksheet for this unit pricing is contained in Appendix B, Table B-6.

In a similar manner, the quantities estimated for the concrete approach and departure transition structures to the siphon were estimated and placed into a concrete pricing worksheet prepared for estimating the unit price of concrete in these structures. A ready-mix concrete purchase price of $90 per cubic yard was used for the material pricing, and the average unit price per cubic yard of concrete for the structure was calculated to be $328. The worksheet for this unit pricing is contained in Appendix B, Table B-7.

4.3.3 Intake Facilities and Fish Screens

The input on estimated cost of intake facility and fish screens for the IFIC was provided to WGI by MWD/SWC in the form of $25,000 per cfs of screening capacity. The design technology and materials used for fish screens has been a rapidly changing and difficult to control technology, because it involves a rapidly changing science. WGI chose to add additional money for the flood control structures that will also be needed on the intake structure. This additional allowance was based on the addition of six radial control gates, whose cost was adjusted for size and escalation from the 1999 Report pricing. There is no additional backup information for these estimated costs.

4.3.4 Embankments

There are two elements of costing for building embankments required for the IFIC project. For the first, the placement and compaction of materials that are obtained from required scraper excavation of the material that is two feet above the water table in the canal alignment, there is no additional cost for embankment construction. WGI chose to include the cost of placement and compaction of excavated materials in the unit price for scraper excavation. However, for the cost of building embankments for replacement of the organic materials removed from the foot print of the embankment (below two feet above the water table down to an average ten feet lower) and for building embankments that require importing material because there is not enough available from scraper excavation (within one mile haul), a unit price was developed for building embankments, including a one-half mile haul. This unit price is based on using a CAT 988F Loader, CAT D350E articulated trucks, CAT D-9N dozers, a CAT 825 compactor, and other support equipment and personnel to place and compact 660 cubic yards of embankment material per hour. The worksheet for this unit pricing is contained in Appendix B, Table B-8.

4.3.5 Excavation & Dewatering

There was little evidence of how the excavation unit pricing was estimated for the 1997 report and virtually no explanation for the 1999 Report. WGI selected three prime excavators for development of unit pricing for the important task of canal excavation. Beginning at the ground surface, the top material, down to about two feet above the water table, will be removed with CAT 637E scrapers. The scrapers, which have a capacity of about 30 cubic yards, will haul off the material, mostly to be used for building nearby embankments. Support equipment for the scraper operation includes CAT D-9N dozers, a CAT 825 compactor, and additional labor crafts. WGI estimates that each spread of scraper equipment can excavate at a rate of 250 cubic yards per hour. The worksheet for this unit pricing is contained in Appendix B, Table B-9.

For canal excavation from two feet above the water table to the invert of the canal, WGI selected large walking dragline equipment spreads. The prime excavator is a Bucyrus 680W with a 225 foot boom and 30 cubic yard bucket. Support equipment for the spread includes three CAT D-9N dozers plus suitable labor crafts. Each of these spreads is able to excavate at an average rate of 1,280 cubic yards per hour. The worksheet for this unit pricing is contained in Appendix B, Table B-10.

The third canal excavation equipment spread is for excavating below the footprint of proposed embankments to an average depth of ten feet below the ground surface where the canal alignments pass through areas of organic materials. This occurs in both Route 1 and Route 2 alignments south of the Disappointment Slough crossings. For these areas, the organic material needs to be removed and replaced with suitable fill and embankment material in order to properly support additional above ground embankments and prevent subsidence. The prime excavator is a CAT 350 BL hydraulic excavator with a four cubic yard bucket. Support equipment for the spread includes one CAT D-9N dozer and more that two CAT 769 off-road end dump trucks plus suitable labor crafts. Each of these spreads is able to excavate at an average rate of 660 cubic yards per hour. The worksheet for this unit pricing is contained in Appendix B, Table B-11.

Another excavation equipment spread was developed for use at material borrow sites where suitable embankment material needs to be obtained some distance away from the canal work. For this scenario, WGI assumed that a ten-mile haul would be needed to get material that meets the embankment construction requirements. For this equipment spread, the prime excavator is also a CAT 350 BL hydraulic excavator with a four cubic yard bucket. Support equipment for the spread includes one CAT D-9N dozer and more that twenty 18 cubic yard on-highway dump trucks plus suitable labor crafts. Each of these spreads is able to excavate at an average rate of 660 cubic yards per hour. The worksheet for this unit pricing is contained in Appendix B, Table B-12.

Although excavation can and does occur "in-the-wet," placement and compaction of embankment materials cannot be properly accomplished "in-the-wet." For estimating dewatering costs associated with placement of embankments, WGI used a simple spreadsheet that incorporates the estimated costs of wells and a well point system that includes placing wells 35

feet deep at 50 foot centers with a moveable collection and pumping system to operate continually for three years on the "Raised" canal alignments and for an equivalent six years on the non-"Raised" canal alignments. This procedure needs to be included where embankments would otherwise be placed below the assumed water table. The worksheet for this lump sum pricing is contained in Appendix B, Table B-13.

4.3.6 Land Rights

At the suggestion of MWD staff, WGI used property values for the purchase of canal right-of-way (ROW) properties that are more in line with today's real estate values along the proposed canal alignments. For portions of the alignment in the Secondary Zone nearest high value property, $200,000 per acre was used for 746 acres of land. For 686 acres of land, also in the Secondary Zone, but not deemed to be of such high value, $50,000 per acre was used. For all of the Primary Zone property, a value of $5,000 per acre was used. Because the Route 2 ROW is entirely within the Primary Zone, the estimated Route 2 ROW property values are $33,000,000, but Route 1 property values are estimated to be worth $209,840,000.

4.3.7 Pumping Plant

The pumping plant pricing used by WGI was derived from the USBR Mechanical Engineers' Pumping Plant Cost Curves, as Corrected by Alan Stroppini (per letter to Mr. Ron Ott for adjusting from Field Cost Prices to Total Field Costs, as of October 1995). This reference is shown as Table B-14 in Appendix B. From these cost curves (and tabulated data), the estimated costs for a Pump Station with a flow of 15,000 cfs at a Total Head of 20-Feet is $ 156,500,000 in October 1995 dollars. Adjustments to this base value to arrive at pumping plant costs for the IFIC were as follows:

a. Costs were adjusted for the ratios of their Heads raised to the 6/10 power.
b. Costs were adjusted for inflation by the ratios of their USBR cost indexes between October 1995 and April 2006.
c. Additionally, costs were adjusted for a Total of 11 pumps instead of the 7 used by USBR by an arbitrary 105%.
d. Additionally costs were added for two Variable Frequency Drives allowing for additional electrical equipment capacities, added space requirements, added ventilation, and added installation costs.
e. Interim Result - Seven Pump Station w/out variable flow drives (VFD's): **$ 186,500,000**
f. Interim Result - Seven Pump Station w/2 VFD's: **$ 187,250,000**
g. Final Result - Eleven Pump Station w/2 VFD's **$ 196,600,000**

The 1997 Report pumping plant estimated costs were based on the actual construction cost of the Waddell Pumping –Generating Plant in Arizona, completed in 1994, adjusted for escalation and horsepower factoring. WGI chose not to use these values, because the Waddell Pump/Generation Plant is a medium head plant using vertical shaft Francis type pump/turbines and synchronous motor generators. This equipment is very different from the very low head and high capacity axial flow pumps required for the IFIC facility. Therefore, WGI used the more conservative estimate based on the USBR Pumping Plant Cost Estimating curves.

4.4 Other Adjustments to the Cost Estimates

Additional WGI adjustments made to the IFIC construction cost estimate included the following:

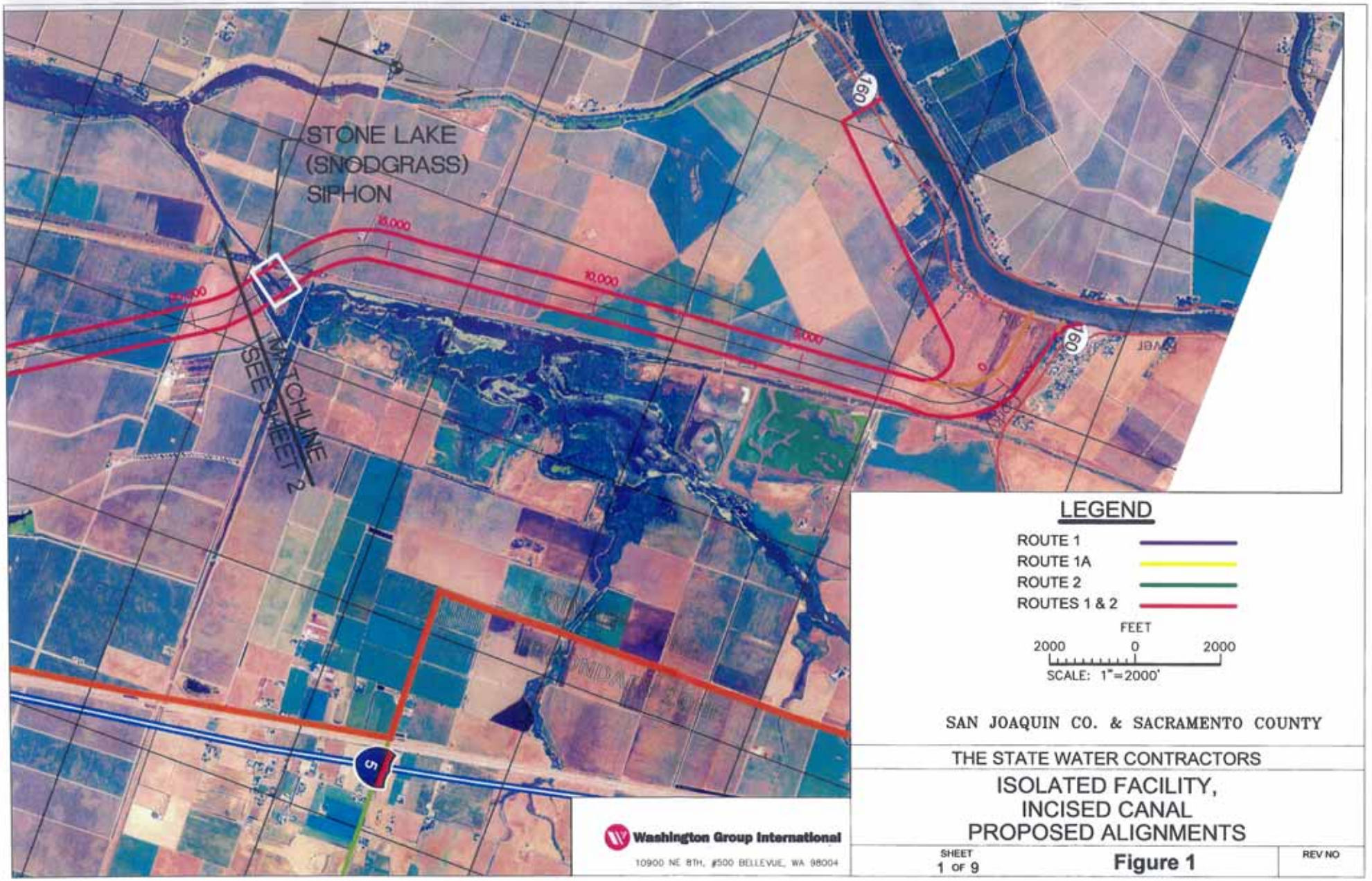
- Add Mobilization and Demobilization Allowances for each major feature – Use 5% of the subtotal for the major feature;
- Add Turnout Structures with 200 cfs discharge capacity to each inverted siphon crossing of waterways – Use a lump sum amount of $1,000,000 per each;
- Add Control Structure on Branch A to CVP – this allows a gravity flow of up to 5,000 cfs directly to the CVP canal
- Add Control Structures on Branch B to SWP – this allows gravity flow of up to 15,000 cfs to enter the new forebay with a second control structure to allow up to 10,000 cfs to flow directly to the SWP
- Add 250 acre Forebay Structure to Branch B – this structure will allow temporary storage of excess IFIC flows, thus providing greater system operational flexibility
- Change Contingency Allowance to 30% - WGI judgment to use 30% vs. 20%, because of the level of design information available and the need for further refinements to project design

5.0 CONCLUSION

WGI concludes that the proposed 15,000 cfs capacity IFIC Bay-Delta Conveyance Facility, as presently conceived, can be built for $3.3 billion to $3.7 billion in August 2006 dollars, depending on which route and pumping plant location is selected. There remains much engineering design work to be done to prepare adequate structure details, drawings, and specifications that will fully define the proposed project, but these goals and ultimate construction of the project can be achieved within the estimated implementation costs.

FIGURES

ISOLATED FACILITY, INCISED CANAL


STONE LAKE
(SNODGRASS)
SIPHON
15,000
10,000
5,000
MATCHLINE
SEE SHEET 2
190
160
5
LEGEND
ROUTE 1
ROUTE 1A
ROUTE 2
ROUTES 1 & 2
FEET
2000
0
2000
SCALE: 1"=2000'
SAN JOAQUIN CO. & SACRAMENTO COUNTY
Washington Group International
10900 NE 8TH, #500 BELLEVUE, WA 98004
THE STATE WATER CONTRACTORS
ISOLATED FACILITY,
INCISED CANAL
PROPOSED ALIGNMENTS
SHEET
1 OF 9
Figure 1
REV NO

FEET
2000 0 2000
SCALE: 1"=2000'

SAN JOAQUIN CO. & SACRAMENTO COUNTY

LEGEND

- ROUTE 1
- ROUTE 1A
- ROUTE 2
- ROUTES 1 & 2

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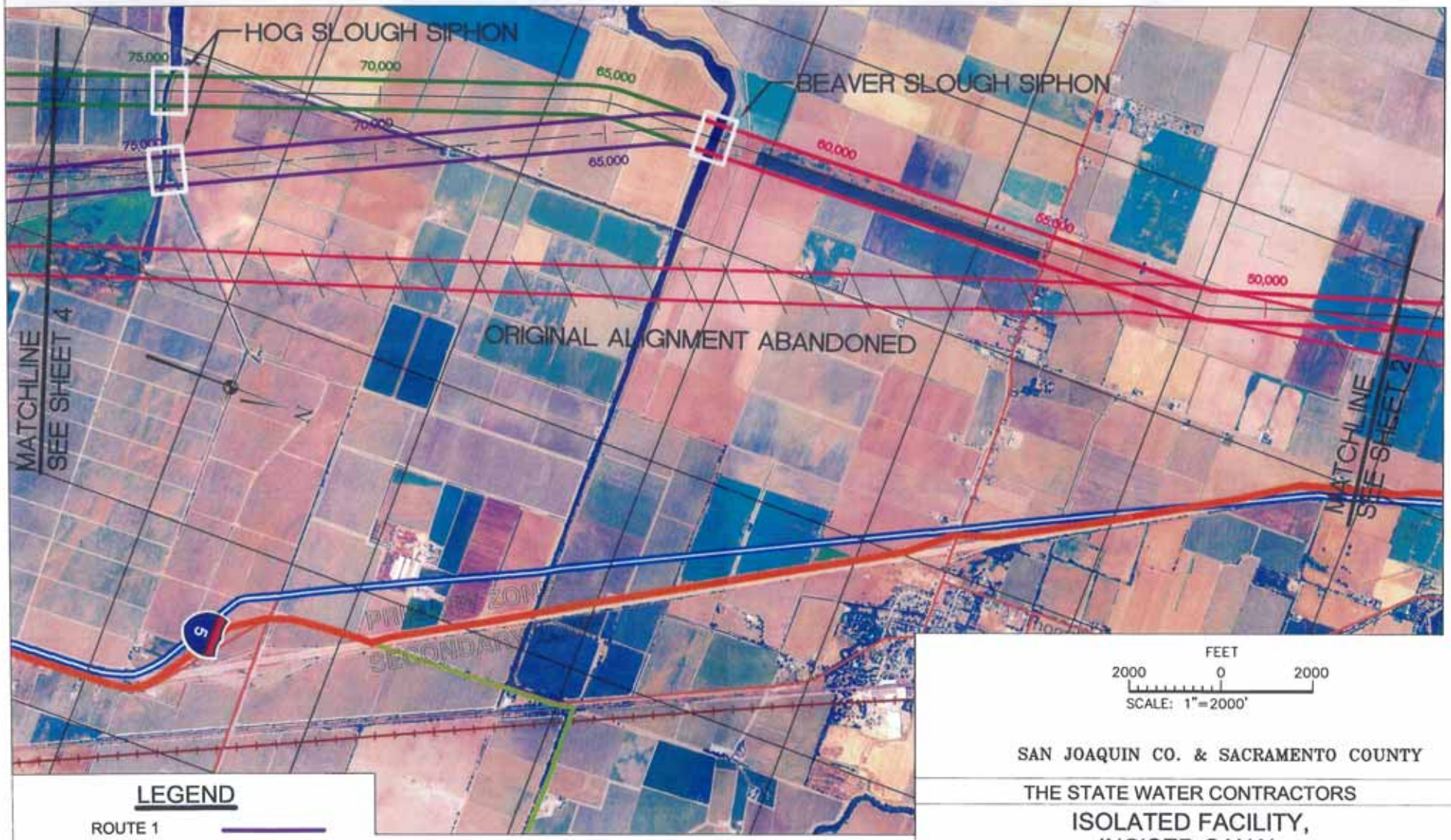
THE STATE WATER CONTRACTORS

ISOLATED FACILITY, INCISED CANAL PROPOSED ALIGNMENTS

SHEET 2 OF 9

Figure 2

REV NO



FEET
2000 0 2000
SCALE: 1"=2000'

SAN JOAQUIN CO. & SACRAMENTO COUNTY

LEGEND

- ROUTE 1
- ROUTE 1A
- ROUTE 2
- ROUTES 1 & 2

Washington Group International
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THE STATE WATER CONTRACTORS

ISOLATED FACILITY, INCISED CANAL PROPOSED ALIGNMENTS

SHEET 3 OF 9

Figure 3

REV NO

LEGEND

- ROUTE 1
- ROUTE 1A
- ROUTE 2
- ROUTES 1 & 2

FEET
2000 0 2000
SCALE: 1"=2000'

SAN JOAQUIN CO. & SACRAMENTO COUNTY

THE STATE WATER CONTRACTORS

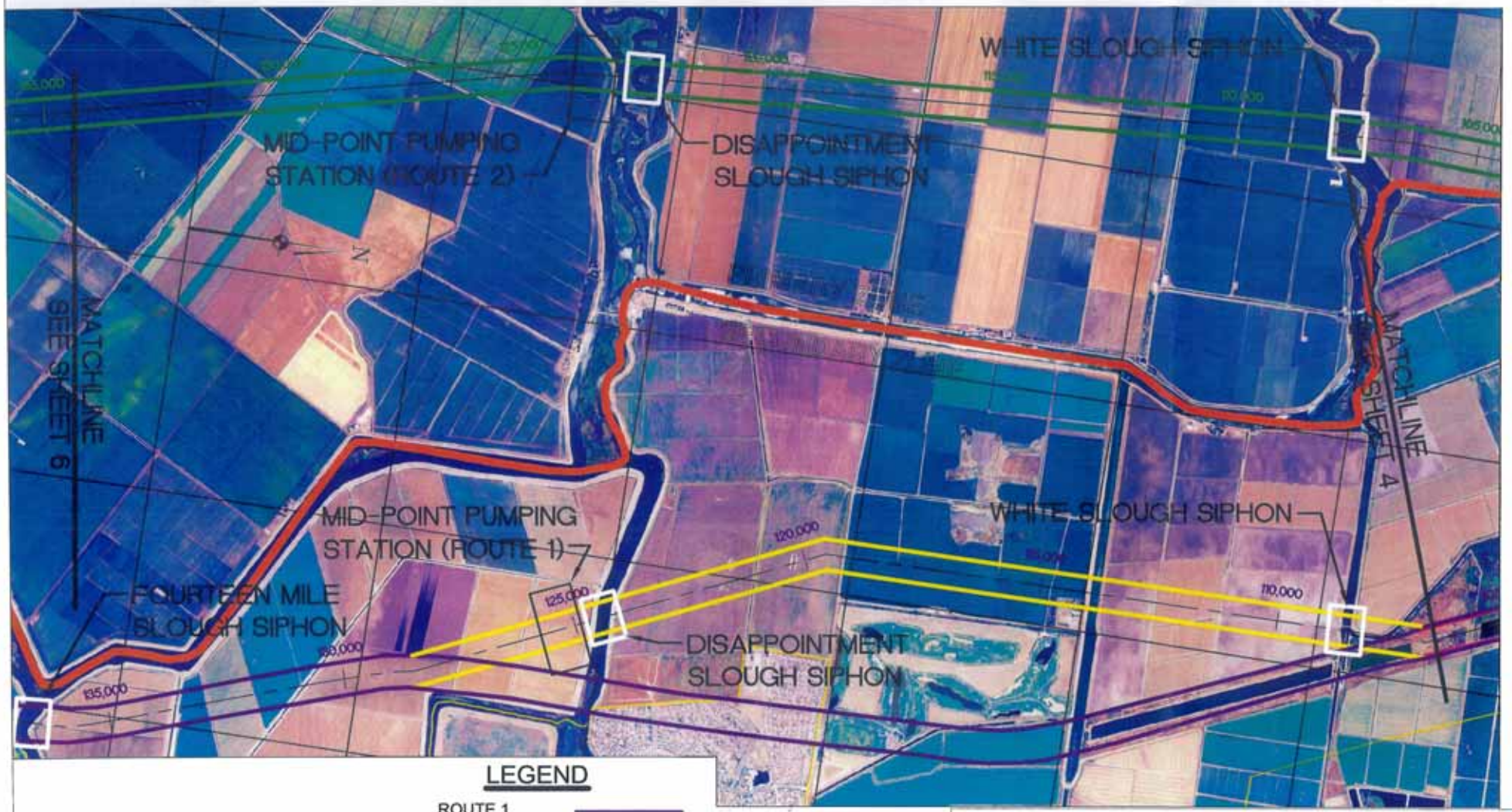
ISOLATED FACILITY, INCISED CANAL PROPOSED ALIGNMENTS

Washington Group International
10900 NE 8TH, #500 BELLEVUE, WA 98004

SHEET 4 OF 9

Figure 4

REV NO



LEGEND

- ROUTE 1
- ROUTE 1A
- ROUTE 2
- ROUTES 1 & 2

FEET
2000 0 2000
SCALE: 1"=2000'

SAN JOAQUIN CO. & SACRAMENTO COUNTY

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ISOLATED FACILITY, INCISED CANAL PROPOSED ALIGNMENTS

SHEET 5 OF 9

Figure 5

REV NO

LEGEND

- ROUTE 1
- ROUTE 1A
- ROUTE 2
- ROUTES 1 & 2

FEET
2000 0 2000
SCALE: 1"=2000'

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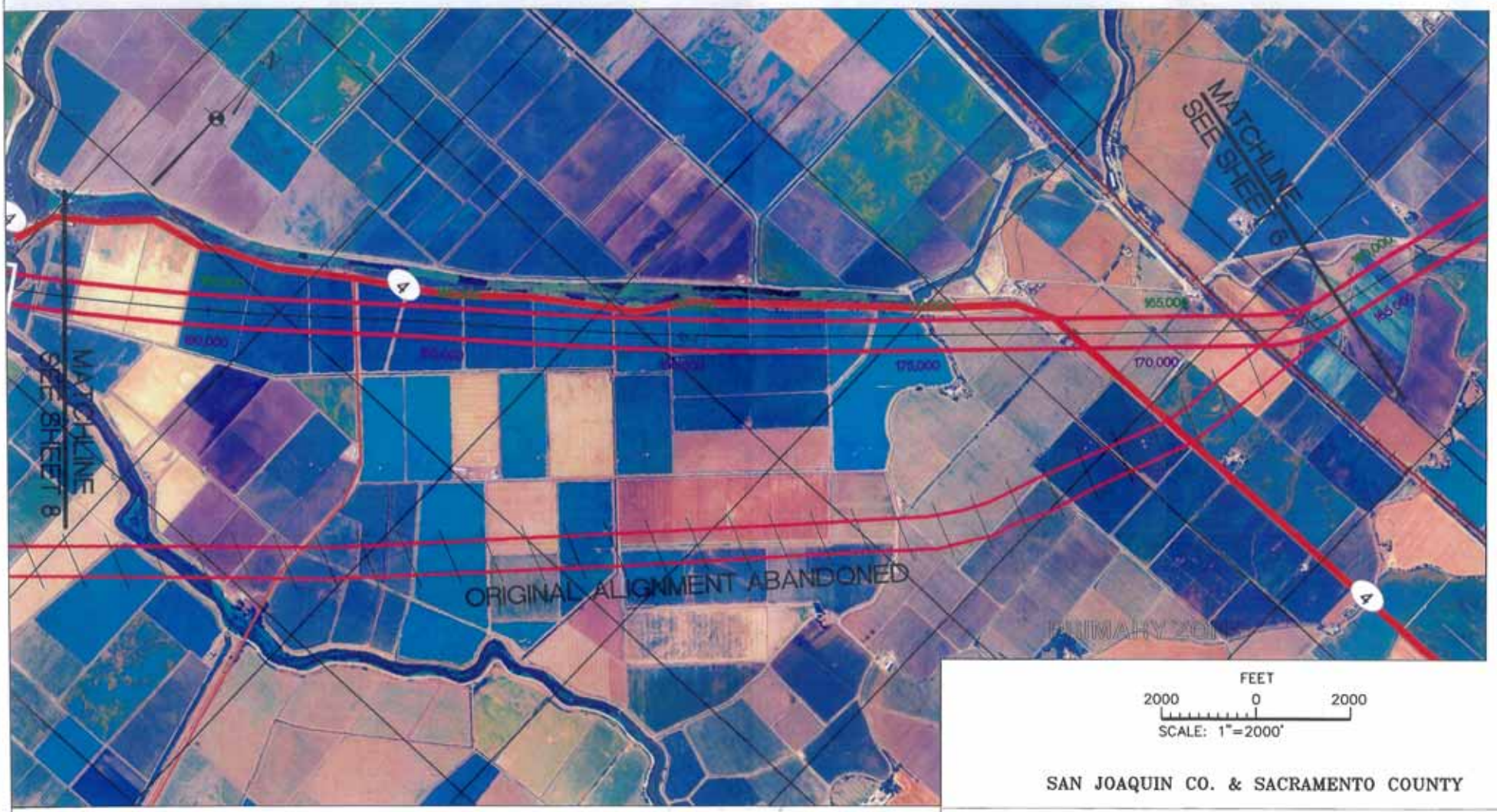
ISOLATED FACILITY, INCISED CANAL PROPOSED ALIGNMENTS

SHEET 6 OF 9

Figure 6

REV NO



SAN JOAQUIN CO. & SACRAMENTO COUNTY

LEGEND

- ROUTE 1
- ROUTE 1A
- ROUTE 2
- ROUTES 1 & 2

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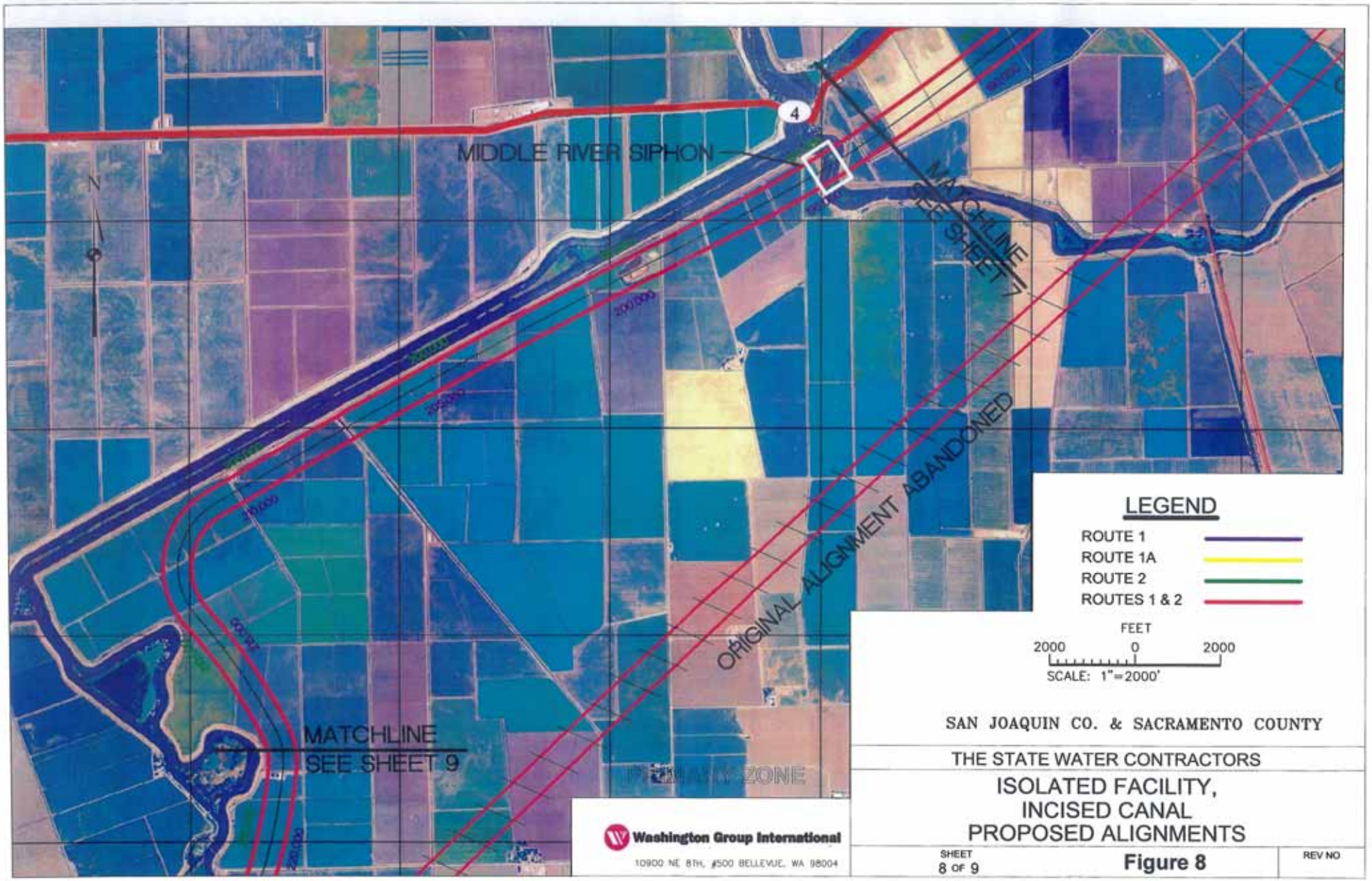
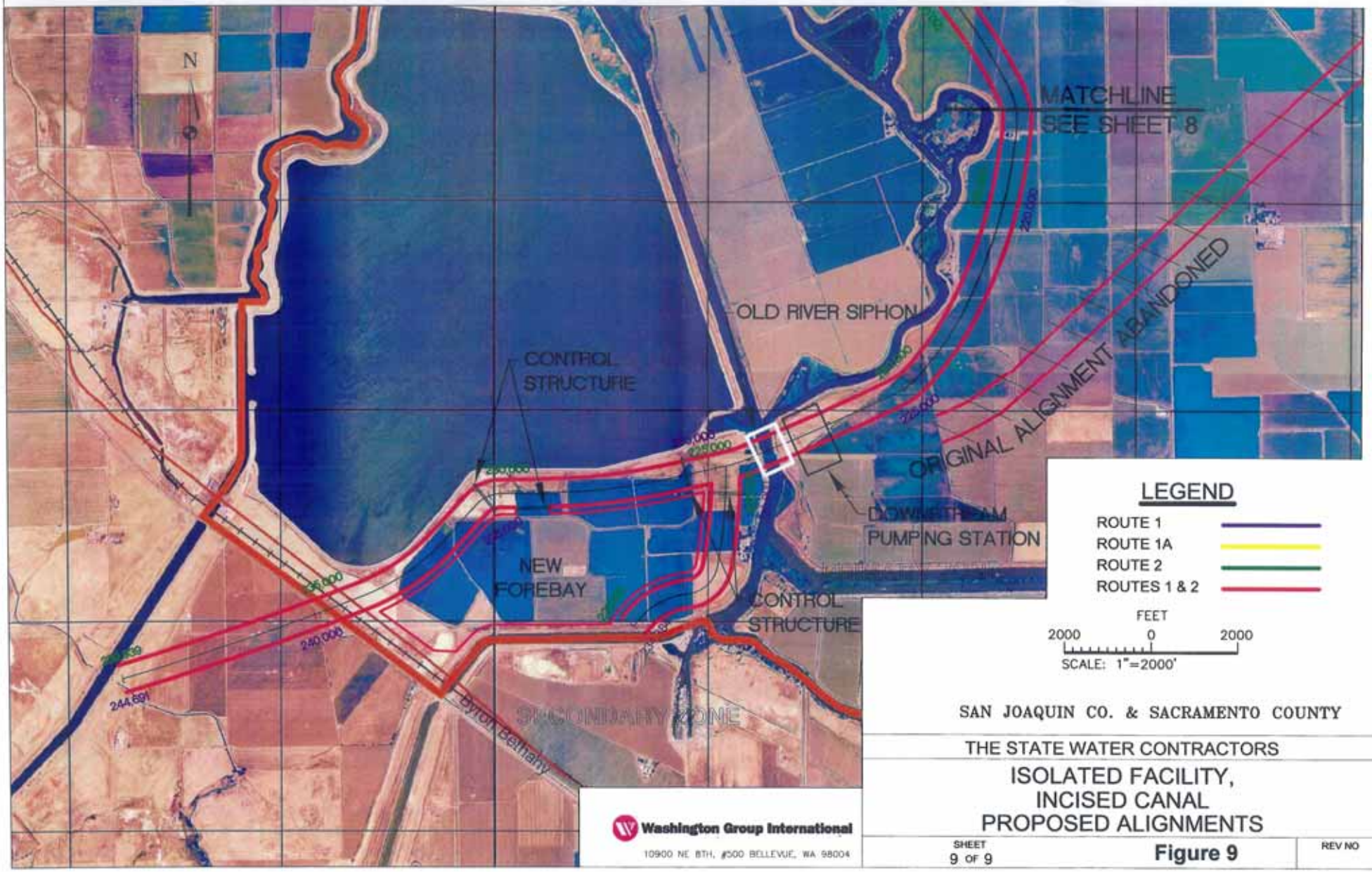
ISOLATED FACILITY, INCISED CANAL PROPOSED ALIGNMENTS

SHEET 7 OF 9

Figure 7

REV NO


MIDDLE RIVER SIPHON
4
N
MATCHLINE SEE SHEET 7
ORIGINAL ALIGNMENT ABANDONED
MATCHLINE SEE SHEET 9
PRIMARY ZONE
LEGEND
ROUTE 1
ROUTE 1A
ROUTE 2
ROUTES 1 & 2
FEET
2000 0 2000
SCALE: 1"=2000'
SAN JOAQUIN CO. & SACRAMENTO COUNTY
THE STATE WATER CONTRACTORS
ISOLATED FACILITY,
INCISED CANAL
PROPOSED ALIGNMENTS
Washington Group International
10900 NE 8TH, #500 BELLEVUE, WA 98004
SHEET
8 OF 9
Figure 8
REV NO



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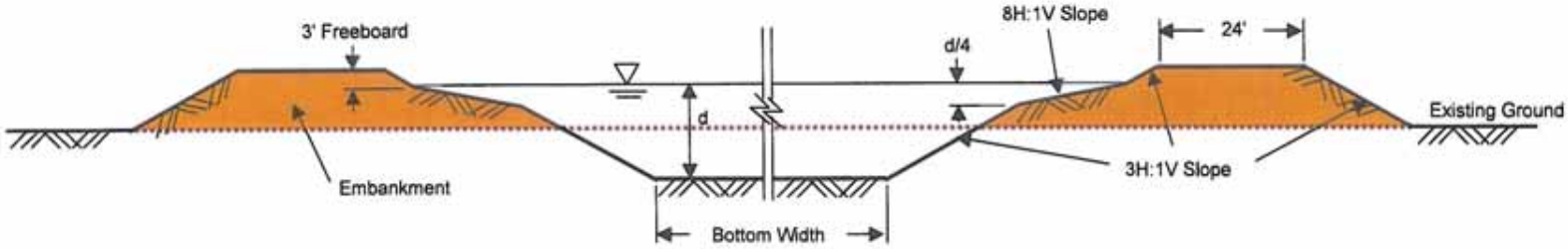
SHEET 9 OF 9

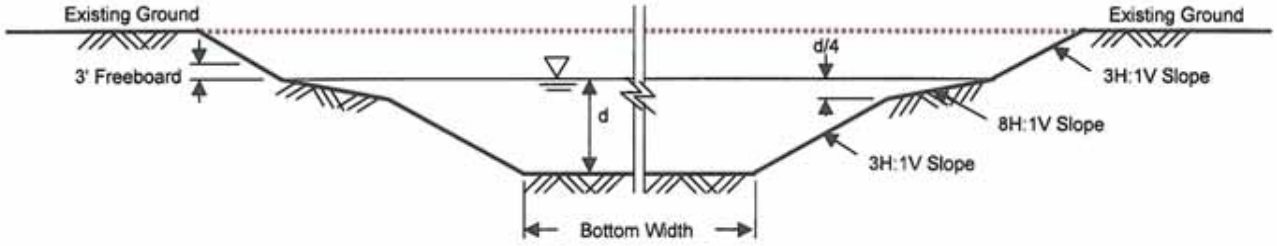
Figure 9

REV NO

Figure 10, Typical Canal Sections, Upstream of Disappointment Slough



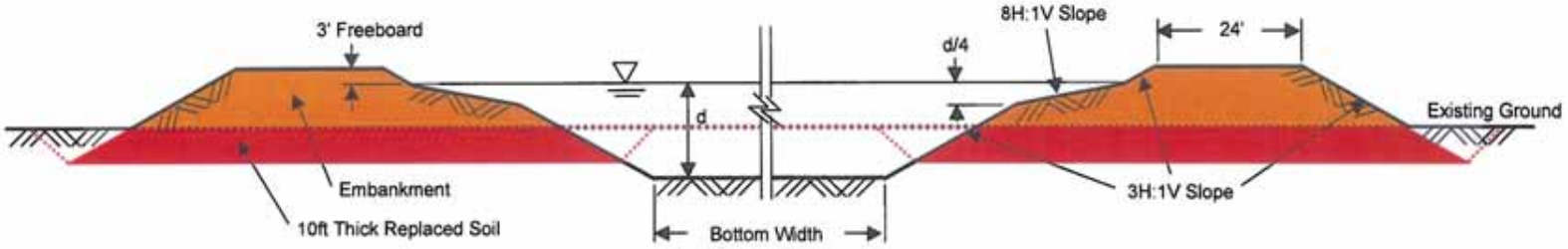
Typical Canal Section with Fill Embankment
Not to Scale



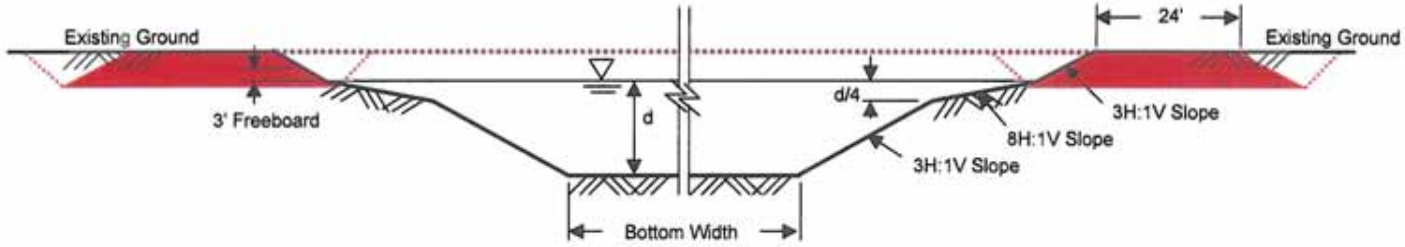
Typical Canal Section with No Fill Embankment
Not to Scale

Reference: Isolated Facility, Conceptual Analysis of Incised Canal Configuration, by CALFED Bay-Delta Program, Water Management Planning Branch, dated September 1999, Figure 3.3 (page 20).

Figure 11, Typical Canal Sections, Downstream of Disappointment Slough



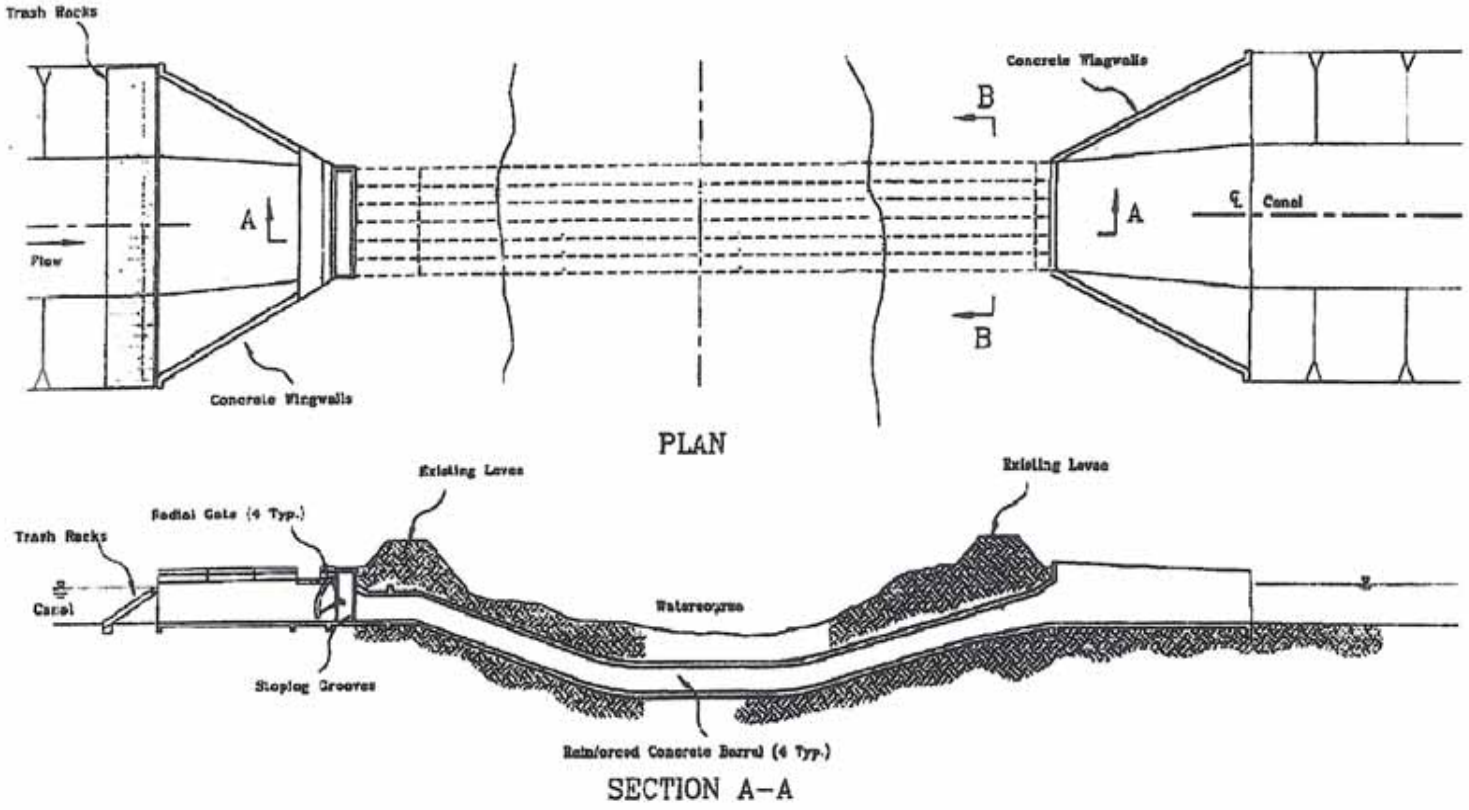
Typical Canal Section with Fill Embankment
Not to Scale



Typical Canal Section with No Fill Embankment
Not to Scale

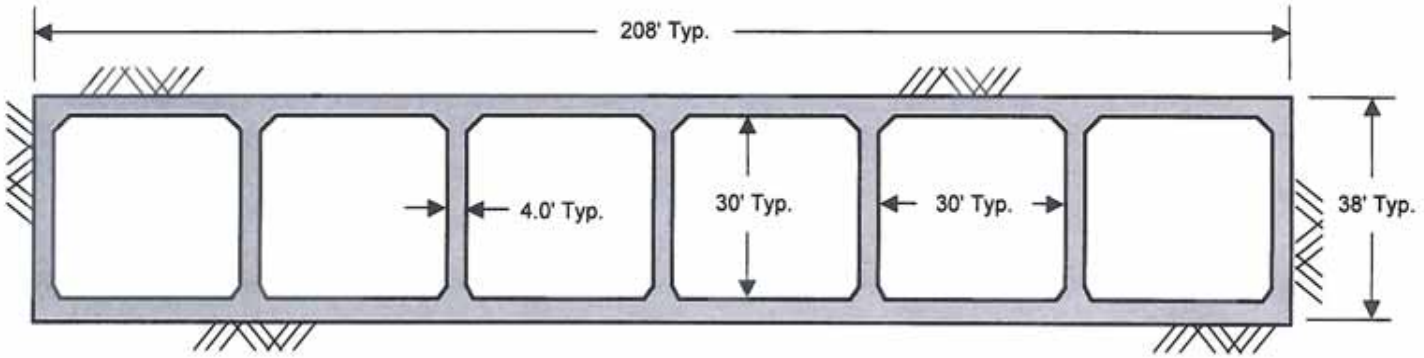
Reference: Isolated Facility, Conceptual Analysis of Incised Canal Configuration, by CALFED Bay-Delta Program, Water Management Planning Branch, dated September 1999, Figure 3.3 (page 20).

Figure 12, Typical Siphon and Control Structure Plan and Section



Reference: Isolated Facility, Conceptual Analysis of Incised Canal Configuration, by CALFED Bay-Delta Program, Water Management Planning Branch, dated September 1999, Figure 3.4 (page 24).

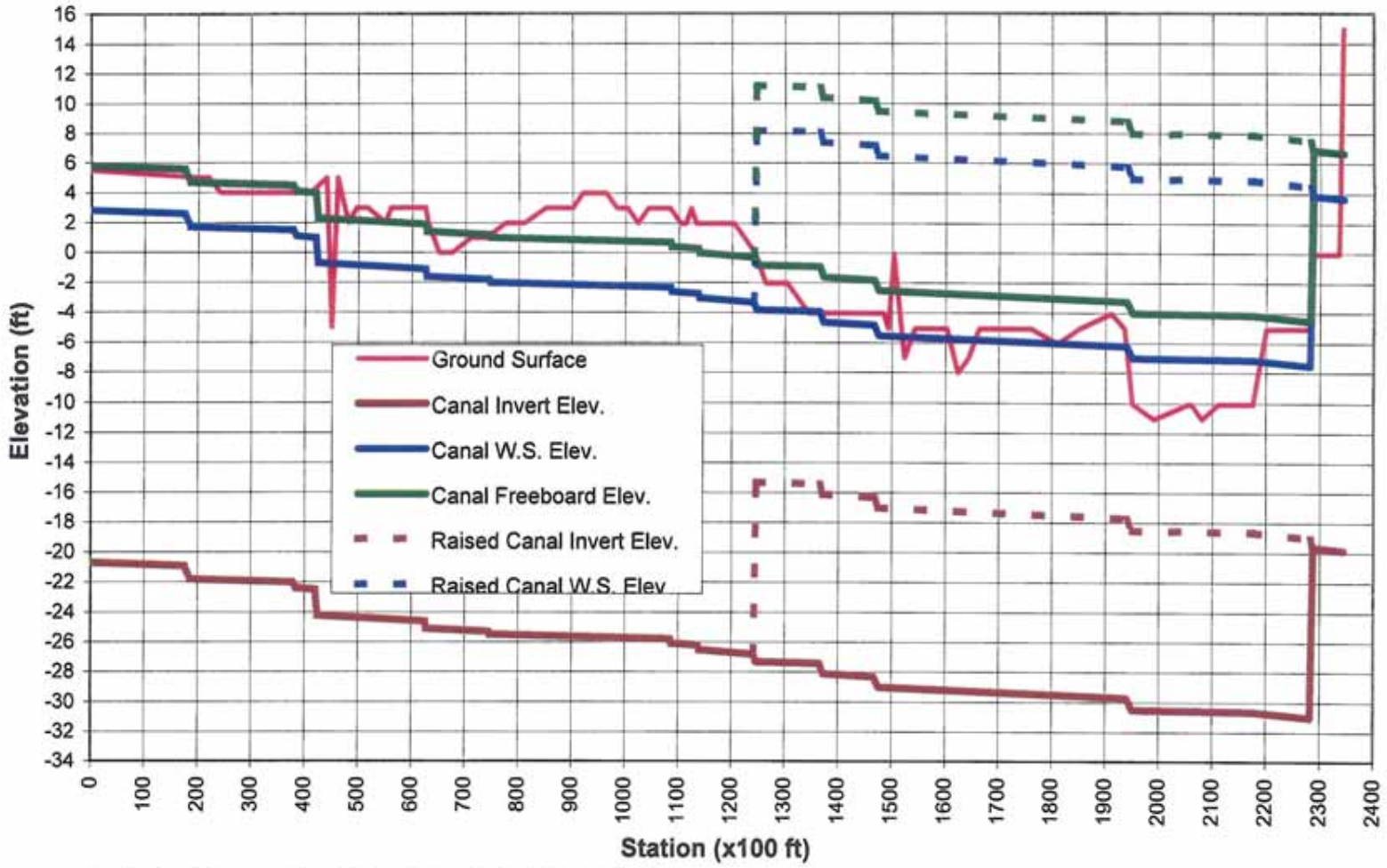
Figure 13, Typical Siphon Cross-Section



Typical Siphon Section
Not to Scale

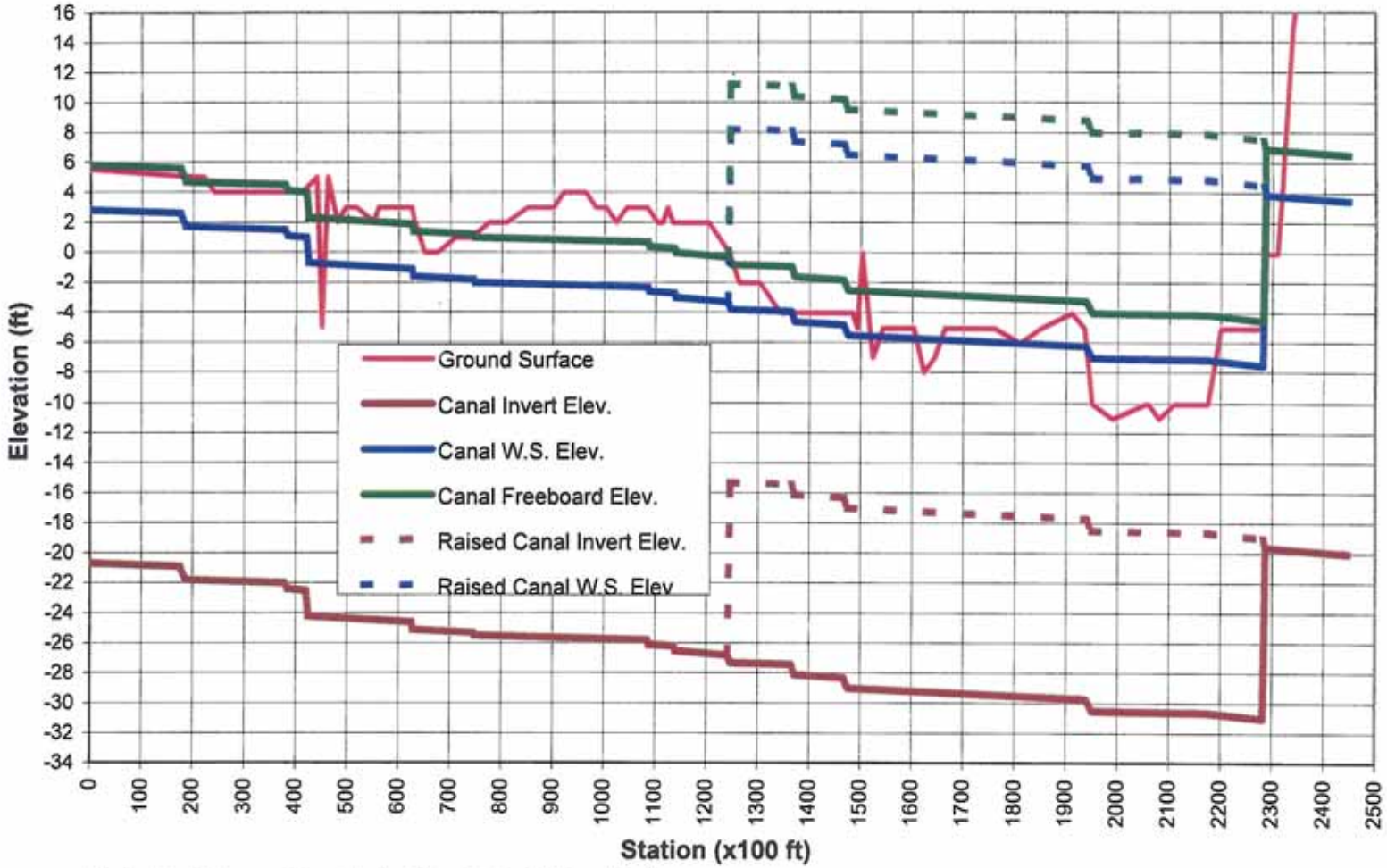
Reference: Isolated Facility, Conceptual Analysis of Incised Canal Configuration, by CALFED Bay-Delta Program, Water Management Planning Branch, dated September 1999, Figure 3.4 (page 24).

Figure 14, Route #1A - Incised and Raised Canal Profiles
(Raised canal raised 12ft after Disappointment Slough)



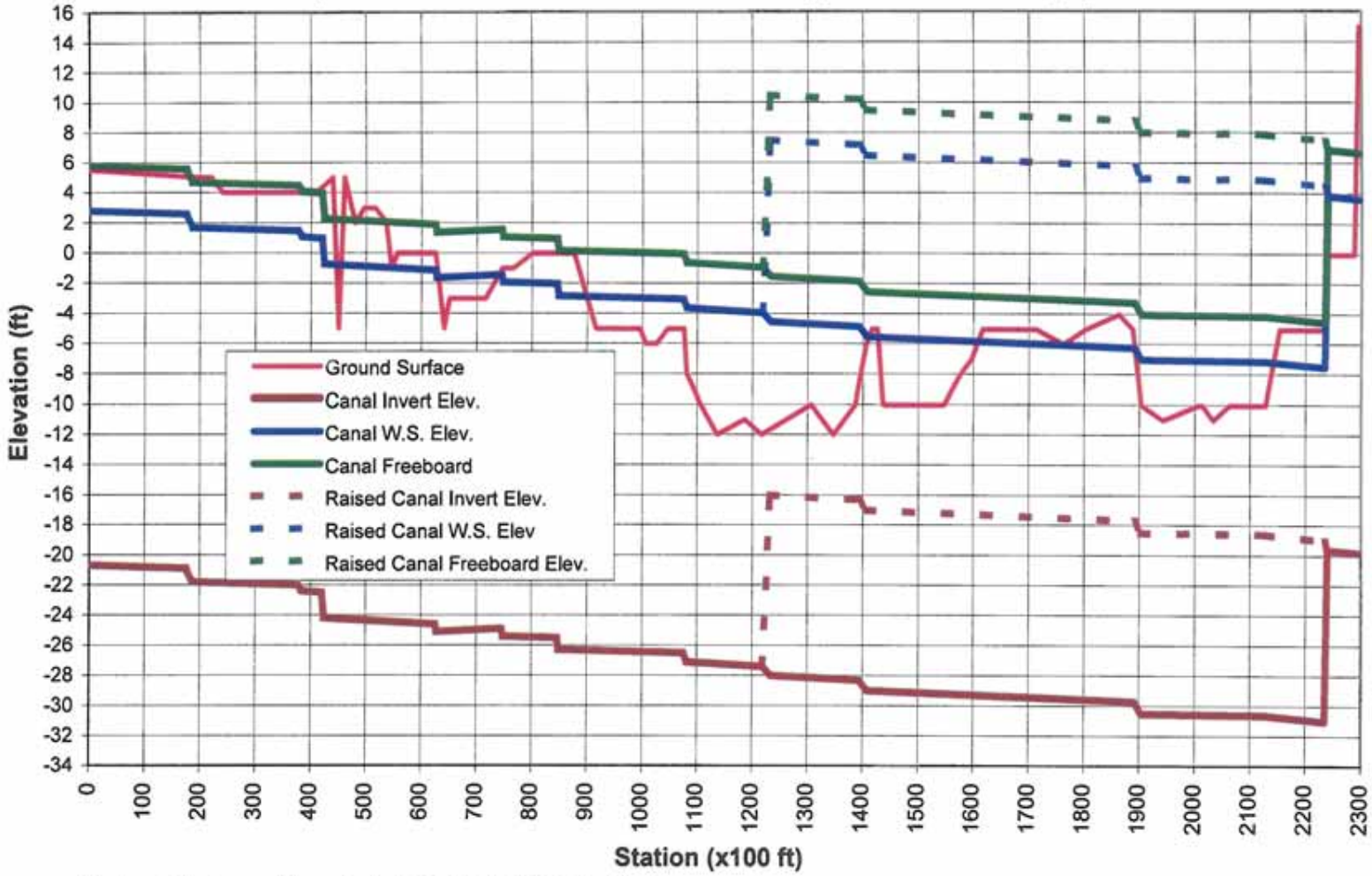
Note: Total canal length is 233,600ft (44.2 miles)

Figure 15, Route #1B - Incised and Raised Canal Profiles
(Raised canal raised 12ft after Disappointment Slough)



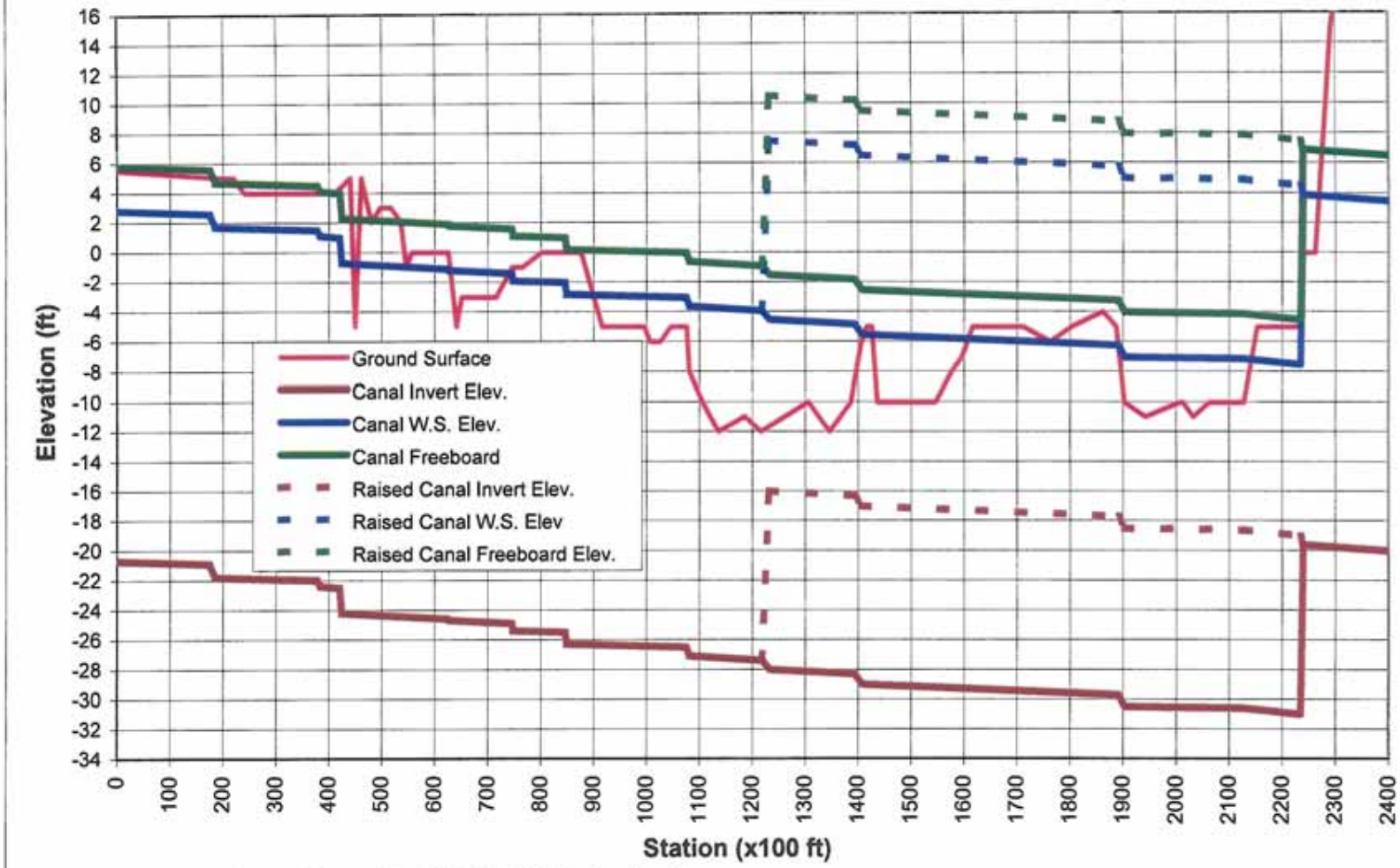
Note: Total canal length is 249,600ft (47.3 miles)

Figure 16, Route #2A - Incised and Raised Canal Profiles
(12ft raised canal starts after Disappointment Slough)



Note: Total canal length is 228,900ft (43.35 miles)

Figure 17, Route #2B - Incised and Raised Canal Profiles (Raised canal raised 12ft after Disappointment Slough)



Note: Total canal length is 244,800ft (46.4 miles)

APPENDIX A

QUANTITY TAKEOFFS TABLES

Table A-1, Route 1A Incised Canal Invert Data from Reference Report

[1] Canal or Channel Station (x100ft)	[2] Canal Invert Elev. (ft)	[3] Canal Slope s (V:1H)	[4] Canal W.S. Elev. (ft)	[5] Canal Freeboard Elev. (ft)	
0	-20.7	-0.0011	2.8	5.8	
174	-20.9	-0.0750	2.6	5.6	Stone Lake
186	-21.8	-0.0011	1.7	4.7	
376	-22.0	-0.0444	1.5	4.5	Lost Slough
385	-22.4	-0.0029	1.1	4.1	
420	-22.5	-0.4250	1.0	4.0	Mokelumne River
424	-24.2	-0.0020	-0.7	2.3	
625	-24.6	-0.1667	-1.1	1.9	Beaver Slough
628	-25.1	-0.0017	-1.6	1.4	
744	-25.3	-0.0500	-1.8	1.2	Hog Slough
748	-25.5	-0.0009	-2.0	1.0	
1084	-25.8	-0.0750	-2.3	0.7	White Slough
1088	-26.1	-0.0021	-2.6	0.4	
1136	-26.2	-0.0750	-2.7	0.3	Telephone Cut
1140	-26.5	-0.0030	-3.0	0.0	
1241	-26.8	-0.1000	-3.3	-0.3	Disappointment Slough
1246	-27.3	-0.0008	-3.8	-0.8	
1365	-27.4	-0.1167	-3.9	-0.9	Fourteenmile Slough
1371	-28.1	-0.0021	-4.6	-1.6	
1467	-28.3	-0.0875	-4.8	-1.8	San Joaquin River
1475	-29.0	-0.0015	-5.5	-2.5	
1939	-29.7	-0.0727	-6.2	-3.2	Middle River
1950	-30.5	-0.0004	-7.0	-4.0	
2174	-30.6	-0.0037	-7.1	-4.1	
2282	-31.0	2.2800	-7.5	-4.5	Old River
2287	-19.6	0.0000	3.9	6.9	
2287	-19.6	-0.0035	3.9	6.9	
2344	-19.8	-	3.7	6.7	Delta-Mendota Canal

Column Notes:

[1] Stationing at Significant Points of Reach

[2] Canal Invert for 10,000 cfs canal

[3] Slope between Significant Points in Canal = (Next Row in Coln [2] - Current Row in Coln [2]) / (Next Row in Coln [1] - Current Row in Coln [1])

[4] Canal W.S. elevation = Coln [2] + 23.5ft (depth of flow)

[5] Canal top freeboard elevation = Coln [4] + 3 ft freeboard

Reference: Isolated Facility, Conceptual Analysis of Incised Canal Configuration, by CALFED Bay-Delta Program, Water Management Planning Branch, dated September 1999, Table 3.4, Two Sheets (pages 30 and 31).

Table A-2, Route 1B Incised Canal Invert Data from Reference Report

[1] Canal or Channel Station (x100ft)	[2] Canal Invert Elev. (ft)	[3] Canal Slope s (V:1H)	[4] Canal W.S. Elev. (ft)	[5] Canal Freeboard Elev. (ft)	
0	-20.7	-0.0011	2.8	5.8	
174	-20.9	-0.0750	2.6	5.6	Stone Lake
186	-21.8	-0.0011	1.7	4.7	
376	-22.0	-0.0444	1.5	4.5	Lost Slough
385	-22.4	-0.0029	1.1	4.1	
420	-22.5	-0.4250	1.0	4.0	Mokelumne River
424	-24.2	-0.0020	-0.7	2.3	
625	-24.6	-0.1667	-1.1	1.9	Beaver Slough
628	-25.1	-0.0017	-1.6	1.4	
744	-25.3	-0.0500	-1.8	1.2	Hog Slough
748	-25.5	-0.0009	-2.0	1.0	
1084	-25.8	-0.0750	-2.3	0.7	White Slough
1088	-26.1	-0.0021	-2.6	0.4	
1136	-26.2	-0.0750	-2.7	0.3	Telephone Cut
1140	-26.5	-0.0030	-3.0	0.0	
1241	-26.8	-0.1000	-3.3	-0.3	Disappointment Slough
1246	-27.3	-0.0008	-3.8	-0.8	
1365	-27.4	-0.1167	-3.9	-0.9	Fourteenmile Slough
1371	-28.1	-0.0021	-4.6	-1.6	
1467	-28.3	-0.0875	-4.8	-1.8	San Joaquin River
1475	-29.0	-0.0015	-5.5	-2.5	
1939	-29.7	-0.0727	-6.2	-3.2	Middle River
1950	-30.5	-0.0004	-7.0	-4.0	
2174	-30.6	-0.0037	-7.1	-4.1	
2282	-31.0	2.2800	-7.5	-4.5	Old River
2287	-19.6	0.0000	3.9	6.9	
2287	-19.6	-0.0025	3.9	6.9	
2447	-20.0	-	3.5	6.5	California Aqueduct

Column Notes:

[1] Stationing at Significant Points of Reach

[2] Canal Invert for 10,000 cfs canal

[3] Slope between Significant Points in Canal = (Next Row in Coln [2] - Current Row in Coln [2]) / (Next Row in Coln [1] - Current Row in Coln [1])

[4] Canal W.S. elevation = Coln [2] + 23.5ft (depth of flow)

[5] Canal top freeboard elevation = Coln [4] + 3 ft freeboard

Reference: Isolated Facility, Conceptual Analysis of Incised Canal Configuration, by CALFED Bay-Delta Program, Water Management Planning Branch, dated September 1999, Table 3.4, Two Sheets (pages 30 and 31).

Table A-3, Route 1A Ground Elevations as Interpreted from Reference Report
(for Both Incised and Raised Canals)

[1] Cannel Station (x100ft)	[2] Ground Elev. (ft)	[3] Diff Station (ft)	[4] Diff Elev. (ft)	[5] Slope (V:H)
0	5.5	200	-0.5	-0.0025
200	5	20	0	0.0000
220	5	20	-1	-0.0500
240	4	170	0	0.0000
410	4	30	1	0.0333
440	5	10	-10	-1.0000
450	-5	11	10	0.9091
461	5	19	-3	-0.1579
480	2	16	1	0.0636
496	3	20	0	0.0000
516	3	34	-1	-0.0292
550	2	10	1	0.1000
560	3	65	0	0.0000
625	3	5	-1	-0.2000
630	2	20	-2	-0.1000
650	0	25	0	0.0000
675	0	35	1	0.0286
710	1	30	0	0.0000
740	1	35	1	0.0286
775	2	35	0	0.0000
810	2	40	1	0.0250
850	3	50	0	0.0000
900	3	20	1	0.0500
920	4	43	0	0.0000
963	4	20	-1	-0.0500
983	3	20	0	0.0000
1003	3	20	-1	-0.0500
1023	2	20	1	0.0500
1043	3	40	0	0.0000
1083	3	20	-1	-0.0500
1103	2	10	0	0.0000
1113	2	10	1	0.1000
1123	3	10	-1	-0.1000
1133	2	70	0	0.0000
1203	2	40	-2	-0.0500
1243	0	20	-2	-0.1000
1263	-2	40	0	0.0000
1303	-2	40	-2	-0.0500
1343	-4	140	0	0.0000
1483	-4	10	-1	-0.1000
1493	-5	10	5	0.5000
1503	0	20	-7	-0.3500
1523	-7	20	2	0.1000
1543	-5	60	0	0.0000
1603	-5	20	-3	-0.1500
1623	-8	20	1	0.0500
1643	-7	20	2	0.1000
1663	-5	37	0	0.0000
1700	-5	60	0	0.0000
1760	-5	50	-1	-0.0200
1810	-6	40	1	0.0250
1850	-5	60	1	0.0167
1910	-4	25	-1	-0.0400
1935	-5	15	-5	-0.3333
1950	-10	40	-1	-0.0250
1990	-11	65	1	0.0154
2055	-10	5	0	0.0000
2060	-10	20	-1	-0.0500
2080	-11	30	1	0.0333
2110	-10	65	0	0.0000
2175	-10	25	5	0.2000
2200	-5	80	0	0.0000
2280	-5	8	5	0.6250
2288	0	22	0	0.0000
2310	0	25	0	0.0000
2335	0	9	15	1.6667
2344	15	-	-	-

Table A-4, Route 1B Ground Elevations as Interpreted from Reference Report
(for Both Incised and Raised Canals)

[1] Cannel Station (x100ft)	[2] Ground Elev. (ft)	[3] Diff Station (ft)	[4] Diff Elev. (ft)	[5] Slope (V:H)
0	5.5	200	-0.5	-0.0025
200	5	20	0	0.0000
220	5	20	-1	-0.0500
240	4	170	0	0.0000
410	4	30	1	0.0333
440	5	10	-10	-1.0000
450	-5	11	10	0.9091
461	5	19	-3	-0.1579
480	2	16	1	0.0636
496	3	20	0	0.0000
516	3	34	-1	-0.0292
550	2	10	1	0.1000
560	3	65	0	0.0000
625	3	5	-1	-0.2000
630	2	20	-2	-0.1000
650	0	25	0	0.0000
675	0	35	1	0.0286
710	1	30	0	0.0000
740	1	35	1	0.0286
775	2	35	0	0.0000
810	2	40	1	0.0250
850	3	50	0	0.0000
900	3	20	1	0.0500
920	4	43	0	0.0000
963	4	20	-1	-0.0500
983	3	20	0	0.0000
1003	3	20	-1	-0.0500
1023	2	20	1	0.0500
1043	3	40	0	0.0000
1083	3	20	-1	-0.0500
1103	2	10	0	0.0000
1113	2	10	1	0.1000
1123	3	10	-1	-0.1000
1133	2	70	0	0.0000
1203	2	40	-2	-0.0500
1243	0	20	-2	-0.1000
1263	-2	40	0	0.0000
1303	-2	40	-2	-0.0500
1343	-4	140	0	0.0000
1483	-4	10	-1	-0.1000
1493	-5	10	5	0.5000
1503	0	20	-7	-0.3500
1523	-7	20	2	0.1000
1543	-5	60	0	0.0000
1603	-5	20	-3	-0.1500
1623	-8	20	1	0.0500
1643	-7	20	2	0.1000
1663	-8	37	0	0.0000
1700	-5	60	0	0.0000
1760	-5	50	-1	-0.0200
1810	-6	40	1	0.0250
1850	-5	60	1	0.0167
1910	-4	25	-1	-0.0400
1935	-5	15	-5	-0.3333
1950	-10	40	-1	-0.0250
1990	-11	65	1	0.0154
2055	-10	5	0	0.0000
2060	-10	20	-1	-0.0500
2080	-11	30	1	0.0333
2110	-10	65	0	0.0000
2175	-10	25	5	0.2000
2200	-5	80	0	0.0000
2280	-5	8	5	0.6250
2288	0	22	0	0.0000
2310	0	10	5	0.5000
2320	5	10	5	0.5000
2330	10	10	5	0.5000
2340	15	20	5	0.2500
2360	20	35	10	0.2857
2395	30	55	10	0.1818
2450	40	-	-	-

Table A-5, Canal Cut-Fill Volumes Reference Table for Both Route #1 and Route #2

(10,000cfs and 15,000cfs Canal Cut-Fill Volumes for Given Ground to Invert Depth

Canal Quantities — 10,000cfs, Bottom width = [illegible]

Ground to Invert Depth d_{inv} (ft)	U/S of Disappointment Slough: Scraper Excav Volume $V_{scraper}$ (cf)	U/S: Dragline Excav Volume $V_{dragline}$ (cf)	U/S: Total Excav Volume $V_{ex,total}$ (cf)	U/S: Embank Fill Volume V_{fill} (cf)	U/S: Disposal Volume V_{disp} (cf)	D/S of Disappointment Slough: 10' Replace. Excav Volume $V_{ex,repl}$ (cf)	D/S: 10' Import Compact Volume V_{comp} (cf)	D/S: 10' Local Fill Volume $V_{fill,local}$ (cf)	D/S: Overlap Excav Volume V_{ol} (cf)	D/S: Scraper Excav Volume $V_{scraper}$ (cf)	D/S: Dragline Excav Volume $V_{dragline}$ (cf)	D/S: Total Excav Volume $V_{ex,total}$ (cf)	D/S: Embank Import Fill Volume V_{fill} (cf)	D/S: Disposal Volume V_{disp} (cf)
0.0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
0.2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
0.4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
0.6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
0.8	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1.0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1.2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1.4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1.6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1.8	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2.0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2.2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2.4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2.6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2.8	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
3.0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
3.2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
3.4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
3.6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
3.8	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
4.0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
4.2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
4.4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
4.6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
4.8	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
5.0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
5.2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
5.4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
5.6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
5.8	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
6.0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
6.2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
6.4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
6.6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
6.8	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7.0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7.2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7.4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7.6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7.8	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
8.0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
8.2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
8.4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
8.6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
8.8	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
9.0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
9.2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
9.4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
9.6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
9.8	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
10.0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
10.2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
10.4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
10.6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
10.8	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
11.0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
11.2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
11.4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
11.6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
11.8	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
12.0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
12.2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
12.4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
12.6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
12.8	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
13.0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
13.2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
13.4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
13.6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
13.8	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
14.0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
14.2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Canal Quantities — 15,000cfs, Bottom width = [illegible]

Ground to Invert Depth d_{inv} (ft)	U/S of Disappointment Slough: Scraper Excav Volume $V_{scraper}$ (cf)	U/S: Dragline Excav Volume $V_{dragline}$ (cf)	U/S: Total Excav Volume $V_{ex,total}$ (cf)	U/S: Embank Fill Volume V_{fill} (cf)	U/S: Disposal Volume V_{disp} (cf)	D/S of Disappointment Slough: 10' Replace. Excav Volume $V_{ex,repl}$ (cf)	D/S: 10' Import Compact Volume V_{comp} (cf)	D/S: 10' Local Fill Volume $V_{fill,local}$ (cf)	D/S: Overlap Excav Volume V_{ol} (cf)	D/S: Scraper Excav Volume $V_{scraper}$ (cf)	D/S: Dragline Excav Volume $V_{dragline}$ (cf)	D/S: Total Excav Volume $V_{ex,total}$ (cf)	D/S: Embank Import Fill Volume V_{fill} (cf)	D/S: Disposal Volume V_{disp} (cf)
0.0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
0.2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
0.4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
0.6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
0.8	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1.0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1.2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1.4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1.6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1.8	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2.0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2.2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2.4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2.6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2.8	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
3.0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
3.2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
3.4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
3.6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
3.8	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
4.0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
4.2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
4.4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
4.6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
4.8	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
5.0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
5.2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
5.4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
5.6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
5.8	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
6.0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
6.2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
6.4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
6.6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
6.8	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7.0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7.2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7.4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7.6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7.8	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
8.0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
8.2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
8.4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
8.6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
8.8	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
9.0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
9.2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
9.4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
9.6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
9.8	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
10.0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
10.2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
10.4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
10.6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
10.8	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
11.0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
11.2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
11.4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
11.6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
11.8	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
12.0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
12.2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
12.4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
12.6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
12.8	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
13.0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
13.2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
13.4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
13.6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
13.8	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
14.0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
14.2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Table A-5, Canal Cut-Fill Volumes Reference Table for Both Route #1 and Route #2

(10,000cfs and 15,000cfs Canal Cut-Fill Volumes for Given Ground to Invert Depth)

Canal Quantities 10,000cfs, Bottom width = [illegible]														
	U/S of Disappointment Slough					D/S of Disappointment Slough								
Ground to Invert Depth d_{gi} (ft)	Scraper Excav Volume $V_{scraper}$ (cf)	Dragline Excav Volume $V_{dragline}$ (cf)	Total Excav Volume $V_{ex,total}$ (cf)	Embank Fill Volume V_{ef} (cf)	Disposal Volume V_{disp} (cf)	10' Replace. Excav Volume $V_{ex,repl}$ (cf)	10' Import Compact Volume V_{comp} (cf)	10' Local Fill Volume V_{lfill} (cf)	Overlap Excav Volume V_{ol} (cf)	Scraper Excav Volume $V_{scraper}$ (cf)	Dragline Excav Volume $V_{dragline}$ (cf)	Total Excav Volume $V_{ex,total}$ (cf)	Embank Import Fill Volume V_{if} (cf)	Disposal Volume V_{disp} (cf)
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Canal Quantities 15,000cfs, Bottom width = [illegible]														
	U/S of Disappointment Slough					D/S of Disappointment Slough								
Ground to Invert Depth d_{gi} (ft)	Scraper Excav Volume $V_{scraper}$ (cf)	Dragline Excav Volume $V_{dragline}$ (cf)	Total Excav Volume $V_{ex,total}$ (cf)	Embank Fill Volume V_{ef} (cf)	Disposal Volume V_{disp} (cf)	10' Replace. Excav Volume $V_{ex,repl}$ (cf)	10' Import Compact Volume V_{comp} (cf)	10' Local Fill Volume V_{lfill} (cf)	Overlap Excav Volume V_{ol} (cf)	Scraper Excav Volume $V_{scraper}$ (cf)	Dragline Excav Volume $V_{dragline}$ (cf)	Total Excav Volume $V_{ex,total}$ (cf)	Embank Import Fill Volume V_{if} (cf)	Disposal Volume V_{disp} (cf)
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Table A-5, Canal Cut-Fill Volumes Reference Table for Both Route #1 and Route #2

(10,000cfs and 15,000cfs Canal Cut-Fill Volumes for Given Ground to Invert Depth

Canal Quantities
10,000cfs, Bottom width = 200ft

Ground to Invert Depth d_{gi} (ft)	U/S of Disappointment Slough					D/S of Disappointment Slough									
	Scraper Excav Volume $V_{scraper}$ (cy)	Dragline Excav Volume $V_{dragline}$ (cy)	Total Excav Volume V_{xtotal} (cy)	Embank Fill Volume V_{fill} (cy)	Disposal Volume V_{disp} (cy)	10' Replace. Excav Volume V_{xrepl} (cy)	10' Import Compact Volume V_{imp} (cy)	10' Local Fill Volume $V_{fillrepl}$ (cy)	Overlap Excav Volume V_{ov} (cy)	Scraper Excav Volume $V_{xscraper}$ (cy)	Dragline Excav Volume $V_{xdragline}$ (cy)	Total Excav Volume V_{xtotal} (cy)	Embank Import Fill Volume V_{fill} (cy)	Disposal Volume V_{disp} (cy)
20.0	1,208	7,445	8,732	0	8,732	2,080	1,170	910	445	833	7,445	10,287	1,131	9,867
20.5	1,321	7,847	8,818	0	8,818	2,080	1,131	949	445	833	7,847	10,448	1,131	9,948
20.7	1,231	7,931	8,903	0	8,903	2,080	1,139	959	454	921	7,931	10,332	1,139	10,032
20.8	1,278	7,714	8,992	0	8,992	2,080	1,131	997	454	921	7,714	10,089	1,131	10,114
20.9	1,282	7,797	8,079	0	8,079	2,080	1,115	946	463	930	7,797	10,864	1,115	10,197
20.9	1,290	7,881	8,167	0	8,167	2,080	1,114	956	466	930	7,881	10,291	1,114	10,281
20.0	1,299	7,965	8,254	0	8,254	2,080	1,111	966	466	930	7,965	10,960	1,107	10,365
20.2	1,293	8,049	8,342	0	8,342	2,080	1,107	970	472	930	8,049	10,950	1,107	10,450
20.4	1,295	8,134	8,430	0	8,430	2,080	1,104	980	479	930	8,134	11,034	1,104	10,534
20.8	1,300	8,218	8,519	0	8,519	2,080	1,101	990	479	921	8,218	11,121	1,101	10,620
20.8	1,304	8,304	8,607	0	8,607	2,080	1,098	998	483	932	8,304	11,206	1,098	10,706
21.0	1,311	8,388	8,698	0	8,698	2,080	1,098	990	494	921	8,388	11,293	1,098	10,792
21.2	1,311	8,474	8,785	0	8,785	2,080	1,091	990	497	934	8,474	11,379	1,091	10,878
21.4	1,314	8,560	8,873	0	8,873	2,080	1,091	990	493	940	8,560	11,466	1,091	10,965
21.6	1,319	8,646	8,964	0	8,964	2,080	1,089	990	497	927	8,646	11,552	1,089	11,050
21.8	1,322	8,732	9,054	0	9,054	2,080	1,081	990	493	926	8,732	11,641	1,081	11,141
22.0	1,326	8,818	9,144	0	9,144	2,080	1,089	970	494	931	8,818	11,730	1,089	11,230
22.3	1,320	8,902	9,229	0	9,229	2,080	1,084	990	498	933	8,902	11,819	1,084	11,316
22.4	1,332	8,990	9,323	0	9,323	2,080	1,090	990	497	930	8,990	11,909	1,090	11,409
22.6	1,330	9,079	9,419	0	9,419	2,080	1,092	990	497	930	9,079	11,998	1,092	11,499
22.8	1,340	9,167	9,508	0	9,508	2,080	1,087	990	499	947	9,167	12,086	1,087	11,588
23.0	1,343	9,254	9,598	0	9,598	2,080	1,091	990	499	944	9,254	12,173	1,091	11,678
23.2	1,347	9,342	9,690	0	9,690	2,080	1,094	990	500	947	9,342	12,263	1,094	11,770
23.4	1,350	9,430	9,781	0	9,781	2,080	1,095	990	500	952	9,430	12,351	1,095	11,861
23.6	1,354	9,518	9,873	0	9,873	2,080	1,098	990	500	956	9,518	12,441	1,098	11,953
23.8	1,358	9,607	9,965	0	9,965	2,080	1,098	990	500	956	9,607	12,540	1,098	12,046
24.0	1,361	9,695	10,057	0	10,057	2,080	1,098	990	500	961	9,695	12,637	1,098	12,137
24.2	1,365	9,784	10,150	0	10,150	2,080	1,098	990	500	966	9,785	12,734	1,098	12,229
24.4	1,368	9,873	10,242	0	10,242	2,080	1,098	990	500	966	9,873	12,825	1,098	12,321
24.6	1,372	9,964	10,336	0	10,336	2,080	1,098	990	500	966	9,964	12,918	1,098	12,415
24.8	1,376	10,054	10,430	0	10,430	2,080	1,098	990	500	976	10,054	13,019	1,098	12,510
25.0	1,379	10,144	10,523	0	10,523	2,080	1,098	990	500	976	10,144	13,119	1,098	12,604
25.2	1,383	10,234	10,617	0	10,617	2,080	1,098	990	500	986	10,234	13,220	1,098	12,697
25.4	1,386	10,325	10,711	0	10,711	2,080	1,098	990	500	986	10,325	13,320	1,098	12,791
25.6	1,390	10,415	10,806	0	10,806	2,080	1,098	990	500	986	10,415	13,420	1,098	12,886
25.8	1,394	10,506	10,900	0	10,900	2,080	1,098	990	500	996	10,506	13,520	1,098	12,980
26.0	1,397	10,596	11,993	0	11,993	2,080	1,098	990	500	997	10,596	13,620	1,098	13,074
26.2	1,401	10,686	11,087	0	11,087	2,080	1,098	990	500	997	10,686	13,720	1,098	13,168
26.4	1,404	10,783	12,181	0	12,181	2,080	1,098	990	500	998	10,781	13,821	1,098	13,261
26.6	1,408	10,872	12,281	0	12,281	2,080	1,098	990	500	998	10,872	13,922	1,098	13,355
26.8	1,412	10,962	12,377	0	12,377	2,080	1,098	990	500	910	10,962	13,972	1,098	13,450
27.0	1,415	11,051	12,473	0	12,473	2,080	1,098	990	500	910	11,051	14,059	1,098	13,544
27.2	1,419	11,139	12,568	0	12,568	2,080	1,098	990	500	919	11,139	14,148	1,098	13,644
27.4	1,422	11,228	12,660	0	12,660	2,080	1,098	990	500	922	11,240	14,249	1,098	13,740
27.6	1,426	11,318	12,757	0	12,757	2,080	1,098	990	500	926	11,330	14,342	1,098	13,840
27.8	1,429	11,407	12,859	0	12,859	2,080	1,098	990	500	930	11,430	14,439	1,098	13,933
28.0	1,433	11,503	12,936	0	12,936	2,080	1,098	990	500	930	11,523	14,534	1,098	14,028
28.2	1,437	11,597	13,034	0	13,034	2,080	1,098	990	500	937	11,617	14,634	1,098	14,114
28.4	1,440	11,701	13,132	0	13,132	2,080	1,098	990	500	988	11,724	14,732	1,098	14,232
28.6	1,444	11,800	13,230	0	13,230	2,080	1,098	990	500	988	11,808	14,830	1,098	14,330
28.8	1,448	11,900	13,348	0	13,348	2,080	1,098	990	500	946	11,908	14,928	1,098	14,428
29.0	1,451	11,997	13,448	0	13,448	2,080	1,098	990	500	951	11,992	15,029	1,098	14,526
29.2	1,455	12,095	13,545	0	13,545	2,080	1,098	990	500	959	12,092	15,131	1,098	14,625
29.4	1,458	12,195	13,644	0	13,644	2,080	1,098	990	500	959	12,191	15,224	1,098	14,724
29.6	1,462	12,293	13,743	0	13,743	2,080	1,098	990	500	963	12,291	15,320	1,098	14,823
29.8	1,466	12,372	13,838	0	13,838	2,080	1,098	990	500	969	12,371	15,422	1,098	14,922
30.0	1,469	12,473	13,942	0	13,942	2,080	1,098	990	500	969	12,473	15,521	1,098	15,020
30.2	1,473	12,569	14,042	0	14,042	2,080	1,098	990	500	969	12,569	15,622	1,098	15,122
30.4	1,476	12,669	14,142	0	14,142	2,080	1,098	990	500	969	12,669	15,722	1,098	15,222
30.6	1,480	12,768	14,242	0	14,242	2,080	1,098	990	500	969	12,768	15,822	1,098	15,322
30.8	1,484	12,868	14,340	0	14,340	2,080	1,098	990	500	969	12,868	15,923	1,098	15,423
31.0	1,487	12,968	14,444	0	14,444	2,080	1,098	990	500	969	12,968	16,024	1,098	15,524
31.2	1,491	13,068	14,540	0	14,540	2,080	1,098	990	500	969	13,068	16,124	1,098	15,624
31.4	1,494	13,167	14,644	0	14,644	2,080	1,098	990	500	969	13,167	16,224	1,098	15,725
31.6	1,498	13,267	14,748	0	14,748	2,080	1,098	990	500	969	13,267	16,324	1,098	15,824
31.8	1,502	13,345	14,848	0	14,848	2,080	1,098	990	500	1,002	13,349	16,429	1,098	15,929
32.0	1,505	13,445	14,950	0	14,950	2,080	1,098	990	500	1,009	13,449	16,531	1,098	16,031
32.2	1,509	13,545	15,054	0	15,054	2,080	1,098	990	500	1,009	13,545	16,634	1,098	16,134
32.4	1,512	13,644	15,156	0	15,156	2,080	1,098	990	500	1,012	13,644	16,736	1,098	16,236
32.6	1,516	13,743	15,259	0	15,259	2,080	1,098	990	500	1,009	13,743	16,834	1,098	16,333
32.8	1,520	13,842	15,362	0	15,362	2,080	1,098	990	500	1,020	13,842	16,943	1,098	16,442
33.0	1,523	13,942	15,465	0	15,465	2,080	1,098	990	500	1,023	13,942	17,045	1,098	16,545

Canal Quantities
15,000cfs, Bottom width = 240ft

Ground to Invert Depth d_{gi} (ft)	U/S of Disappointment Slough					D/S of Disappointment Slough									
	Scraper Excav Volume $V_{scraper}$ (cy)	Dragline Excav Volume $V_{dragline}$ (cy)	Total Excav Volume V_{xtotal} (cy)	Embank Fill Volume V_{fill} (cy)	Disposal Volume V_{disp} (cy)	10' Replace. Excav Volume V_{xrepl} (cy)	10' Import Compact Volume V_{imp} (cy)	10' Local Fill Volume $V_{fillrepl}$ (cy)	Overlap Excav Volume V_{ov} (cy)	Scraper Excav Volume $V_{xscraper}$ (cy)	Dragline Excav Volume $V_{xdragline}$ (cy)	Total Excav Volume V_{xtotal} (cy)	Embank Import Fill Volume V_{fill} (cy)	Disposal Volume V_{disp} (cy)
20.0	1,208	11,601	12,794	0	12,794	2,080	1,235	930	465	1,243	11,537	14,309	1,235	13,899
20.5	1,291	11,537	12,879	0	12,879	2,080	1,231	930	449	1,243	11,591	14,305	1,231	14,005
20.7	1,400	11,294	12,993	0	12,993	2,080	1,226	930	464	1,241	11,294	14,000	1,126	14,120
20.8	1,406	11,401	13,108	0	13,108	2,080	1,122	930	454	1,240	11,412	14,193	1,122	14,235
20.9	1,702	11,501	13,203	0	13,203	2,080	1,218	930	460	1,240	11,501	14,345	1,218	14,341
20.9	1,296	11,910	13,206	0	13,206	2,080	1,214	930	466	1,240	11,910	14,503	1,214	14,453
20.0	1,299	11,794	13,404	0	13,404	2,080	1,210	930	469	1,240	11,740	15,089	1,131	14,569
20.2	1,773	11,827	13,570	0	13,570	2,080	1,107	930	473	1,240	11,827	15,138	1,107	14,674
20.4	1,776	11,970	13,686	0	13,686	2,080	1,104	930	479	1,240	11,962	15,285	1,104	14,795
20.6	1,723	12,083	13,803	0	13,803	2,080	1,102	930	479	1,241	12,083	15,404	1,102	14,909
20.8	1,724	12,190	13,918	0	13,918	2,080	1,098	930	482	1,240	12,190	15,518	1,098	15,018
21.0	1,727	12,299	14,026	0	14,026	2,080	1,098	930	494	1,240	12,299	15,632	1,098	15,132
21.2	1,731	12,520	14,172	0	14,172	2,080	1,098	930	497	1,240	12,422	15,746	1,098	15,246
21.4	1,734	12,540	14,271	0	14,271	2,080	1,098	930	493	1,240	12,518	15,862	1,098	15,362
21.6	1,738	12,630	14,369	0	14,369	2,080	1,098	930	497	1,241	12,630	15,977	1,098	15,477
21.8	1,742	12,734	14,476	0	14,476	2,080	1,098	930	493	1,241	12,734	16,093	1,098	15,593
22.0	1,745	12,831	14,576	0	14,576	2,080	1,098	930	494	1,241	12,831	16,210	1,098	15,710
22.3	1,749	12,933	14,682	0	14,682	2,080	1,098	930	498	1,233	12,940	16,324	1,098	15,824
22.4	1,752	13,038	14,791	0	14,791	2,080	1,098	930	497	1,233	13,038	16,444	1,098	15,944
22.6	1,756	13,023	14,879	0	14,879	2,080	1,098	930	499	1,233	13,137	16,562	1,098	16,060
22.8	1,760	13,131	15,046	0	15,046	2,080	1,098	930	499	1,264	13,237	16,680	1,098	16,180
23.0	1,763	13,454	15,218	0	15,218	2,080	1,098	930	499	1,264	13,454	16,918	1,098	16,298
23.2	1,767	13,510	15,332	0	15,332	2,080	1,098	930	500	1,267	13,510	16,917	1,098	16,417
23.4	1,770	13,660	15,457	0	15,457	2,080	1,098	930	500	1,270	13,660	17,060	1,098	16,537
23.6	1,774	13,643	15,517	0	15,517	2,080	1,098	930	500	1,274	13,643	17,197	1,098	16,657
23.8	1,778	13,810	15,647	0	15,647	2,080	1,098	930	500	1,278	13,810	17,337	1,098	16,777
24.0	1,781	14,030	15,812	0	15,812	2,080	1,098	930	500	1,281	14,030	17,547	1,098	16,997
24.2	1,785	14,154	15,939	0	15,939	2,080	1,098	930	500	1,285	14,153	17,538	1,098	17,018
24.4	1,788	14,271	16,059	0	16,059	2,080	1,098	930	500	1,288	14,271	17,659	1,098	17,138
24.6	1,792	14,394	16,186	0	16,186	2,080	1,098	930	500	1,292	14,394	17,686	1,098	17,266
24.8	1,796	14,520	16,316	0	16,316	2,080	1,098	930	500	1,296	14,520	17,816	1,098	17,396
25.0	1,799	14,634	16,433	0	16,433	2,080	1,098	930	500	1,299	14,634	17,933	1,098	17,513
25.2	1,803	14,761	16,564	0	16,564	2,080	1,098	930	500	1,303	14,761	18,064	1,098	17,644
25.4	1,806	14,884	16,690	0	16,690	2,080	1,098	930	500	1,306	14,884	18,190	1,098	17,770
25.6	1,810	14,974	16,784	0	16,784	2,080	1,098	930	500	1,310	14,974	18,284	1,098	17,864
25.8	1,814	15,094	16,908	0	16,908	2,080	1,098	930	500	1,314	15,094	18,408	1,098	17,988
26.0	1,817	15,214	17,031	0	17,031	2,080	1,098	930	500	1,317	15,214	18,531	1,098	18,111
26.2	1,821	15,337	17,158	0	17,158	2,080	1,098	930	500	1,321	15,337	18,658	1,098	18,238
26.4	1,824	15,457	17,281	0	17,281	2,080	1,098	930	500	1,324	15,457	18,781	1,098	18,361
26.6	1,828	15,577	17,405	0	17,405	2,080	1,098	930	500	1,328	15,577	18,905	1,098	18,485
26.8	1,832	15,697	17,529	0	17,529	2,080	1,098	930	500	1,332	15,697	19,029	1,098	18,609
27.0	1,835	15,817	17,653	0	17,653	2,080	1,098	930	500	1,335	15,817	19,153	1,098	18,733
27.2	1,839	15,938	17,777	0	17,777	2,080	1,098	930	500	1,339	15,938	19,277	1,098	18,857
27.4	1,842	16,058	17,901	0	17,901	2,080	1,098	930	500	1,342	16,058	19,400	1,098	18,980
27.6	1,846	16,178	18,024	0	18,024	2,080	1,098	930	500	1,346	16,178	19,524	1,098	19,104
27.8	1,850	16,298	18,148	0	18,148	2,080	1,098	930	500	1,350	16,298	19,648	1,098	19,228
28.0	1,853	16,418	18,272	0	18,272	2,080	1,098	930	500	1,353	16,418	19,772	1,098	19,352
28.2	1,857	16,538	18,396	0	18,396	2,080	1,098	930	500	1,357	16,538	19,896	1,098	19,476
28.4	1,860	16,658	18,519	0	18,519	2,080	1,098	930	500	1,360	16,658	20,019	1,098	19,600
28.6	1,864	16,778	18,643	0	18,643	2,080	1,098	930	500	1,364	16,778	20,143	1,098	19,724
28.8	1,868	16,898	18,767	0	18,767	2,080	1,098	930	500	1,368	16,898	20,267	1,098	19,848
29.0	1,871	17,018	18,890	0	18,890	2,080	1,098	930	500	1,371	17,018	20,390	1,098	19,972
29.2	1,875	17,138	19,014	0	19,014	2,080	1,098	930	500	1,375	17,138	20,514	1,098	20,096
29.4	1,878	17,258	19,138	0	19,138	2,080	1,098	930	500	1,378	17,258	20,638	1,098	20,220
29.6	1,882	17,378	19,262	0	19,262	2,080	1,098	930	500	1,382	17,378	20,762	1,098	20,344
29.8	1,886	17,498	19,385	0	19,385	2,080	1,098	930	500	1,386	17,498	20,885	1,098	20,467
30.0	1,889	17,618	19,509	0	19,509	2,080	1,098	930	500	1,389	17,618	21,009	1,098	20,591
30.2	1,893	17,738	19,633	0	19,633	2,080	1,098	930	500	1,393	17,738	21,133	1,098	20,715
30.4	1,896	17,858	19,756	0	19,756	2,080	1,098	930	500	1,396	17,858	21,256	1,098	20,839
30.6	1,900	17,978	19,880	0	19,880	2,080	1,098	930	500	1,400	17,978	21,380	1,098	20,963
30.8	1,904	18,098	20,003	0	20,003	2,080	1,098	930	500	1,404	18,098	21,504	1,098	21,087
31.0	1,907	18,218	20,127	0	20,127	2,080	1,098	930	500	1,407	18,218	21,627	1,098	21,211
31.2	1,911	18,338	20,251	0	20,251	2,080	1,098	930	500	1,411	18,338	21,751	1,098	21,335
31.4	1,914	18,458	20,374	0	20,374	2,080	1,098	930	500	1,414	18,458	21,874	1,098	21,459
31.6	1,918	18,578	20,498	0	20,498	2,080	1,098	930	500	1,418	18,578	21,998	1,098	21,583
31.8	1,922	18,698	20,621	0	20,621	2,080	1,098	930	500	1,422	18,698	22,121	1,098	21,707
32.0	1,925	18,818	20,745	0	20,745	2,080	1,098	930	500	1,425	18,818	22,245	1,098	21,831
32.2	1,929	18,938	20,869	0	20,869	2,080	1,098	930	500	1,429	18,938	22,369	1,098	21,955
32.4	1,932	19,058	20,992	0	20,992	2,080	1,098	930	500	1,432	19,058	22,492	1,098	22,079
32.6	1,936	19,178	21,116	0	21,116	2,080	1,098	930	500	1,436	19,178	22,616	1,098	22,203
32.8	1,940	19,298	21,239	0	21,239	2,080	1,098	930	500	1,440	19,298	22,739	1,098	22,327
33.0	1,943	19,418	21,362	0	21,362	2,080	1,098	930	500	1,443	19,418	22,863	1,098	22,451

Table A-5, Canal Cut-Fill Volumes Reference Table for Both Route #1 and Route #2

(10,000cfs and 15,000cfs Canal Cut-Fill Volumes for Given Ground to Invert Depth)

Canal Quantities
10,000cfs, Bottom width = 200ft

Ground to Invert Depth d_{gi}	U/S of Disappointment Slough					D/S of Disappointment Slough									
	Scraper Excav Volume $V_{scraper}$	Dragline Excav Volume $V_{dragline}$	Total Excav Volume $V_{excavated}$	Embank Fill Volume V_{fill}	Disposal Volume V_{disp}	10' Replace. Excav Volume V_{excav}	10' Import Compact Volume V_{comp}	10' Local Fill Volume $V_{compact}$	Overlap Excav Volume V_{ov}	Scraper Excav Volume $V_{scraper}$	Dragline Excav Volume $V_{dragline}$	Total Excav Volume $V_{excavated}$	Embank Import Fill Volume V_{im}	Disposal Volume V_{disp}
(ft)	(cf)	(cf)	(cf)	(cf)	(cf)	(cf)	(cf)	(cf)	(cf)	(cf)	(cf)	(cf)	(cf)	(cf)
43.2	1,527	14,042	15,569	0	15,569	2,000	1,000	500	500	1,027	14,042	15,069	1,000	15,069
43.4	1,550	14,142	15,692	0	15,692	2,000	1,000	500	500	1,050	14,142	15,192	1,000	15,192
43.6	1,574	14,243	15,816	0	15,816	2,000	1,000	500	500	1,074	14,243	15,316	1,000	15,316
43.8	1,598	14,343	15,941	0	15,941	2,000	1,000	500	500	1,098	14,343	15,441	1,000	15,441
44.0	1,621	14,443	16,065	0	16,065	2,000	1,000	500	500	1,121	14,443	15,565	1,000	15,565
44.2	1,645	14,543	16,190	0	16,190	2,000	1,000	500	500	1,145	14,543	15,690	1,000	15,690
44.4	1,669	14,643	16,315	0	16,315	2,000	1,000	500	500	1,169	14,643	15,815	1,000	15,815
44.6	1,693	14,743	16,440	0	16,440	2,000	1,000	500	500	1,193	14,743	15,940	1,000	15,940
44.8	1,716	14,843	16,565	0	16,565	2,000	1,000	500	500	1,216	14,843	16,065	1,000	16,065
45.0	1,740	14,943	16,691	0	16,691	2,000	1,000	500	500	1,240	14,943	16,191	1,000	16,191
45.2	1,764	15,044	16,817	0	16,817	2,000	1,000	500	500	1,264	15,044	16,317	1,000	16,317
45.4	1,788	15,144	16,932	0	16,932	2,000	1,000	500	500	1,288	15,144	16,432	1,000	16,432
45.6	1,812	15,244	17,056	0	17,056	2,000	1,000	500	500	1,312	15,244	16,556	1,000	16,556
45.8	1,835	15,344	17,179	0	17,179	2,000	1,000	500	500	1,335	15,344	16,679	1,000	16,679
46.0	1,859	15,444	17,303	0	17,303	2,000	1,000	500	500	1,359	15,444	16,803	1,000	16,803
46.2	1,881	15,544	17,425	0	17,425	2,000	1,000	500	500	1,381	15,544	16,925	1,000	16,925
46.4	1,904	15,643	17,547	0	17,547	2,000	1,000	500	500	1,404	15,643	17,047	1,000	17,047
46.6	1,926	15,743	17,669	0	17,669	2,000	1,000	500	500	1,426	15,743	17,169	1,000	17,169
46.8	1,948	15,842	17,790	0	17,790	2,000	1,000	500	500	1,448	15,842	17,290	1,000	17,290
47.0	1,970	15,941	17,911	0	17,911	2,000	1,000	500	500	1,470	15,941	17,411	1,000	17,411
47.2	1,992	16,040	18,032	0	18,032	2,000	1,000	500	500	1,492	16,040	17,532	1,000	17,532
47.4	2,013	16,139	18,152	0	18,152	2,000	1,000	500	500	1,513	16,139	17,652	1,000	17,652
47.6	2,035	16,238	18,273	0	18,273	2,000	1,000	500	500	1,535	16,238	17,773	1,000	17,773
47.8	2,056	16,336	18,392	0	18,392	2,000	1,000	500	500	1,556	16,336	17,892	1,000	17,892
48.0	2,077	16,435	18,512	0	18,512	2,000	1,000	500	500	1,577	16,435	18,012	1,000	18,012
48.2	2,098	16,533	18,631	0	18,631	2,000	1,000	500	500	1,598	16,533	18,131	1,000	18,131
48.4	2,119	16,631	18,750	0	18,750	2,000	1,000	500	500	1,619	16,631	18,250	1,000	18,250
48.6	2,140	16,729	18,869	0	18,869	2,000	1,000	500	500	1,640	16,729	18,369	1,000	18,369
48.8	2,161	16,827	18,988	0	18,988	2,000	1,000	500	500	1,661	16,827	18,488	1,000	18,488
49.0	2,181	16,925	19,106	0	19,106	2,000	1,000	500	500	1,681	16,925	18,606	1,000	18,606
49.2	2,202	17,022	19,224	0	19,224	2,000	1,000	500	500	1,702	17,022	18,724	1,000	18,724
49.4	2,222	17,119	19,341	0	19,341	2,000	1,000	500	500	1,722	17,119	18,841	1,000	18,841
49.6	2,242	17,216	19,458	0	19,458	2,000	1,000	500	500	1,742	17,216	18,958	1,000	18,958
49.8	2,262	17,313	19,575	0	19,575	2,000	1,000	500	500	1,762	17,313	19,075	1,000	19,075
50.0	2,282	17,410	19,692	0	19,692	2,000	1,000	500	500	1,782	17,410	19,192	1,000	19,192
50.2	2,302	17,506	19,808	0	19,808	2,000	1,000	500	500	1,802	17,506	19,308	1,000	19,308
50.4	2,322	17,602	19,924	0	19,924	2,000	1,000	500	500	1,822	17,602	19,424	1,000	19,424
50.6	2,342	17,698	20,040	0	20,040	2,000	1,000	500	500	1,842	17,698	19,540	1,000	19,540
50.8	2,362	17,794	20,156	0	20,156	2,000	1,000	500	500	1,862	17,794	19,656	1,000	19,656
51.0	2,381	17,890	20,271	0	20,271	2,000	1,000	500	500	1,881	17,890	19,771	1,000	19,771
51.2	2,401	17,985	20,386	0	20,386	2,000	1,000	500	500	1,901	17,985	19,886	1,000	19,886
51.4	2,420	18,080	20,500	0	20,500	2,000	1,000	500	500	1,920	18,080	20,000	1,000	20,000
51.6	2,439	18,175	20,614	0	20,614	2,000	1,000	500	500	1,939	18,175	20,114	1,000	20,114
51.8	2,458	18,270	20,728	0	20,728	2,000	1,000	500	500	1,958	18,270	20,228	1,000	20,228
52.0	2,477	18,365	20,842	0	20,842	2,000	1,000	500	500	1,977	18,365	20,342	1,000	20,342
52.2	2,496	18,459	20,955	0	20,955	2,000	1,000	500	500	1,996	18,459	20,455	1,000	20,455
52.4	2,515	18,553	21,068	0	21,068	2,000	1,000	500	500	2,015	18,553	20,568	1,000	20,568
52.6	2,533	18,647	21,180	0	21,180	2,000	1,000	500	500	2,033	18,647	20,680	1,000	20,680
52.8	2,552	18,741	21,293	0	21,293	2,000	1,000	500	500	2,052	18,741	20,793	1,000	20,793
53.0	2,570	18,834	21,404	0	21,404	2,000	1,000	500	500	2,070	18,834	20,904	1,000	20,904
53.2	2,589	18,927	21,516	0	21,516	2,000	1,000	500	500	2,089	18,927	21,016	1,000	21,016
53.4	2,607	19,020	21,627	0	21,627	2,000	1,000	500	500	2,107	19,020	21,127	1,000	21,127
53.6	2,625	19,113	21,738	0	21,738	2,000	1,000	500	500	2,125	19,113	21,238	1,000	21,238
53.8	2,643	19,205	21,848	0	21,848	2,000	1,000	500	500	2,143	19,205	21,348	1,000	21,348
54.0	2,661	19,297	21,958	0	21,958	2,000	1,000	500	500	2,161	19,297	21,458	1,000	21,458
54.2	2,679	19,389	22,068	0	22,068	2,000	1,000	500	500	2,179	19,389	21,568	1,000	21,568
54.4	2,697	19,481	22,178	0	22,178	2,000	1,000	500	500	2,197	19,481	21,678	1,000	21,678
54.6	2,715	19,572	22,287	0	22,287	2,000	1,000	500	500	2,215	19,572	21,787	1,000	21,787
54.8	2,733	19,663	22,396	0	22,396	2,000	1,000	500	500	2,233	19,663	21,896	1,000	21,896
55.0	2,750	19,754	22,504	0	22,504	2,000	1,000	500	500	2,250	19,754	22,004	1,000	22,004
55.2	2,768	19,844	22,612	0	22,612	2,000	1,000	500	500	2,268	19,844	22,112	1,000	22,112
55.4	2,785	19,934	22,720	0	22,720	2,000	1,000	500	500	2,285	19,934	22,220	1,000	22,220
55.6	2,803	20,024	22,827	0	22,827	2,000	1,000	500	500	2,303	20,024	22,327	1,000	22,327
55.8	2,820	20,114	22,934	0	22,934	2,000	1,000	500	500	2,320	20,114	22,434	1,000	22,434
56.0	2,837	20,203	23,040	0	23,040	2,000	1,000	500	500	2,337	20,203	22,540	1,000	22,540
56.2	2,854	20,292	23,146	0	23,146	2,000	1,000	500	500	2,354	20,292	22,646	1,000	22,646
56.4	2,871	20,381	23,252	0	23,252	2,000	1,000	500	500	2,371	20,381	22,752	1,000	22,752
56.6	2,888	20,469	23,357	0	23,357	2,000	1,000	500	500	2,388	20,469	22,857	1,000	22,857
56.8	2,905	20,558	23,462	0	23,462	2,000	1,000	500	500	2,405	20,558	22,962	1,000	22,962
57.0	2,922	20,646	23,567	0	23,567	2,000	1,000	500	500	2,422	20,646	23,067	1,000	23,067
57.2	2,938	20,734	23,672	0	23,672	2,000	1,000	500	500	2,438	20,734	23,172	1,000	23,172
57.4	2,955	20,821	23,776	0	23,776	2,000	1,000	500	500	2,455	20,821	23,276	1,000	23,276

Canal Quantities
15,000cfs, Bottom width = 240ft

Ground to Invert Depth d_{gi}	U/S of Disappointment Slough					D/S of Disappointment Slough									
	Scraper Excav Volume $V_{scraper}$	Dragline Excav Volume $V_{dragline}$	Total Excav Volume $V_{excavated}$	Embank Fill Volume V_{fill}	Disposal Volume V_{disp}	10' Replace. Excav Volume V_{excav}	10' Import Compact Volume V_{comp}	10' Local Fill Volume $V_{compact}$	Overlap Excav Volume V_{ov}	Scraper Excav Volume $V_{scraper}$	Dragline Excav Volume $V_{dragline}$	Total Excav Volume $V_{excavated}$	Embank Import Fill Volume V_{im}	Disposal Volume V_{disp}
(ft)	(cf)	(cf)	(cf)	(cf)	(cf)	(cf)	(cf)	(cf)	(cf)	(cf)	(cf)	(cf)	(cf)	(cf)
43.2	1,947	19,430	21,377	0	21,377	2,000	1,000	500	500	1,447	19,430	20,877	1,000	20,877
43.4	1,976	19,590	21,566	0	21,566	2,000	1,000	500	500	1,476	19,590	21,066	1,000	21,066
43.6	2,004	19,750	21,754	0	21,754	2,000	1,000	500	500	1,504	19,750	21,254	1,000	21,254
43.8	2,033	19,910	21,943	0	21,943	2,000	1,000	500	500	1,533	19,910	21,443	1,000	21,443
44.0	2,061	20,069	22,130	0	22,130	2,000	1,000	500	500	1,561	20,069	21,630	1,000	21,630
44.2	2,090	20,228	22,318	0	22,318	2,000	1,000	500	500	1,590	20,228	21,818	1,000	21,818
44.4	2,118	20,387	22,505	0	22,505	2,000	1,000	500	500	1,618	20,387	22,005	1,000	22,005
44.6	2,147	20,546	22,693	0	22,693	2,000	1,000	500	500	1,647	20,546	22,193	1,000	22,193
44.8	2,175	20,705	22,880	0	22,880	2,000	1,000	500	500	1,675	20,705	22,380	1,000	22,380
45.0	2,204	20,863	23,067	0	23,067	2,000	1,000	500	500	1,704	20,863	22,567	1,000	22,567
45.2	2,232	21,022	23,254	0	23,254	2,000	1,000	500	500	1,732	21,022	22,754	1,000	22,754
45.4	2,261	21,180	23,441	0	23,441	2,000	1,000	500	500	1,761	21,180	22,941	1,000	22,941
45.6	2,289	21,338	23,627	0	23,627	2,000	1,000	500	500	1,789	21,338	23,127	1,000	23,127
45.8	2,318	21,496	23,814	0	23,814	2,000	1,000	500	500	1,818	21,496	23,314	1,000	23,314
46.0	2,346	21,654	24,000	0	24,000	2,000	1,000	500	500	1,846	21,654	23,500	1,000	23,500
46.2	2,375	21,812	24,186	0	24,186	2,000	1,000	500	500	1,875	21,812	23,686	1,000	23,686
46.4	2,403	21,969	24,372	0	24,372	2,000	1,000	500	500	1,903	21,969	23,872	1,000	23,872
46.6	2,432	22,126	24,558	0	24,558	2,000	1,000	500	500	1,932	22,126	24,058	1,000	24,058
46.8	2,460	22,284	24,744	0	24,744	2,000	1,000	500	500	1,960	22,284	24,244	1,000	24,244
47.0	2,489	22,441	24,930	0	24,930	2,000	1,000	500	500	1,989	22,441	24,430	1,000	24,430
47.2	2,518	22,598	25,116	0	25,116	2,000	1,000	500	500	2,018	22,598	24,616	1,000	24,616
47.4	2,546	22,755	25,301	0	25,301	2,000	1,000	500	500	2,046	22,755	24,801	1,000	24,801
47.6	2,575	22,912	25,487	0	25,487	2,000	1,000	500	500	2,075	22,912	24,987	1,000	24,987
47.8	2,603	23,069	25,672	0	25,672	2,000	1,000	500	500	2,103	23,069	25,172	1,000	25,172
48.0	2,632	23,225	25,857	0	25,857	2,000	1,000	500	500	2,132	23,225	25,357	1,000	25,357
48.2	2,660	23,382	26,042	0	26,042	2,000	1,000	500	500	2,160	23,382	25,542	1,000	25,542
48.4	2,689	23,538	26,227	0	26,227	2,000	1,000	500	500	2,189	23,538	25,727	1,000	25,727
48.6	2,717	23,694	26,411	0	26,411	2,000	1,000	500	500	2,217	23,694	25,911	1,000	25,911
48.8	2,746	23,850	26,596	0	26,596	2,000	1,000	500	500	2,246	23,850	26,096	1,000	26,096
49.0	2,774	24,006	26,780	0	26,780	2,000	1,000	500	500	2,274	24,006	26,280	1,000	26,280
49.2	2,803	24,162	26,964	0	26,964	2,000	1,000	500	500	2,303	24,162	26,464	1,000	26,464
49.4	2,831	24,317	27,148	0	27,148	2,000	1,000	500	500	2,331	24,317	26,648	1,000	26,648
49.6	2,860	24,473	27,333	0	27,333	2,000	1,000	500	500	2,360	24,473	26,833	1,000	26,833
49.8	2,888	24,628	27,516	0	27,516	2,000	1,000	500	500	2,388	24,628	27,016	1,000	27,016
50.0	2,917	24,784	27,700	0	27,700	2,000	1,000	500	500	2,417	24,784	27,200	1,000	27,200
50.2	2,945	24,939	27,884	0	27,884	2,000	1,000	500	500	2,445	24,939	27,384	1,000	27,384
50.4	2,974	25,094	28,068	0	28,068	2,000	1,000	500	500	2,474	25,094	27,568	1,000	27,568
50.6	3,002	25,249	28,251	0	28,251	2,000	1,000	500	500	2,502	25,249	27,751	1,000	27,751
50.8	3,031	25,404	28,435	0	28,435	2,000	1,000	500	500	2,531	25,404	27,935	1,000	27,935
51.0	3,059	25,559	28,618	0	28,618	2,000	1,000	500	500	2,559	25,559	28,118	1,000	28,118
51.2	3,088	25,714	28,802	0	28,802	2,000	1,000	500	500	2,588	25,714	28,302	1,000	28,302
51.4	3,116	25,868	28,985	0	28,985	2,000	1,000	500	500	2,616	25,868	28,485	1,000	28,485
51.6	3,145	26,023	29,168	0	29,168	2,000	1,000	500	500	2,645	26,023	28,668	1,000	28,668
51.8	3,173	26,177	29,351	0	29,351	2,000	1,000	500	500	2,673	26,177	28,851	1,000	28,851
52.0	3,202	26,332	29,534	0	29,534	2,000	1,000	500	500	2,702	26,332	29,034	1,000	29,034
52.2	3,230	26,486	29,717	0	29,717	2,000	1,000	500	500	2,730	26,486	29,217	1,000	29,217
52.4	3,259	26,640	29,899	0	29,899	2,000	1,000	500	500	2,759	26,640	29,399	1,000	29,399
52.6	3,287	26,794	30,081	0	30,081	2,000	1,000	500	500	2,787	26,794	29,581	1,000	29,581
52.8	3,316	26,948	30,264	0	30,264	2,000	1,000	500	500	2,816	26,948	29,764	1,000	29,764
53.0	3,344	27,102	30,446	0	30,446	2,000	1,000	500	500	2,844	27,102	29,946	1,000	29,946
53.2	3,373	27,255	30,628	0	30,628	2,000	1,000	500	500	2,873	27,255	30,128	1,000	30,128
53.4	3,401	27,409	30,810	0	30,810	2,000	1,000	500	500	2,901	27,409	30,310	1,000	30,310
53.6	3,430	27,562	30,992	0	30,992	2,000	1,000	500	500	2,930	27,562	30,492	1,000	30,492
53.8	3,458	27,715	31,173	0	31,173	2,000	1,000	500	500	2,958	27,715	30,673	1,000	30,673
54.0	3,487	27,868	31,355	0	31,355	2,000	1,000	500	500	2,987	27,868	30,855	1,000	30,855
54.2	3,515	28,021	31,536	0	31,536	2,000	1,000	500	500	3,015	28,021	31,036	1,000	31,036
54.4	3,544	28,174	31,717	0	31,717	2,000	1,000	500	500	3,044	28,174	31,217	1,000	31,217
54.6	3,572	28,327	31,898	0	31,898	2,000	1,000	500	500	3,072	28,327	31,398	1,000	31,398
54.8	3,601	28,479	32,079	0	32,079	2,000	1,000	500	500	3,101	28,479	31,579	1,000	31,579
55.0	3,629	28,632	32,260	0	32,260	2,000	1,000	500	500	3,129	28,632	31,760	1,000	31,760
55.2	3,658	28,784	32,441	0	32,441	2,000	1,000	500	500	3,158	28,784	31,941	1,000	31,941
55.4	3,686	28,936	32,622	0	32,622	2,000	1,000	500	500	3,186	28,936	32,122	1,000	32,122
55.6	3,715	29,088	32,803	0	32,803	2,000	1,000	500	500	3,215	29,088	32,303	1,000	32,303
55.8	3,743	29,240	32,983	0	32,983	2,000	1,000	500	500	3,243	29,240	32,483	1,000	32,483
56.0	3,772	29,392	33,164	0	33,164	2,000	1,000	500	500	3,272	29,392	32,664	1,000	32,664
56.2	3,800	29,544	33,344	0	33,344	2,000	1,000	500	500	3,300	29,544	32,844	1,000	32,844
56.4	3,829	29,695	33,524	0	33,524	2,000	1,000	500	500	3,329	29,695	33,024	1,000	33,024
56.6	3,857	29,847	33,704	0	33,704	2,000	1,000	500	500	3,357	29,847	33,204	1,000	33,204
56.8	3,886	29,998	33,884	0	33,884	2,000	1,000	500	500	3,386	29,998	33,384	1,000	33,384
57.0	3,914	30,149	34,063	0	34,063	2,000	1,000	500	500	3,414	30,149	33,563	1,000	33,563
57.2	3,943	30,300	34,243	0	34,243	2,000	1,000	500	500	3,443	30,300	33,743	1,000	33,743
57.4	3,971	30,451	34,422	0	34,422	2,000	1,000	500	500	3,471	30,451	33,922	1,000	33,922

Table A-5, Canal Cut-Fill Volumes Reference Table for Both Route #1 and Route #2

(10,000cfs and 15,000cfs Canal Cut-Fill Volumes for Given Ground to Invert Depth)

Canal Quantities — 10,000cfs, Bottom width = [illegible]

	U/S of Disappointment Slough					D/S of Disappointment Slough								
Ground to Invert Depth (ft)	Scraper Excav Volume (cf)	Dragline Excav Volume (cf)	Total Excav Volume (cf)	Embank Fill Volume (cf)	Disposal Volume (cf)	10' Replace. Excav Volume (cf)	10' Import Compact Volume (cf)	10' Local Fill Volume (cf)	Overlap Excav Volume (cf)	Scraper Excav Volume (cf)	Dragline Excav Volume (cf)	Total Excav Volume (cf)	Embank Import Fill Volume (cf)	Disposal Volume (cf)
57.6	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
57.8	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
58.0	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
58.2	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
58.4	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
58.6	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
58.8	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
59.0	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
59.2	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
59.4	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
59.6	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
59.8	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
60.0	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
60.2	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
60.4	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
60.6	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
60.8	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
61.0	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
61.2	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
61.4	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
61.6	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
61.8	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
62.0	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
62.2	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
62.4	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
62.6	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
62.8	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
63.0	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
63.2	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
63.4	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
63.6	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
63.8	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
64.0	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
64.2	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
64.4	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
64.6	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
64.8	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
65.0	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
65.2	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
65.4	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
65.6	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
65.8	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
66.0	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
66.2	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
66.4	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
66.6	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
66.8	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
67.0	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
67.2	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
67.4	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
67.6	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
67.8	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
68.0	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
68.2	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
68.4	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
68.6	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
68.8	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
69.0	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
69.2	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
69.4	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
69.6	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
69.8	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
70.0	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
70.2	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
70.4	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
70.6	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
70.8	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
71.0	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
71.2	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
71.4	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
71.6	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
71.8	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]

Canal Quantities — 15,000cfs, Bottom width = [illegible]

	U/S of Disappointment Slough					D/S of Disappointment Slough								
Ground to Invert Depth (ft)	Scraper Excav Volume (cf)	Dragline Excav Volume (cf)	Total Excav Volume (cf)	Embank Fill Volume (cf)	Disposal Volume (cf)	10' Replace. Excav Volume (cf)	10' Import Compact Volume (cf)	10' Local Fill Volume (cf)	Overlap Excav Volume (cf)	Scraper Excav Volume (cf)	Dragline Excav Volume (cf)	Total Excav Volume (cf)	Embank Import Fill Volume (cf)	Disposal Volume (cf)
57.6	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
57.8	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
58.0	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
58.2	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
58.4	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
58.6	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
58.8	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
59.0	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
59.2	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
59.4	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
59.6	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
59.8	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
60.0	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
60.2	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
60.4	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
60.6	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
60.8	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
61.0	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
61.2	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
61.4	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
61.6	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
61.8	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
62.0	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
62.2	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
62.4	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
62.6	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
62.8	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
63.0	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
63.2	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
63.4	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
63.6	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
63.8	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
64.0	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
64.2	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
64.4	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
64.6	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
64.8	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
65.0	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
65.2	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
65.4	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
65.6	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
65.8	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
66.0	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
66.2	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
66.4	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
66.6	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
66.8	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
67.0	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
67.2	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
67.4	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
67.6	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
67.8	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
68.0	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
68.2	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
68.4	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
68.6	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
68.8	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
69.0	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
69.2	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
69.4	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
69.6	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
69.8	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
70.0	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
70.2	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
70.4	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
70.6	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
70.8	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
71.0	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
71.2	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
71.4	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
71.6	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]
71.8	[illegible]	[illegible]	[illegible]	0	[illegible]	2,000	1,000	500	500	[illegible]	[illegible]	[illegible]	1,000	[illegible]

Table A-5, Canal Cut-Fill Volumes Reference Table for Both Route #1 and Route #2

(10,000cfs and 15,000cfs Canal Cut-Fill Volumes for Given Ground to Invert Depth

Canal Quantities
15,000cfs, Bottom width = 200ft

Ground to Invert Depth d_{gi} (ft)	U/S of Disappointment Slough: Scraper Excav Volume $V_{scraper}$ (cy)	Dragline Excav Volume $V_{dragline}$ (cy)	Total Excav Volume $V_{excavated}$ (cy)	Embank Fill Volume V_{em} (cy)	Disposal Volume V_{disp} (cy)	D/S of Disappointment Slough: 10' Replace. Excav Volume $V_{excavated}$ (cy)	10' Import Compact Volume V_{comp} (cy)	10' Local Fill Volume $V_{subsoil}$ (cy)	Overlap Excav Volume V_{ov} (cy)	Scraper Excav Volume $V_{scraper}$ (cy)	Dragline Excav Volume $V_{dragline}$ (cy)	Total Excav Volume $V_{excavated}$ (cy)	Embank Import Fill Volume V_{im} (cy)	Disposal Volume V_{disp} (cy)
72.0	2,340	30,835	33,174	0	33,174	2,080	1,040	520	520	3,345	33,629	36,974	1,560	34,054
72.2	2,340	31,083	33,172	0	33,172	2,080	1,040	520	520	3,344	31,683	34,922	1,560	34,192
72.4	2,432	31,256	33,251	0	33,251	2,080	1,040	520	520	3,392	31,795	34,831	1,560	34,331
72.6	2,296	31,233	33,529	0	33,529	2,080	1,040	520	520	3,330	31,533	34,864	1,560	34,404
72.8	2,296	31,489	33,529	0	33,529	2,080	1,040	520	520	4,040	31,856	35,896	1,560	34,896
73.0	2,080	31,604	33,684	0	33,684	2,080	1,040	520	520	3,380	31,604	35,184	1,560	34,744
73.2	2,080	31,760	33,837	0	33,837	2,080	1,040	520	520	3,380	31,340	35,567	1,560	34,907
73.4	2,080	31,816	33,843	0	33,843	2,080	1,040	520	520	3,332	31,836	35,523	1,560	34,923
73.6	2,024	32,012	34,097	0	34,097	2,080	1,040	520	520	3,324	32,219	35,807	1,560	35,167
73.8	2,078	32,149	34,227	0	34,227	2,080	1,040	520	520	3,328	32,149	35,803	1,560	35,307
74.0	2,081	32,246	34,327	0	34,327	2,080	1,040	520	520	3,331	32,256	35,947	1,560	35,407
74.2	2,081	32,423	34,505	0	34,504	2,080	1,040	520	520	4,080	32,423	36,503	1,560	35,559
74.4	2,080	32,561	34,640	0	34,640	2,080	1,040	520	520	4,083	32,561	36,644	1,560	35,704
74.6	2,080	32,658	34,738	0	34,738	2,080	1,040	520	520	3,342	32,696	36,038	1,560	35,878
74.8	2,080	32,936	34,932	0	34,931	2,080	1,040	520	520	3,348	32,936	36,332	1,560	36,051
75.0	2,080	32,874	34,875	0	34,875	2,080	1,040	520	520	3,344	32,874	36,830	1,560	36,193

Canal Quantities
15,000cfs, Bottom width = 240ft

Ground to Invert Depth d_{gi} (ft)	U/S of Disappointment Slough: Scraper Excav Volume $V_{scraper}$ (cy)	Dragline Excav Volume $V_{dragline}$ (cy)	Total Excav Volume $V_{excavated}$ (cy)	Embank Fill Volume V_{em} (cy)	Disposal Volume V_{disp} (cy)	D/S of Disappointment Slough: 10' Replace. Excav Volume $V_{excavated}$ (cy)	10' Import Compact Volume V_{comp} (cy)	10' Local Fill Volume $V_{subsoil}$ (cy)	Overlap Excav Volume V_{ov} (cy)	Scraper Excav Volume $V_{scraper}$ (cy)	Dragline Excav Volume $V_{dragline}$ (cy)	Total Excav Volume $V_{excavated}$ (cy)	Embank Import Fill Volume V_{im} (cy)	Disposal Volume V_{disp} (cy)
72.0	2,405	40,569	43,094	0	43,094	2,080	1,040	520	520	3,965	40,589	44,554	1,560	44,134
72.2	2,404	40,731	43,220	0	43,220	2,080	1,040	520	520	3,964	40,731	44,830	1,560	44,390
72.4	2,472	40,814	43,367	0	43,367	2,080	1,040	520	520	3,972	40,914	44,967	1,560	44,467
72.6	2,419	41,011	43,533	0	43,533	2,080	1,040	520	520	3,975	41,077	45,113	1,560	44,633
72.8	2,440	41,291	43,732	0	43,732	2,080	1,040	520	520	3,985	41,241	45,290	1,560	44,900
73.0	2,443	41,404	43,846	0	43,846	2,080	1,040	520	520	3,991	41,404	45,445	1,560	44,986
73.2	2,407	41,588	44,055	0	44,055	2,080	1,040	520	520	3,987	41,569	45,611	1,560	45,115
73.4	2,490	41,732	44,223	0	44,223	2,080	1,040	520	520	3,990	41,732	45,873	1,560	45,333
73.6	2,444	41,937	44,381	0	44,381	2,080	1,040	520	520	3,994	41,897	45,971	1,560	45,471
73.8	2,498	42,067	44,566	0	44,559	2,080	1,040	520	520	3,998	42,061	46,134	1,560	45,610
74.0	2,500	42,226	44,727	0	44,727	2,080	1,040	520	520	4,001	42,226	46,227	1,560	45,853
74.2	2,502	42,391	44,898	0	44,896	2,080	1,040	520	520	4,003	42,391	46,395	1,560	45,976
74.4	2,504	42,557	45,062	0	45,060	2,080	1,040	520	520	4,004	42,557	46,561	1,560	46,145
74.6	2,512	42,720	45,234	0	45,234	2,080	1,040	520	520	4,012	42,722	46,734	1,560	46,334
74.8	2,516	42,968	45,484	0	45,484	2,080	1,040	520	520	4,016	42,968	46,984	1,560	46,444
75.0	2,516	43,056	45,573	0	45,573	2,080	1,040	520	520	4,016	43,056	47,072	1,560	46,633

Table A-6, Canal Route #1 Quantity Calculation (Sacramento River to Disappointment Slough)

Canal Profile						Route #1, 10,000cfs Bottom width = 200ft					Route #1, 15,000cfs Bottom width = 340ft					Excavation and Embankment Quantity Increase from 10,000cfs to 15,000cfs				
[1] Canal Station (x100ft)	[2] Step Length (ft)	[3] Mid-Point Station (x100ft)	[4] Mid-Point Ground Elev. (ft)	[5] Mid-Point Canal Invert EL (ft)	[6] Ground To Invert Depth (ft)	[7] Scraper Excav Volume $V_{scraper}$ (cy)	[8] Dragline Excav Volume $V_{dragline}$ (cy)	[9] Total Excav Volume V_{ex} (cy)	[10] Total Embank Volume V_{em} (cy)	[11] Net Disposal Volume V_{dis} (cy)	[12] Scraper Excav Volume $V_{scraper}$ (cy)	[13] Dragline Excav Volume $V_{dragline}$ (cy)	[14] Total Excav Volume V_{ex} (cy)	[15] Total Embank Volume V_{em} (cy)	[16] Net Disposal Volume V_{dis} (cy)	[17] Scraper Volume Diff. $V_{scraper,diff}$ (cy)	[18] Dragline Volume Diff. $V_{dragline,diff}$ (cy)	[19] Total Excav Diff. V_{ex} (cy)	[20] Total Embank Diff. V_{dis} (cy)	[21] Disposal Volume Diff. V_{diff} (cy)
Sacramento River																				
0	1000.0	5	5.49	-20.71	26.19	45,069	235,061	280,130	869	279,261	60,624	354,521	415,145	869	414,276	15,556	119,460	135,015	0	135,015
10	1000.0	15	5.46	-20.72	26.18	45,066	235,022	280,088	874	279,214	60,622	354,468	415,089	874	414,215	15,556	119,446	135,001	0	135,001
20	1000.0	25	5.44	-20.73	26.17	45,064	234,983	280,047	879	279,167	60,620	354,414	415,034	879	414,155	15,556	119,432	134,987	0	134,987
30	1000.0	35	5.41	-20.74	26.15	45,062	234,943	280,005	885	279,120	60,617	354,361	414,978	885	414,094	15,556	119,418	134,973	0	134,973
40	1000.0	45	5.39	-20.75	26.14	45,060	234,904	279,964	890	279,074	60,615	354,308	414,923	890	414,033	15,556	119,404	134,959	0	134,959
50	1000.0	55	5.36	-20.76	26.13	45,058	234,865	279,922	895	279,027	60,613	354,254	414,867	895	413,972	15,556	119,390	134,945	0	134,945
60	1000.0	65	5.34	-20.77	26.11	45,055	234,825	279,881	901	278,980	60,611	354,201	414,812	901	413,911	15,556	119,376	134,931	0	134,931
70	1000.0	75	5.31	-20.79	26.10	45,053	234,786	279,839	906	278,933	60,609	354,147	414,756	906	413,850	15,556	119,362	134,917	0	134,917
80	1000.0	85	5.29	-20.80	26.09	45,051	234,747	279,797	911	278,886	60,606	354,094	414,701	911	413,789	15,556	119,348	134,903	0	134,903
90	1000.0	95	5.26	-20.81	26.07	45,049	234,707	279,756	916	278,839	60,604	354,041	414,645	916	413,729	15,556	119,334	134,889	0	134,889
100	1000.0	105	5.24	-20.82	26.06	45,047	234,668	279,714	922	278,793	60,602	353,987	414,589	922	413,668	15,556	119,320	134,875	0	134,875
110	1000.0	115	5.21	-20.83	26.04	45,044	234,628	279,673	927	278,746	60,600	353,934	414,534	927	413,607	15,556	119,306	134,861	0	134,861
120	1000.0	125	5.19	-20.84	26.03	45,042	234,589	279,631	932	278,699	60,598	353,881	414,478	932	413,546	15,556	119,292	134,847	0	134,847
130	1000.0	135	5.16	-20.86	26.02	45,040	234,550	279,590	938	278,652	60,595	353,827	414,423	938	413,485	15,556	119,278	134,833	0	134,833
140	1000.0	145	5.14	-20.87	26.00	45,038	234,510	279,548	943	278,605	60,593	353,774	414,367	943	413,424	15,556	119,264	134,819	0	134,819
150	1000.0	155	5.11	-20.88	25.99	44,893	232,159	277,052	1,275	275,777	60,449	350,579	411,028	1,275	409,753	15,556	118,420	133,975	0	133,975
160	1000.0	165	5.09	-20.89	25.98	44,891	232,120	277,011	1,281	275,730	60,446	350,526	410,972	1,281	409,692	15,556	118,406	133,961	0	133,961
170	400.0	172	5.07	-20.90	25.97	17,956	92,837	110,793	514	110,279	24,178	140,196	164,373	514	163,860	6,222	47,358	53,581	0	53,581
174	0.0																			
Stone Lake Siphon																				
180	400.0	188	5.03	-21.80	26.83	18,248	98,550	116,798	0	116,798	24,471	147,926	172,397	0	172,397	6,222	49,376	55,599	0	55,599
190	1000.0	195	5.01	-21.81	26.82	45,620	246,344	291,964	0	291,964	61,175	369,774	430,949	0	430,949	15,556	123,430	138,986	0	138,986
200	1000.0	205	5.00	-21.82	26.82	45,619	246,338	291,958	0	291,958	61,175	369,766	430,941	0	430,941	15,556	123,428	138,984	0	138,984
210	1000.0	215	5.00	-21.83	26.83	45,621	246,370	291,990	0	291,990	61,176	369,809	430,985	0	430,985	15,556	123,439	138,995	0	138,995
220	1000.0	225	4.75	-21.84	26.59	45,374	240,915	286,289	146	286,143	60,930	362,446	423,376	146	423,230	15,556	121,531	137,087	0	137,087
230	1000.0	235	4.25	-21.85	26.10	45,054	234,794	279,848	905	278,943	60,609	354,159	414,768	905	413,863	15,556	119,365	134,920	0	134,920
240	1000.0	245	4.00	-21.86	25.86	44,870	231,788	276,658	1,328	275,330	60,426	350,074	410,500	1,328	409,172	15,556	118,287	133,842	0	133,842
250	1000.0	255	4.00	-21.87	25.87	44,872	231,818	276,690	1,324	275,367	60,428	350,116	410,543	1,324	409,220	15,556	118,298	133,853	0	133,853
260	1000.0	265	4.00	-21.88	25.88	44,874	231,849	276,723	1,319	275,403	60,430	350,157	410,587	1,319	409,267	15,556	118,308	133,864	0	133,864
270	1000.0	275	4.00	-21.89	25.89	44,876	231,879	276,755	1,315	275,440	60,431	350,198	410,630	1,315	409,315	15,556	118,319	133,875	0	133,875
280	1000.0	285	4.00	-21.90	25.90	44,878	231,909	276,787	1,311	275,476	60,433	350,240	410,673	1,311	409,362	15,556	118,330	133,886	0	133,886
290	1000.0	295	4.00	-21.91	25.91	44,880	231,940	276,819	1,306	275,513	60,435	350,281	410,716	1,306	409,410	15,556	118,341	133,897	0	133,897
300	900.0	305	4.00	-21.92	25.92	40,393	208,772	249,165	1,172	247,993	54,393	315,288	369,682	1,172	368,509	14,000	106,516	120,516	0	120,516
309	1100.0	315	4.00	-21.94	25.94	0	0	0	1,428	[illegible]	0	0	0	1,428	[illegible]	0	0	0	0	0
320	600.0	323	4.00	-21.94	25.94	0	0	0	777	[illegible]	0	0	0	777	[illegible]	0	0	0	0	0
332	1400.0	333	4.00	-21.95	25.95	62,841	324,878	387,719	1,806	385,913	84,619	490,613	575,233	1,806	573,427	21,778	165,736	187,514	0	187,514
340	1000.0	345	4.00	-21.97	25.97	44,889	232,092	276,981	1,285	275,696	60,445	350,488	410,932	1,285	409,647	15,556	118,396	133,951	0	133,951
350	1000.0	355	4.00	-21.98	25.98	44,891	232,122	277,013	1,281	275,733	60,446	350,529	410,976	1,281	409,695	15,556	118,407	133,962	0	133,962
360	1000.0	365	4.00	-21.99	25.99	44,893	232,153	277,046	1,276	275,769	60,448	350,570	411,019	1,276	409,742	15,556	118,418	133,973	0	133,973
370	600.0	373	4.00	-22.00	26.00	26,937	139,306	166,243	764	165,479	36,270	210,362	246,632	764	245,868	9,333	71,056	80,389	0	80,389
376	0.0																			
Lost Slough Siphon																				
385	500.0	388	4.00	-22.41	26.41	22,675	120,185	142,860	89	142,770	30,452	180,856	211,308	89	211,219	7,778	60,670	68,448	0	68,448
390	1000.0	395	4.00	-22.43	26.43	45,352	240,434	285,786	175	285,611	60,908	361,797	422,704	175	422,530	15,556	121,363	136,919	0	136,919
400	1000.0	405	4.00	-22.46	26.46	45,356	240,518	285,874	170	285,705	60,911	361,911	422,822	170	422,653	15,556	121,393	136,948	0	136,948
410	1000.0	415	4.17	-22.49	26.65	45,490	243,464	288,955	0	288,955	61,046	365,889	426,935	0	426,935	15,556	122,425	137,980	0	137,980
420	0.0																			
Mokelumne River Control Structure and Siphon																				
424	600.0	427	4.57	-24.21	28.77	28,104	164,362	192,466	0	192,466	37,437	244,114	281,551	0	281,551	9,333	79,752	89,085	0	89,085
430	1000.0	435	4.83	-24.22	29.06	47,091	279,705	326,796	0	326,796	62,646	414,577	477,224	0	477,224	15,556	134,872	150,428	0	150,428

Table A-6, Canal Route #1 Quantity Calculation (Sacramento River to Disappointment Slough)

Canal Profile						Route #1, 10,000cfs Bottom width = 200ft					Route #1, 15,000cfs Bottom width = 340ft					Excavation and Embankment Quantity Increase from 10,000cfs to 15,000cfs				
[1] Canal Station (x100ft)	[2] Step Length (ft)	[3] Mid-Point Station (x100ft)	[4] Mid-Point Ground Elev. (ft)	[5] Mid-Point Canal Invert El. (ft)	[6] Ground To Invert Depth (ft)	[7] Scraper Excav Volume $V_{scraper}$ (cy)	[8] Dragline Excav Volume $V_{dragline}$ (cy)	[9] Total Excav Volume V_{ex} (cy)	[10] Total Embank Volume V_{em} (cy)	[11] Net Disposal Volume V_{dis} (cy)	[12] Scraper Excav Volume $V_{scraper}$ (cy)	[13] Dragline Excav Volume $V_{dragline}$ (cy)	[14] Total Excav Volume V_{ex} (cy)	[15] Total Embank Volume V_{em} (cy)	[16] Net Disposal Volume V_{dis} (cy)	[17] Scraper Volume Diff. $V_{scraper,diff}$ (cy)	[18] Dragline Volume Diff. $V_{dragline,diff}$ (cy)	[19] Total Excav Diff. V_{ex} (cy)	[20] Total Embank Diff. V_{dis} (cy)	[21] Disposal Volume Diff. V_{diff} (cy)
440	1000.0	445	0.00	-24.24	24.24	42,916	209,454	252,371	5,241	247,129	58,472	319,424	377,895	5,241	372,654	15,556	109,969	125,525	0	125,525
450	1000.0	455	-0.45	-24.26	23.81	42,269	204,031	246,300	6,416	239,884	57,825	311,890	369,715	6,416	363,299	15,556	107,859	123,415	0	123,415
460	1000.0	465	4.37	-24.28	28.65	46,823	273,562	320,385	0	320,385	62,379	406,354	468,733	0	468,733	15,556	132,793	148,348	0	148,348
470	1000.0	475	2.79	-24.30	27.09	45,762	249,529	295,291	0	295,291	61,318	374,068	435,386	0	435,386	15,556	124,539	140,094	0	140,094
480	1000.0	485	2.32	-24.32	26.64	45,489	243,425	288,914	0	288,914	61,044	365,836	426,880	0	426,880	15,556	122,411	137,967	0	137,967
490	1000.0	495	2.95	-24.34	27.29	45,896	252,530	298,426	0	298,426	61,452	378,110	439,561	0	439,561	15,556	125,580	141,135	0	141,135
500	1000.0	505	3.00	-24.36	27.36	45,905	252,728	298,633	0	298,633	61,460	378,377	439,837	0	439,837	15,556	125,649	141,204	0	141,204
510	1000.0	515	3.00	-24.38	27.38	45,907	252,788	298,695	0	298,695	61,463	378,457	439,920	0	439,920	15,556	125,669	141,225	0	141,225
520	1000.0	525	2.73	-24.40	27.13	45,767	249,647	295,415	0	295,415	61,323	374,227	435,550	0	435,550	15,556	124,580	140,135	0	140,135
530	1000.0	535	2.44	-24.42	26.86	45,624	246,453	292,078	0	292,078	61,180	369,921	431,101	0	431,101	15,556	123,468	139,024	0	139,024
540	1100.0	546	2.13	-24.44	26.57	49,909	264,948	314,856	164	314,693	67,020	398,612	465,632	164	465,468	17,111	133,664	150,775	0	150,775
551	900.0	556	2.55	-24.46	27.01				0					0		0	0	0	0	0
560	1000.0	565	3.00	-24.48	27.48				0					0		0	0	0	0	0
570	1000.0	575	3.00	-24.50	27.50				0					0		0	0	0	0	0
580	1000.0	585	3.00	-24.52	27.52				0					0		0	0	0	0	0
590	1000.0	595	3.00	-24.54	27.54				0					0		0	0	0	0	0
600	1000.0	605	3.00	-24.56	27.56				0					0		0	0	0	0	0
610	600.0	613	3.00	-24.58	27.58				0					0		0	0	0	0	0
619	900.0	621	3.00	-24.59	27.59	41,438	230,235	271,672	0	271,672	55,438	344,280	399,717	0	399,717	14,000	114,045	128,045	0	128,045
625	0.0																			
Beaver Slough Siphon																				
629	100.0	630	2.10	-25.10	27.20	4,588	25,225	29,814	0	29,814	6,144	37,774	43,918	0	43,918	1,556	12,548	14,104	0	14,104
630	1000.0	635	1.50	-25.11	26.61	45,485	243,344	288,829	0	288,829	61,040	365,727	426,768	0	426,768	15,556	122,383	137,938	0	137,938
640	1000.0	645	0.50	-25.13	25.63	44,672	228,826	273,498	1,767	271,731	60,228	346,042	406,269	1,767	404,502	15,556	117,216	132,771	0	132,771
650	1000.0	655	0.00	-25.15	25.15	44,035	220,695	264,730	3,096	261,633	59,590	334,921	394,511	3,096	391,415	15,556	114,226	129,782	0	129,782
660	1000.0	665	0.00	-25.16	25.16	44,039	220,743	264,782	3,088	261,694	59,594	334,987	394,581	3,088	391,493	15,556	114,244	129,799	0	129,799
670	1000.0	675	0.00	-25.18	25.18	44,043	220,791	264,834	3,080	261,754	59,598	335,053	394,652	3,080	391,572	15,556	114,262	129,817	0	129,817
680	1000.0	685	0.29	-25.20	25.48	44,477	226,138	270,615	2,187	268,428	60,032	342,373	402,406	2,187	400,218	15,556	116,235	131,791	0	131,791
690	1000.0	695	0.57	-25.22	25.79	44,703	229,278	273,980	1,700	272,280	60,258	346,657	406,915	1,700	405,215	15,556	117,379	132,935	0	132,935
700	1000.0	705	0.86	-25.23	26.09	45,052	234,760	279,812	909	278,903	60,607	354,113	414,720	909	413,811	15,556	119,352	134,908	0	134,908
710	1000.0	715	1.00	-25.25	26.25	45,207	237,559	282,766	535	282,232	60,763	357,907	418,670	535	418,135	15,556	120,348	135,904	0	135,904
720	1000.0	725	1.00	-25.27	26.27	45,210	237,609	282,819	528	282,291	60,766	357,975	418,741	528	418,213	15,556	120,366	135,922	0	135,922
730	1000.0	735	1.00	-25.28	26.28	45,213	237,660	282,873	522	282,351	60,768	358,044	418,812	522	418,290	15,556	120,384	135,939	0	135,939
740	400.0	742	1.06	-25.30	26.35	18,089	95,145	113,234	198	113,036	24,311	143,328	167,639	198	167,441	6,222	48,182	54,404	0	54,404
744	0.0																			
Hog Slough Siphon																				
748	200.0	749	1.26	-25.50	26.76	9,101	48,756	57,856	0	57,856	12,212	73,262	85,474	0	85,474	3,111	24,507	27,618	0	27,618
750	1000.0	755	1.43	-25.51	26.93	45,635	246,680	292,315	0	292,315	61,190	370,227	431,418	0	431,418	15,556	123,547	139,103	0	139,103
760	1000.0	765	1.71	-25.52	27.23	45,887	252,334	298,221	0	298,221	61,443	377,846	439,288	0	439,288	15,556	125,512	141,068	0	141,068
770	1000.0	775	2.00	-25.52	27.52	46,033	255,615	301,648	0	301,648	61,589	382,262	443,851	0	443,851	15,556	126,647	142,203	0	142,203
780	1000.0	785	2.00	-25.53	27.53	46,034	255,642	301,676	0	301,676	61,590	382,298	443,888	0	443,888	15,556	126,656	142,212	0	142,212
790	1000.0	795	2.00	-25.54	27.54	46,036	255,669	301,704	0	301,704	61,591	382,334	443,926	0	443,926	15,556	126,666	142,221	0	142,221
800	1000.0	805	2.00	-25.55	27.55	46,037	255,695	301,732	0	301,732	61,592	382,370	443,963	0	443,963	15,556	126,675	142,231	0	142,231
810	1000.0	815	2.13	-25.56	27.68	46,161	258,503	304,665	0	304,665	61,717	386,147	447,864	0	447,864	15,556	127,644	143,199	0	143,199
820	1000.0	825	2.38	-25.57	27.94	46,302	261,697	307,999	0	307,999	61,858	390,438	452,296	0	452,296	15,556	128,742	144,297	0	144,297
830	1000.0	835	2.63	-25.58	28.20	46,550	267,326	313,876	0	313,876	62,106	397,995	460,101	0	460,101	15,556	130,669	146,225	0	146,225
840	1000.0	845	2.88	-25.59	28.46	46,692	270,547	317,238	0	317,238	62,247	402,314	464,561	0	464,561	15,556	131,768	147,323	0	147,323
850	1000.0	855	3.00	-25.60	28.60	46,709	270,955	317,664	0	317,664	62,265	402,861	465,126	0	465,126	15,556	131,906	147,462	0	147,462
860	1000.0	865	3.00	-25.60	28.60	46,817	273,422	320,240	0	320,240	62,373	406,168	468,540	0	468,540	15,556	132,745	148,301	0	148,301
870	1000.0	875	3.00	-25.61	28.61	46,818	273,450	320,268	0	320,268	62,374	406,204	468,578	0	468,578	15,556	132,755	148,310	0	148,310
880	1400.0	887	3.00	-25.62	28.62	65,548	382,875	448,423	0	448,423	87,326	568,747	656,073	0	656,073	21,778	185,872	207,650	0	207,650

Table A-6, Canal Route #1 Quantity Calculation (Sacramento River to Disappointment Slough)

Canal Profile						Route #1, 10,000cfs Bottom width = 200ft					Route #1, 15,000cfs Bottom width = 340ft					Excavation and Embankment Quantity Increase from 10,000cfs to 15,000cfs				
[1] Canal Station (x100ft)	[2] Step Length (ft)	[3] Mid-Point Station (x100ft)	[4] Mid-Point Ground Elev. (ft)	[5] Mid-Point Canal Invert El. (ft)	[6] Ground To Invert Depth (ft)	[7] Scraper Excav Volume $V_{scraper}$ (cy)	[8] Dragline Excav Volume $V_{dragline}$ (cy)	[9] Total Excav Volume V_{ex} (cy)	[10] Total Embank Volume V_{em} (cy)	[11] Net Disposal Volume V_{dis} (cy)	[12] Scraper Excav Volume $V_{scraper}$ (cy)	[13] Dragline Excav Volume $V_{dragline}$ (cy)	[14] Total Excav Volume V_{ex} (cy)	[15] Total Embank Volume V_{em} (cy)	[16] Net Disposal Volume V_{dis} (cy)	[17] Scraper Volume Diff. $V_{scraper,diff}$ (cy)	[18] Dragline Volume Diff. $V_{dragline,diff}$ (cy)	[19] Total Excav Diff. V_{ex} (cy)	[20] Total Embank Diff. V_{dis} (cy)	[21] Disposal Volume Diff. V_{diff} (cy)
[illegible]	600.0	897	3.00	-25.63	28.63				0					0		0	0	0	0	0
[illegible]	1000.0	905	3.25	-25.64	28.89				0					0		0	0	0	0	0
[illegible]	1000.0	915	3.75	-25.65	29.40				0					0		0	0	0	0	0
[illegible]	1200.0	926	4.00	-25.66	29.66				0					0		0	0	0	0	0
[illegible]	500.0	935	4.00	-25.67	29.67	23,746	144,499	168,245	0	168,245	31,524	213,497	245,021	0	245,021	7,778	68,997	76,775	0	76,775
[illegible]	1300.0	944	4.00	-25.67	29.67				0					0		0	0	0	0	0
[illegible]	1000.0	955	4.00	-25.68	29.68				0					0		0	0	0	0	0
[illegible]	1200.0	966	3.84	-25.69	29.54				0					0		0	0	0	0	0
[illegible]	800.0	976	3.34	-25.70	29.05	37,672	223,743	261,414	0	261,414	50,116	331,633	381,749	0	381,749	12,444	107,890	120,335	0	120,335
980	600.0	983	3.00	-25.71	28.71	28,099	164,247	192,346	0	192,346	37,432	243,960	281,392	0	281,392	9,333	79,713	89,046	0	89,046
[illegible]	2100.0	997	3.00	-25.72	28.72				0					0		0	0	0	0	0
[illegible]	200.0	1008	2.74	-25.73	28.48	9,339	54,118	63,456	0	63,456	12,450	80,474	92,924	0	92,924	3,111	26,356	29,467	0	29,467
[illegible]	1100.0	1015	2.42	-25.74	28.16				0					0		0	0	0	0	0
[illegible]	1000.0	1025	2.11	-25.75	27.85				0					0		0	0	0	0	0
[illegible]	1300.0	1037	2.68	-25.76	28.44				0					0		0	0	0	0	0
[illegible]	200.0	1044	3.00	-25.76	28.76	9,368	54,782	64,150	0	64,150	12,479	81,364	93,843	0	93,843	3,111	26,582	29,693	0	29,693
[illegible]	1200.0	1051	3.00	-25.77	28.77				0					0		0	0	0	0	0
[illegible]	1300.0	1064	3.00	-25.78	28.78	60,893	356,154	417,047	0	417,047	81,115	528,962	610,077	0	610,077	20,222	172,808	193,030	0	193,030
1070	1000.0	1075	3.00	-25.79	28.79	46,842	273,996	320,838	0	320,838	62,398	406,936	469,333	0	469,333	15,556	132,940	148,495	0	148,495
1080	400.0	1082	3.00	-25.80	28.80	18,737	109,606	128,343	0	128,343	24,959	162,784	187,744	0	187,744	6,222	53,179	59,401	0	59,401
1084	0.0																			
White Slough Control Structure and Siphon																				
1085	200.0	1089	2.69	-26.10	28.80	9,369	54,801	64,170	0	64,170	12,480	81,390	93,869	0	93,869	3,111	26,589	29,700	0	29,700
1090	1000.0	1095	2.39	-26.11	28.51	46,698	270,687	317,384	0	317,384	62,253	402,502	464,755	0	464,755	15,556	131,815	147,371	0	147,371
1100	1000.0	1105	2.00	-26.14	28.14	46,435	264,696	311,131	0	311,131	61,990	394,466	456,456	0	456,456	15,556	129,770	145,326	0	145,326
1110	1000.0	1115	2.21	-26.16	28.37	46,573	267,835	314,408	0	314,408	62,128	398,678	460,807	0	460,807	15,556	130,843	146,399	0	146,399
1120	1000.0	1125	2.79	-26.18	28.96	46,972	276,968	323,940	0	323,940	62,527	410,915	473,442	0	473,442	15,556	133,947	149,502	0	149,502
1130	1000.0	1135	2.00	-26.20	28.20	46,443	264,885	311,328	0	311,328	61,999	394,720	456,719	0	456,719	15,556	129,835	145,390	0	145,390
1140	1000.0	1145	2.00	-26.51	28.51	46,699	270,709	317,408	0	317,408	62,254	402,532	464,786	0	464,786	15,556	131,823	147,378	0	147,378
1150	1000.0	1155	2.00	-26.54	28.54	46,703	270,800	317,502	0	317,502	62,258	402,653	464,911	0	464,911	15,556	131,854	147,409	0	147,409
1160	1000.0	1165	2.00	-26.57	28.57	46,707	270,890	317,597	0	317,597	62,262	402,775	465,037	0	465,037	15,556	131,884	147,440	0	147,440
1170	1000.0	1175	2.00	-26.60	28.60	46,817	273,421	320,238	0	320,238	62,373	406,166	468,538	0	468,538	15,556	132,745	148,300	0	148,300
1180	1000.0	1185	2.00	-26.63	28.63	46,821	273,512	320,333	0	320,333	62,377	406,287	468,664	0	468,664	15,556	132,776	148,331	0	148,331
1190	1000.0	1195	2.00	-26.66	28.66	46,825	273,602	320,428	0	320,428	62,381	406,409	468,790	0	468,790	15,556	132,806	148,362	0	148,362
1200	1000.0	1205	1.89	-26.69	28.59	46,708	270,926	317,634	0	317,634	62,264	402,823	465,086	0	465,086	15,556	131,897	147,452	0	147,452
1210	1000.0	1215	1.39	-26.72	28.12	46,432	264,636	311,068	0	311,068	61,988	394,386	456,374	0	456,374	15,556	129,750	145,305	0	145,305
1220	1000.0	1225	0.89	-26.75	27.65	46,156	258,385	304,541	0	304,541	61,712	385,987	447,699	0	447,699	15,556	127,603	143,158	0	143,158
1230	1000.0	1235	0.39	-26.78	27.18	45,773	249,781	295,554	0	295,554	61,329	374,407	435,736	0	435,736	15,556	124,626	140,182	0	140,182
1240	100.0	1241	0.12	-26.80	26.92	4,563	24,663	29,226	0	29,226	6,119	37,015	43,134	0	43,134	1,556	12,353	13,908	0	13,908
1241	0.0																			
Disappointment Slough Siphon																				
Total	120,400					4,479,501	24,339,999	28,819,500	65,266	28,754,234	6,007,056	36,505,107	42,512,163	65,266	42,446,897	1,527,556	12,165,107	13,692,663	0	13,692,663
Max					29.7															
Min					23.8															

Column Notes:

[1] Canal stations Siphon locations at 100ft increments.

[2] Canal length between calculation stations = Next Row in Coln [1] - Current Row in Coln [1].

[3] Midpoint stations between adjacent calculation stations.

[4] Ground elevation at midpoint station.

[5] Canal invert elevation at midpoint.

Table A-6, Canal Route #1 Quantity Calculation (Sacramento River to Disappointment Slough)

Canal Profile						Route #1, 10,000cfs Bottom width = 200ft					Route #1, 15,000cfs Bottom width = 340ft					Excavation and Embankment Quantity Increase from 10,000cfs to 15,000cfs				
[1] Canal Station (x100ft)	[2] Step Length (ft)	[3] Mid-Point Station (x100ft)	[4] Mid-Point Ground Elev. (ft)	[5] Mid-Point Canal Invert EL (ft)	[6] Ground To Invert Depth (ft)	[7] Scraper Excav Volume $V_{scraper}$ (cy)	[8] Dragline Excav Volume $V_{dragline}$ (cy)	[9] Total Excav Volume V_{ex} (cy)	[10] Total Embank Volume V_{em} (cy)	[11] Net Disposal Volume V_{dis} (cy)	[12] Scraper Excav Volume $V_{scraper}$ (cy)	[13] Dragline Excav Volume $V_{dragline}$ (cy)	[14] Total Excav Volume V_{ex} (cy)	[15] Total Embank Volume V_{em} (cy)	[16] Net Disposal Volume V_{dis} (cy)	[17] Scraper Volume Diff. $V_{scraper,diff}$ (cy)	[18] Dragline Volume Diff. $V_{dragline,diff}$ (cy)	[19] Total Excav Diff. V_{ex} (cy)	[20] Total Embank Diff. V_{dis} (cy)	[21] Disposal Volume Diff. V_{diff} (cy)

[6] Gound to invert depth = Coln [4] - Coln [5].
[7] 10,000cfs Canal, volume of excavation of the top 3 ft by scraper, interpolated from Cut-Fill Calc Table using Ground to Invert Depth from Coln [6].
[8] 10,000cfs Canal, volume of excavation from 3 ft below ground surface down to invert , by dragline, interpolated from Cut-Fill Calc Table using Grd to Invert Depth from Coln [6].
[9] 10,000cfs Canal, total excavation volume = Coln [7] + Coln [8].
[10] 10,000cfs Canal, required fill volume for canal embankments, interpolated from Cut-Fill Calc Table using Grd to Invert Depth from Coln [6].
[11] 10,000cfs Canal, net disposal volume = Coln [9] - Coln [10].
[12] 15,000cfs Canal, volume of excavation of the top 3 ft by scraper, interpolated from Cut-Fill Calc Table using Grd to Invert Depth from Coln [6].
[13] 15,000cfs Canal, volume of excavation from 3 ft below ground surface down to invert, by dragline, interpolated from Cut-Fill Calc Table using Grd to Invert Depth from Coln [6].
[14] 15,000cfs Canal, total excavation volume = Coln [12] + Coln [13]
[15] 15,000cfs Canal, required fill volume for canal embankments , interpolated from Cut-Fill Calc Table using Grd to Invert Depth from Coln [6].
[16] 15,000cfs Canal, net disposal volume = Coln [14] - Coln [15]
[17] Difference in scraper excavation volume (10,000cfs and 15,000cfs canals) = Coln [12] - Coln [7]
[18] Difference in dragline excavation volume (10,000cfs and 15,000cfs canals) = Coln [13] - Coln [8]
[19] Difference in total excavation volume (10,000cfs and 15,000cfs canals) = Coln [14] - Coln [9]
[20] Difference in embankment volume (10,000cfs and 15,000cfs canals) = Coln [15] - Coln [10]
[21] Difference in net disposal volume (10,000cfs and 15,000cfs canals) = Coln [16] - Coln [11]

Table A-7, Canal Route #1 Quantity Calculation (Disappointment Slough to Old River)

Canal Profile						Route #1, 10,000cfs Bottom width = 200ft							Route #1, 15,000cfs Bottom width = 340ft							Excavation and Embankment Quantity Increase from 10,000cfs to 15,000cfs						
[1] Canal Station (x1000)	[2] Step Length (ft)	[3] Mid-Point Station (x1000)	[4] Mid-Point Ground Elev. (ft)	[5] Mid-Point Canal Invert El. (ft)	[6] Ground To Invert Depth (ft)	[7] Hydraulic Excav Volume $V_{Hydraulic}$ (cy)	[8] Scraper Excav Volume $V_{scraper}$ (cy)	[9] Dragline Excav Volume $V_{dragline}$ (cy)	[10] Total Excav Volume V_{ex} (cy)	[11] Local Embank Volume V_{em} (cy)	[12] Import Embank Volume V_{im} (cy)	[13] Net Disposal Volume V_{dis} (cy)	[14] Hydraulic Excav Volume $V_{Hydraulic}$ (cy)	[15] Scraper Excav Volume $V_{scraper}$ (cy)	[16] Dragline Excav Volume $V_{dragline}$ (cy)	[17] Total Excav Volume V_{ex} (cy)	[18] Local Embank Volume V_{em} (cy)	[19] Import Embank Volume V_{im} (cy)	[20] Net Disposal Volume V_{dis} (cy)	[21] Hydraulic Volume Diff. $V_{Hydraulic,diff}$ (cy)	[22] Scraper Volume Diff. $V_{scraper,diff}$ (cy)	[23] Dragline Volume Diff. $V_{dragline,diff}$ (cy)	[24] Total Excav Diff. V_{ex} (cy)	[25] Local Embank Diff. V_{em} (cy)	[26] Import Embank Diff. V_{im} (cy)	[27] Disposal Volume Diff. V_{dif} (cy)
Disappointment Slough Siphon																										
1245	400.0	1248	-0.51	-27.30	26.79	30,815	12,540	97,546	140,902	7,407	17,744	133,494	30,815	16,783	148,572	196,150	7,407	17,744	188,742	0	6,222	49,026	55,248	0	0	55,248
1255	1000.0	1255	-1.21	-27.31	26.09	79,176	31,716	234,771	345,663	18,519	48,230	327,143	79,176	47,272	354,127	480,575	18,519	48,230	462,057	0	15,556	119,356	134,912	0	0	134,912
1265	1000.0	1265	-2.00	-27.32	25.32	82,712	32,088	223,407	338,207	18,519	54,651	319,688	82,712	47,643	338,639	468,994	18,519	54,651	450,475	0	15,556	115,231	130,787	0	0	130,787
1275	1000.0	1275	-2.00	-27.32	25.32	82,704	32,087	223,431	338,222	18,519	54,637	319,704	82,704	47,643	338,671	469,018	18,519	54,637	450,500	0	15,556	115,240	130,796	0	0	130,796
1285	1000.0	1285	-2.00	-27.33	25.33	82,697	32,086	223,455	338,238	18,519	54,623	319,719	82,697	47,642	338,704	469,042	18,519	54,623	450,524	0	15,556	115,249	130,804	0	0	130,804
1295	1000.0	1295	-2.00	-27.34	25.34	82,689	32,086	223,479	338,253	18,519	54,610	319,735	82,689	47,641	338,736	469,067	18,519	54,610	450,548	0	15,556	115,258	130,813	0	0	130,813
1305	1000.0	1305	-2.11	-27.35	25.24	82,777	32,094	223,200	338,071	18,519	54,773	319,553	82,777	47,649	338,356	468,782	18,519	54,773	450,264	0	15,556	115,155	130,711	0	0	130,711
1315	1000.0	1315	-2.81	-27.36	24.75	85,347	32,298	215,161	332,816	18,519	59,697	314,298	85,347	47,844	327,337	460,529	18,519	59,697	442,010	0	15,556	112,157	127,712	0	0	127,712
1325	1000.0	1325	-3.11	-27.37	24.26	87,206	32,391	209,502	329,099	18,519	63,389	310,581	87,206	47,946	319,489	454,642	18,519	63,389	436,124	0	15,556	109,988	125,543	0	0	125,543
1335	1000.0	1335	-3.61	-27.37	23.77	89,777	32,479	201,824	324,079	18,519	68,677	305,561	89,777	48,034	306,813	446,624	18,519	68,677	428,105	0	15,556	106,969	122,544	0	0	122,544
1345	1000.0	1345	-4.00	-27.38	23.38	91,541	32,503	196,668	320,712	18,519	72,427	302,194	91,541	48,099	301,599	441,199	18,519	72,427	422,880	0	15,556	104,931	120,486	0	0	120,486
1355	1000.0	1355	-4.00	-27.39	23.39	91,533	32,503	196,690	320,727	18,519	72,411	302,208	91,533	48,099	301,629	441,222	18,519	72,411	422,703	0	15,556	104,938	120,495	0	0	120,495
1365	500.0	1363	-4.00	-27.40	23.40	45,764	16,252	88,353	150,369	9,259	36,200	151,109	45,764	24,029	155,836	225,629	9,259	36,200	211,360	0	7,778	67,473	60,251	0	0	60,251
1365	0.0																									
Fourteenmile Slough Siphon																										
1377	900.0	1376	-4.00	-28.11	24.11	79,248	29,184	166,262	294,692	18,667	58,593	276,025	79,248	43,184	284,364	406,794	18,667	58,593	390,127	0	14,000	98,102	112,102	0	0	112,102
1385	1000.0	1385	-4.00	-28.13	24.13	88,033	32,426	207,011	327,470	18,519	65,068	308,951	88,033	47,981	316,033	452,048	18,519	65,068	433,530	0	15,556	109,023	124,578	0	0	124,578
1395	1000.0	1395	-4.00	-28.15	24.15	88,015	32,425	207,066	327,506	18,519	65,030	308,988	88,015	47,981	316,111	452,106	18,519	65,030	433,588	0	15,556	109,044	124,600	0	0	124,600
1405	1000.0	1405	-4.00	-28.17	24.17	87,996	32,424	207,122	327,543	18,519	64,992	309,024	87,996	47,980	316,186	452,164	18,519	64,992	433,646	0	15,556	109,066	124,622	0	0	124,622
1415	1000.0	1415	-4.00	-28.19	24.19	87,978	32,423	207,176	327,579	18,519	64,955	309,061	87,978	47,979	316,266	452,222	18,519	64,955	433,704	0	15,556	109,088	124,643	0	0	124,643
1425	1000.0	1425	-4.00	-28.21	24.21	87,248	32,393	209,375	329,016	18,519	63,473	310,498	87,248	47,948	319,314	454,511	18,519	63,473	435,982	0	15,556	109,939	125,494	0	0	125,494
1435	1000.0	1435	-4.00	-28.23	24.23	87,230	32,392	209,432	329,053	18,519	63,436	310,535	87,230	47,948	319,392	454,569	18,519	63,436	436,051	0	15,556	109,960	125,516	0	0	125,516
1445	1000.0	1445	-4.00	-28.25	24.25	87,211	32,391	209,488	329,090	18,519	63,399	310,572	87,211	47,947	319,470	454,628	18,519	63,399	436,109	0	15,556	109,982	125,538	0	0	125,538
1455	1000.0	1455	-4.00	-28.26	24.26	87,193	32,390	209,544	329,127	18,519	63,361	310,608	87,193	47,946	319,548	454,686	18,519	63,361	436,168	0	15,556	110,004	125,559	0	0	125,559
1465	700.0	1464	-4.00	-28.29	24.29	61,024	22,673	146,714	230,411	12,963	44,331	217,448	61,024	33,561	223,730	318,315	12,963	44,331	305,352	0	10,889	77,015	87,904	0	0	87,904
1467	0.0																									
San Joaquin River Control Structure and Siphon																										
1478	500.0	1478	-4.00	-29.00	25.00	41,850	16,086	110,148	168,084	9,259	28,258	158,824	41,850	23,863	157,187	232,900	9,259	28,258	223,641	0	7,778	57,039	64,817	0	0	64,817
1485	1000.0	1485	-4.21	-29.02	24.80	84,592	32,238	217,517	334,346	18,519	58,227	315,828	84,592	47,793	330,555	462,940	18,519	58,227	444,422	0	15,556	113,038	128,594	0	0	128,594
1495	1000.0	1495	-3.93	-29.03	25.10	83,615	32,164	220,565	336,344	18,519	56,355	317,825	83,615	47,719	334,743	466,077	18,519	56,355	447,559	0	15,556	114,179	129,734	0	0	129,734
1505	1000.0	1505	-0.75	-29.05	28.30	77,037	30,627	267,610	375,274	18,519	42,582	356,755	77,037	46,182	398,377	521,596	18,519	42,582	503,078	0	15,556	130,796	146,322	0	0	146,322
1515	1000.0	1515	-4.25	-29.06	24.81	84,583	32,237	217,545	334,365	18,519	58,209	315,846	84,583	47,793	330,594	462,969	18,519	58,209	444,451	0	15,556	113,049	128,604	0	0	128,604
1525	1000.0	1525	-4.79	-29.08	22.29	90,069	32,433	183,662	312,364	18,519	62,506	293,845	90,069	47,999	283,510	427,568	18,519	62,506	409,049	0	15,556	99,648	115,204	0	0	115,204
1535	1000.0	1535	-5.79	-29.09	23.30	91,811	32,504	196,405	320,580	18,519	72,577	302,061	91,811	48,059	301,314	440,984	18,519	72,577	422,466	0	15,556	104,849	120,405	0	0	120,405
1545	1000.0	1545	-5.00	-29.11	24.11	88,054	32,427	206,948	327,429	18,519	65,110	308,910	88,054	47,982	315,946	451,982	18,519	65,110	433,464	0	15,556	108,998	124,554	0	0	124,554
1555	1000.0	1555	-5.00	-29.12	24.12	88,041	32,426	206,988	327,455	18,519	65,083	308,936	88,041	47,982	316,000	452,025	18,519	65,083	433,506	0	15,556	109,014	124,570	0	0	124,570
1565	1000.0	1565	-5.00	-29.14	24.14	88,027	32,426	207,028	327,481	18,519	65,056	308,963	88,027	47,981	316,058	452,067	18,519	65,056	433,548	0	15,556	109,030	124,585	0	0	124,585
1575	1000.0	1575	-5.00	-29.15	24.15	88,014	32,425	207,069	327,508	18,519	65,029	308,989	88,014	47,981	316,114	452,109	18,519	65,029	433,590	0	15,556	109,045	124,601	0	0	124,601
1585	1000.0	1585	-5.00	-29.17	24.17	88,001	32,424	207,109	327,534	18,519	65,001	309,016	88,001	47,980	316,170	452,151	18,519	65,001	433,632	0	15,556	109,061	124,617	0	0	124,617
1595	1000.0	1595	-5.00	-29.18	24.18	87,987	32,424	207,149	327,561	18,519	64,974	309,042	87,987	47,979	316,225	452,193	18,519	64,974	433,674	0	15,556	109,077	124,632	0	0	124,632
1605	1000.0	1605	-5.32	-29.20	23.88	88,970	32,458	204,211	325,639	18,519	66,995	307,121	88,970	48,014	312,141	449,125	18,519	66,995	430,606	0	15,556	107,930	123,485	0	0	123,485
1615	1000.0	1615	-6.82	-29.21	22.39	95,979	32,436	184,110	312,525	18,519	82,301	294,007	95,979	47,992	283,863	427,834	18,519	82,301	409,315	0	15,556	99,753	115,308	0	0	115,308
1625	1000.0	1625	-7.89	-29.23	21.33	100,474	32,154	171,993	304,622	18,519	92,915	286,103	100,474	47,710	266,502	414,686	18,519	92,915	396,167	0	15,556	94,509	110,064	0	0	110,064
1635	1000.0	1635	-7.39	-29.24	21.85	97,883	32,351	176,903	309,137	18,519	86,728	290,619	97,883	47,957	279,435	422,224	18,519	86,728	403,706	0	15,556	97,532	113,087	0	0	113,087
1645	1000.0	1645	-6.79	-29.26	22.47	95,197	32,462	186,280	313,939	18,519	80,514	295,420	95,197	48,017	286,946	430,160	18,519	80,514	411,641	0	15,556	100,666	116,221	0	0	116,221
1655	1000.0	1655	-5.79	-29.27	23.49	90,739	32,499	199,000	322,255	18,519	70,709	303,716	90,739	48,052	304,667	443,657	18,519	70,709	425,138	0	15,556	105,866	121,422	0	0	121,422
1665	1000.0	1665	-5.00	-29.29	24.29	87,182	32,390	209,576	329,147	18,519	63,341	310,629	87,182	47,945	319,591	454,719	18,519	63,341	436,200	0	15,556	110,016	125,571	0	0	125,571
1675	1000.0	1675	-5.00	-29.30	24.30	87,169	32,388	209,618	329,174	18,519	63,314	310,658	87,169	47,943	319,648	454,761	18,519	63,314	436,243	0	15,556	110,031	125,587	0	0	125,587
1685	1000.0	1685	-5.00	-29.32	24.32	87,155	32,388	209,657	329,201	18,519	63,287	310,682	87,155	47,944	319,704	454,803	18,519	63,287	436,285	0	15,556	110,047	125,603	0	0	125,603
1695	1000.0	1695	-5.00	-29.33	24.33	87,142	32,388	209,698	329,227	18,519	63,260	310,709	87,142	47,943	319,760	454,846	18,519	63,260	436,327	0	15,556	110,063	125,618	0	0	125,618
1705	1000.0	1705	-5.00	-29.35	24.35	87,129	32,387	209,738	329,254	18,519	63,233	310,736	87,129	47,943	319,817	454,888	18,519	63,233	436,369	0	15,556	110,078	125,634	0	0	125,634
1715	1000.0	1715	-5.00	-29.36	24.36	87,115	32,386	209,779	329,281	18,519	63,206	310,762	87,115	47,942	319,873	454,930	18,519	63,206	436,412	0	15,556	110,094	125,650	0	0	125,650
1725	1000.0	1725	-5.00	-29.38	24.38	87,102	32,386	209,820	329,307	18,519	63,180	310,789	87,102	47,941	319,930	454,973	18,519	63,180	436,454	0	15,556	110,110	125,665	0	0	125,665
1735	1000.0	1735	-5.00	-29.39	24.39	87,088	32,385	209,861	329,334	18,519	63,153	310,816	87,088	47,941	319,986	455,015	18,519	63,153	436,496	0	15,556	110,125	125,681	0	0	125,681
1745	1000.0	1745	-5.00	-29.41	24.41	86,364	32,349	212,062	330,774	18,519	61,701	312,256	86,364	47,904	323,032	457,301	18,519	61,701	438,782	0	15,556	110,971	126,526	0	0	126,526
1755	1000.0	1755	-5.00	-29.42	24.42	86,350	32,348	212,103	330,801	18,519	61,675	312,283	86,350	47,903	323,089	457,343	18,519	61,675	438,825	0	15,556	110,986	126,542	0	0	126,542
1765	1000.0	1765	-5.10	-29.44	24.34	87,137	32,387	209,713	329,237	18,519	63,250	310,719	87,137	47,943	319,781	454,861	18,519	63,250	436,343	0	15,556	110,069	125,624	0	0	125,624
1775	1000.0	1775	-5.30	-29.45	24.15	88,013	32,425	207,073	327,511	18,519	65,025	308,992	88,013	47,980	316,120	452,113	18,519	65,025	433,595	0	15,556	109,047	124,603	0	0	124,603
1785	1000.0	1785	-5.50	-29.47	23.97	88,888	32,455	204,457	325,800	18,519	66,825	307,281	88,888	48,011	312,883	449,391	18,519	66,825	430,863	0	15,556	108,026	123,581	0	0	123,581
1795	1000.0	1795	-5.70	-29.48	23.78	89,763	32,478	201,863	324,105	18,519	68,649	305,567	89,763	48,034	309,869	446,665	18,519	68,649	428,146	0	15,556	107,004	122,560	0	0	122,560
1805	1000.0	1805	-5.90	-29.50	23.60	90,639	32,494	199,293	322,426	18,519	70,498	303,907	90,639	48,050	305,276	443,964	18,519	70,498	425,446	0	15,556	105,983	121,539	0	0	121,539
1815	1000.0	1815	-5.68	-29.51	23.84	89,892	32,482	201,482	323,856	18,519	68,918	305,338	89,892	48,037	306,337	446,256	18,519	68,918	427,747	0	15,556	106,854	122,410	0	0	122,410
1825	1000.0	1825	-5.63	-29.53	23.90	88,945	32,457	204,285	325,688	18,519	66,943	307,169	88,945	48,013	312,244	449,202	18,519	66,943	430,084	0	15,556	107,959	123,514	0	0	123,514
1835	1000.0	1835	-5.38	-29.54	24.17	87,999	32,424	207,115	327,538	18,519	64,997	309,019	87,999	47,980	316,178	452,157	18,519	64,997	433,038	0	15,556	109,083	124,639	0	0	124,639
1845	1000.0	1845	-5.13	-29.56	24.43	86,341	32,347	212,132	330,621	18,519	61,856	312,302	86,341	47,903	323,130	457,374	18,519	61,856	438,855	0	15,556	110,997	126,553	0	0	126,553
1855	1000.0	1855	-4.92	-29.57	24.66	85,431	32,294	214,922	332,647	18,519	59,861	314,128	85,431	47,849	326,980	460,261	18,519	59,861	441,742	0	15,556	112,059	127,614	0	0	127,614

Table A-7, Canal Route #1 Quantity Calculation (Disappointment Slough to Old River)

Canal Profile						Route #1, 10,000cfs Bottom width = 200ft							Route #1, 15,000cfs Bottom width = 340ft							Excavation and Embankment Quantity Increase from 10,000cfs to 15,000cfs						
[1] Canal Station (x1000)	[2] Step Length (ft)	[3] Mid-Point Station (x1000)	[4] Mid-Point Ground Elev. (ft)	[5] Mid-Point Canal Invert El. (ft)	[6] Ground To Invert Depth (ft)	[7] Hydraulic Excav Volume $V_{hydraulic}$ (cy)	[8] Scraper Excav Volume $V_{scraper}$ (cy)	[9] Dragline Excav Volume $V_{dragline}$ (cy)	[10] Total Excav Volume V_{ex} (cy)	[11] Local Embank Volume V_{em} (cy)	[12] Import Embank Volume V_{im} (cy)	[13] Net Disposal Volume V_{dis} (cy)	[14] Hydraulic Excav Volume $V_{hydraulic}$ (cy)	[15] Scraper Excav Volume $V_{scraper}$ (cy)	[16] Dragline Excav Volume $V_{dragline}$ (cy)	[17] Total Excav Volume V_{ex} (cy)	[18] Local Embank Volume V_{em} (cy)	[19] Import Embank Volume V_{im} (cy)	[20] Net Disposal Volume V_{dis} (cy)	[21] Hydraulic Volume Diff. $V_{hydraulic,diff}$ (cy)	[22] Scraper Volume Diff. $V_{scraper,diff}$ (cy)	[23] Dragline Volume Diff. $V_{dragline,diff}$ (cy)	[24] Total Excav Diff. V_{ex} (cy)	[25] Local Embank Diff. V_{em} (cy)	[26] Import Embank Diff. V_{im} (cy)	[27] Disposal Volume Diff. V_{dis} (cy)
[illegible]	1000.0	1869	-4.75	-29.59	24.84	84,558	32,235	217,620	334,414	18,519	58,163	315,896	84,558	47,791	330,697	463,046	18,519	58,163	444,528	0	15,556	113,077	128,632	0	0	128,632
[illegible]	1000.0	1875	-4.58	-29.60	25.02	83,686	32,170	220,342	336,197	18,519	56,489	317,679	83,686	47,725	334,436	465,848	18,519	56,489	447,329	0	15,556	114,095	129,650	0	0	129,650
[illegible]	1000.0	1885	-4.42	-29.62	25.20	82,813	32,097	223,086	337,996	18,519	54,840	319,477	82,813	47,653	338,199	468,665	18,519	54,840	450,146	0	15,556	115,113	130,669	0	0	130,669
[illegible]	1000.0	1895	-4.25	-29.63	25.38	82,652	32,082	223,598	338,332	18,519	54,539	319,813	82,652	47,638	338,900	469,189	18,519	54,539	450,671	0	15,556	115,302	130,857	0	0	130,857
[illegible]	1000.0	1905	-4.08	-29.65	25.57	81,779	32,001	226,369	340,149	18,519	52,919	321,631	81,779	47,557	342,689	472,025	18,519	52,919	453,508	0	15,556	115,320	131,675	0	0	131,675
[illegible]	1000.0	1915	-4.20	-29.68	25.48	81,869	32,010	226,081	339,960	18,519	53,084	321,441	81,869	47,566	342,295	471,730	18,519	53,084	453,211	0	15,556	115,214	131,770	0	0	131,770
[illegible]	1000.0	1925	-4.60	-29.68	25.08	83,634	32,165	220,506	336,305	18,519	56,391	317,786	83,634	47,721	334,662	466,016	18,519	56,391	447,498	0	15,556	114,156	129,711	0	0	129,711
[illegible]	930.0	1935	-4.98	-29.69	24.71	76,843	29,061	193,569	299,474	16,667	53,787	282,807	76,843	43,061	284,475	414,379	16,667	53,787	397,713	0	14,000	100,906	114,906	0	0	114,906
[illegible]	0.0																									
Middle River Control Structure and Siphon																										
[illegible]	1000.0	1955	-10.13	-30.50	20.38	104,880	31,561	160,677	297,118	18,519	103,781	278,600	104,880	47,117	250,046	402,043	18,519	103,781	383,524	0	15,556	89,369	104,925	0	0	104,925
[illegible]	1000.0	1965	-10.38	-30.51	20.13	105,809	31,422	158,332	295,563	18,519	106,129	277,045	105,809	46,979	245,617	399,403	18,519	106,129	380,885	0	15,556	88,285	103,840	0	0	103,840
[illegible]	1000.0	1975	-10.63	-30.51	19.88	106,738	31,283	155,997	294,018	18,519	108,496	275,499	106,738	46,838	243,197	396,774	18,519	108,496	378,255	0	15,556	87,200	102,756	0	0	102,756
[illegible]	1000.0	1985	-10.88	-30.52	19.64	107,668	31,143	153,671	292,482	18,519	110,882	273,963	107,668	46,689	239,787	394,154	18,519	110,882	375,635	0	15,556	86,116	101,672	0	0	101,672
[illegible]	1000.0	1995	-10.92	-30.52	19.60	108,417	31,031	151,802	291,251	18,519	112,824	272,732	108,417	46,586	237,044	392,047	18,519	112,824	373,529	0	15,556	85,241	100,797	0	0	100,797
[illegible]	1000.0	2005	-10.77	-30.52	19.76	107,566	31,159	153,926	292,650	18,519	110,620	274,132	107,566	46,714	240,161	394,441	18,519	110,620	375,923	0	15,556	86,235	101,791	0	0	101,791
[illegible]	1000.0	2015	-10.62	-30.53	19.91	106,714	31,286	156,058	294,058	18,519	108,434	275,540	106,714	46,842	243,267	396,843	18,519	108,434	378,324	0	15,556	87,229	102,785	0	0	102,785
[illegible]	1000.0	2025	-10.48	-30.53	20.07	105,862	31,414	158,198	295,474	18,519	106,263	276,956	105,862	46,970	246,421	399,253	18,519	106,263	380,734	0	15,556	88,223	103,778	0	0	103,778
[illegible]	1000.0	2035	-10.31	-30.54	20.23	105,010	31,542	160,347	296,899	18,519	104,109	278,380	105,010	47,097	249,563	401,671	18,519	104,109	383,152	0	15,556	89,217	104,772	0	0	104,772
[illegible]	1000.0	2045	-10.15	-30.54	20.39	104,868	31,563	160,703	297,135	18,519	103,758	278,617	104,868	47,119	250,084	402,072	18,519	103,758	383,553	0	15,556	89,381	104,936	0	0	104,936
[illegible]	1000.0	2055	-10.00	-30.55	20.55	104,018	31,691	162,861	298,569	18,519	101,621	280,051	104,018	47,248	253,235	404,499	18,519	101,621	385,981	0	15,556	90,375	105,930	0	0	105,930
[illegible]	1000.0	2065	-10.25	-30.55	20.30	104,947	31,551	160,507	297,005	18,519	103,950	278,486	104,947	47,107	249,787	401,851	18,519	103,950	383,332	0	15,556	89,290	104,846	0	0	104,846
[illegible]	1000.0	2075	-10.75	-30.56	19.81	106,810	31,272	155,817	293,899	18,519	108,676	275,380	106,810	46,828	242,935	396,572	18,519	108,676	378,053	0	15,556	87,117	102,673	0	0	102,673
[illegible]	1000.0	2085	-10.83	-30.56	19.73	107,591	31,155	153,893	292,639	18,519	110,685	274,090	107,591	46,710	240,069	394,370	18,519	110,685	375,851	0	15,556	86,206	101,761	0	0	101,761
[illegible]	1000.0	2095	-10.90	-30.56	20.06	105,868	31,413	158,182	295,464	18,519	106,279	276,945	105,868	46,969	248,397	399,234	18,519	106,279	380,716	0	15,556	88,215	103,771	0	0	103,771
[illegible]	1000.0	2105	-10.17	-30.57	20.40	104,146	31,672	162,535	298,352	18,519	101,940	279,634	104,146	47,227	252,759	404,132	18,519	101,940	385,614	0	15,556	90,225	105,780	0	0	105,780
[illegible]	1000.0	2115	-10.00	-30.57	20.57	103,994	31,694	162,921	298,609	18,519	101,561	280,091	103,994	47,250	253,324	404,567	18,519	101,561	386,049	0	15,556	90,402	105,958	0	0	105,958
[illegible]	1000.0	2125	-10.00	-30.58	20.58	103,990	31,695	162,931	298,616	18,519	101,551	280,098	103,990	47,250	253,338	404,579	18,519	101,551	386,060	0	15,556	90,407	105,962	0	0	105,962
[illegible]	1000.0	2135	-10.00	-30.58	20.58	103,986	31,696	162,941	298,623	18,519	101,541	280,104	103,986	47,251	253,353	404,590	18,519	101,541	386,071	0	15,556	90,412	105,967	0	0	105,967
[illegible]	1000.0	2145	-10.00	-30.59	20.59	103,982	31,696	162,951	298,629	18,519	101,532	280,111	103,982	47,252	253,368	404,601	18,519	101,532	386,083	0	15,556	90,416	105,972	0	0	105,972
[illegible]	1000.0	2155	-10.00	-30.59	20.59	103,978	31,697	162,962	298,636	18,519	101,522	280,118	103,978	47,252	253,383	404,613	18,519	101,522	386,094	0	15,556	90,421	105,976	0	0	105,976
[illegible]	1000.0	2165	-10.00	-30.60	20.60	103,974	31,697	162,972	298,643	18,519	101,512	280,124	103,974	47,253	253,397	404,624	18,519	101,512	386,105	0	15,556	90,425	105,981	0	0	105,981
[illegible]	1000.0	2175	-10.00	-30.60	20.60	103,236	31,805	164,787	299,656	18,519	99,724	281,339	103,256	47,361	256,000	406,876	18,519	99,724	388,158	0	15,556	91,263	106,819	0	0	106,819
[illegible]	1000.0	2185	-8.00	-30.84	22.84	94,334	32,483	188,894	315,511	18,519	78,567	296,993	94,334	48,039	290,366	432,739	18,519	78,567	414,220	0	15,556	101,672	117,227	0	0	117,227
[illegible]	1000.0	2195	-6.00	-30.68	24.68	85,412	32,293	214,980	332,685	18,519	59,624	314,166	85,412	47,848	327,060	460,321	18,519	59,624	441,802	0	15,556	112,081	127,636	0	0	127,636
[illegible]	1000.0	2205	-5.00	-30.71	25.71	80,935	31,916	229,071	341,922	18,519	51,375	323,403	80,935	47,471	348,375	474,782	18,519	51,375	456,263	0	15,556	117,304	132,860	0	0	132,860
[illegible]	1000.0	2215	-5.00	-30.75	25.75	80,902	31,912	229,177	341,992	18,519	51,315	323,473	80,902	47,468	348,520	474,890	18,519	51,315	456,371	0	15,556	117,343	132,898	0	0	132,898
[illegible]	1000.0	2225	-5.00	-30.79	25.79	80,869	31,909	229,283	342,061	18,519	51,256	323,543	80,869	47,464	348,664	474,998	18,519	51,256	456,479	0	15,556	117,381	132,937	0	0	132,937
[illegible]	1000.0	2235	-5.00	-30.83	25.83	80,125	31,828	231,683	343,636	18,519	49,913	325,118	80,125	47,383	349,932	477,441	18,519	49,913	458,922	0	15,556	118,249	133,805	0	0	133,805
[illegible]	1000.0	2245	-5.00	-30.86	25.86	80,082	31,824	231,790	343,706	18,519	49,855	325,188	80,082	47,380	350,078	477,550	18,519	49,855	459,031	0	15,556	118,268	133,843	0	0	133,843
[illegible]	1000.0	2255	-5.00	-30.90	25.90	80,059	31,820	231,897	343,777	18,519	49,796	325,258	80,059	47,376	350,223	477,658	18,519	49,796	459,140	0	15,556	118,326	133,881	0	0	133,881
[illegible]	1000.0	2265	-5.00	-30.94	25.94	80,026	31,816	232,004	343,847	18,519	49,738	325,328	80,026	47,372	350,369	477,767	18,519	49,738	459,248	0	15,556	118,364	133,920	0	0	133,920
[illegible]	1000.0	2275	-5.00	-30.97	25.97	79,993	31,813	232,111	343,917	18,519	49,679	325,398	79,993	47,368	350,514	477,876	18,519	49,679	459,357	0	15,556	118,403	133,958	0	0	133,958
[illegible]	330.0	2291	-4.38	-31.00	26.62	15,407	6,274	46,674	70,356	3,704	8,881	66,652	15,407	9,385	73,153	97,946	3,704	8,881	94,242	0	3,111	24,478	27,590	0	0	27,590
[illegible]	0.0																									
Old River Siphon																										
Total	101,100					9,185,541	3,243,320	20,227,935	32,656,795	1,872,222	7,291,608	30,784,573	9,185,541	4,815,987	30,926,519	44,928,047	1,872,222	7,291,608	43,055,825	0	1,572,867	10,898,585	12,271,252	0	0	12,271,252
Max					29.3																					
Min					19.6																					

Column Notes:

[1] Canal stations Siphon locations at 100ft increments.

[2] Canal length between calculation stations = Next Row in Colin [1] - Current Row in Colin [1].

[3] Midpoint stations between adjacent calculation stations.

[4] Ground elevation at midpoint station.

[5] Canal invert elevation at midpoint.

[6] Gound to invert depth = Colin [4] - Colin [5].

[7] 10,000cfs Canal, volume of excavation by hydraulic excavators, interpolated from Cut-Fill Calc Table using Ground to Invert Depth from Colin [6].

[8] 10,000cfs Canal, volume of excavation of the top 3 ft by scraper, interpolated from Cut-Fill Calc Table using Ground to Invert Depth from Colin [6].

[9] 10,000cfs Canal, volume of excavation from 3 ft below ground surface down to invert , by dragline, interpolated from Cut-Fill Calc Table using Grd to Invert Depth from Colin [6].

[10] 10,000cfs Canal, total excavation volume = Colin [7] + Colin [8] + Colin [9].

[11] 10,000cfs Canal, local canal excavated volume used for canal embankments, interpolated from Cut-Fill Calc Table using Grd to Invert Depth from Colin [6].

[12] 10,000cfs Canal, imported soil volume used for canal embankments, interpolated from Cut-Fill Calc Table using Grd to Invert Depth from Colin [6].

[13] 10,000cfs Canal, net disposal volume = Colin [10] - Colin [11].

[14] 15,000cfs Canal, volume of excavation by hydraulic excavators, interpolated from Cut-Fill Calc Table using Ground to Invert Depth from Colin [6].

[15] 15,000cfs Canal, volume of excavation of the top 3 ft by scraper, interpolated from Cut-Fill Calc Table using Ground to Invert Depth from Colin [6].

[16] 15,000cfs Canal, volume of excavation from 3 ft below ground surface down to invert , by dragline, interpolated from Cut-Fill Calc Table using Grd to Invert Depth from Colin [6].

Table A-7, Canal Route #1 Quantity Calculation (Disappointment Slough to Old River)

Canal Profile						Route #1, 10,000cfs Bottom width = 200ft							Route #1, 15,000cfs Bottom width = 340ft							Excavation and Embankment Quantity Increase from 10,000cfs to 15,000cfs						
[1] Canal Station (x1000)	[2] Step Length (ft)	[3] Mid-Point Station (x1000)	[4] Mid-Point Ground Elev. (ft)	[5] Mid-Point Canal Invert EL (ft)	[6] Ground To Invert Depth (ft)	[7] Hydraulic Excav Volume $V_{Hydraulic}$ (cy)	[8] Scraper Excav Volume $V_{scraper}$ (cy)	[9] Dragline Excav Volume $V_{dragline}$ (cy)	[10] Total Excav Volume V_{ex} (cy)	[11] Local Embank Volume V_{em} (cy)	[12] Import Embank Volume V_{im} (cy)	[13] Net Disposal Volume V_{dis} (cy)	[14] Hydraulic Excav Volume $V_{Hydraulic}$ (cy)	[15] Scraper Excav Volume $V_{scraper}$ (cy)	[16] Dragline Excav Volume $V_{dragline}$ (cy)	[17] Total Excav Volume V_{ex} (cy)	[18] Local Embank Volume V_{em} (cy)	[19] Import Embank Volume V_{im} (cy)	[20] Net Disposal Volume V_{dis} (cy)	[21] Hydraulic Volume Diff. $V_{Hydraulic,Diff}$ (cy)	[22] Scraper Volume Diff. $V_{scraper,diff}$ (cy)	[23] Dragline Volume Diff. $V_{dragline,diff}$ (cy)	[24] Total Excav Diff. V_{ex} (cy)	[25] Local Embank Diff. V_{em} (cy)	[26] Import Embank Diff. V_{im} (cy)	[27] Disposal Volume Diff. V_{dis} (cy)

[17] 15,000cfs Canal, total excavation volume = Colin [14] + Colin [15] + Colin [16].
[18] 15,000cfs Canal, local canal excavated volume used for canal embankments, interpolated from Cut-Fill Calc Table using Grd to Invert Depth from Colin [6].
[19] 15,000cfs Canal, imported soil volume used for canal embankments, interpolated from Cut-Fill Calc Table using Grd to Invert Depth from Colin [6].
[20] 15,000cfs Canal, net disposal volume = Colin [17] - Colin [18].
[21] Difference in hydraulic excavation volume (10,000cfs and 15,000cfs canals) = Colin [14] - Colin [7]
[22] Difference in scraper excavation volume (10,000cfs and 15,000cfs canals) = Colin [15] - Colin [8]
[23] Difference in dragline excavation volume (10,000cfs and 15,000cfs canals) = Colin [16] - Colin [9]
[24] Difference in total excavation volume (10,000cfs and 15,000cfs canals) = Colin [17] - Colin [10]
[25] Difference in local canal excavated volume used for canal embankments (10,000cfs and 15,000cfs canals) = Colin [18] - Colin [11]
[26] Difference in imported soil volume used for canal embankments (10,000cfs and 15,000cfs canals) = Colin [19] - Colin [12]
[27] Difference in net disposal volume (10,000cfs and 15,000cfs canals) = Colin [20] - Colin [13]

Table A-8, Canal Route #1A Quantity Calculation (Old River to Delta-Mendota Canal)

Canal Profile						Route #1A, 10,000cfs (12-ft Raised) Bottom width = 200ft					Route #1A, 15,000cfs (12-ft Raised) Bottom width = 340ft					Route #1A, 10,000cfs and 15,000cfs (12-ft Raised) Quantity Comparison				
[1] Canal Station (x100ft)	[2] Step Length (ft)	[3] Mid-Point Station (x100ft)	[4] Mid-Point Ground Elev. (ft)	[5] Mid-Point Canal Invert EL (ft)	[6] Ground To Invert Depth (ft)	[7] Scraper Excav Volume $V_{scraper}$ (cy)	[8] Dragline Excav Volume $V_{dragline}$ (cy)	[9] Total Excav Volume V_{ex} (cy)	[10] Total Embank Volume V_{em} (cy)	[11] Net Disposal Volume V_{dis} (cy)	[12] Scraper Excav Volume $V_{scraper}$ (cy)	[13] Dragline Excav Volume $V_{dragline}$ (cy)	[14] Total Excav Volume V_{ex} (cy)	[15] Total Embank Volume V_{em} (cy)	[16] Net Disposal Volume V_{dis} (cy)	[17] Scraper Volume Diff. $V_{scraper,diff}$ (cy)	[18] Dragline Volume Diff. $V_{dragline,diff}$ (cy)	[19] Total Excav Diff. V_{ex} (cy)	[20] Total Embank Diff. V_{dis} (cy)	[21] Disposal Volume Diff. V_{diff} (cy)
Old River Siphon																				
2287	300.0	2289	0.00	-19.61	19.61	10,504	46,078	56,582	7,697	48,885	15,170	71,902	87,072	7,697	79,375	4,667	25,824	30,491	0	30,491
2290	1000.0	2295	0.00	-19.63	19.63	35,019	153,643	188,662	25,628	163,034	50,575	239,746	290,321	25,628	264,693	15,556	86,103	101,659	0	101,659
2300	1000.0	2305	0.00	-19.66	19.66	35,029	153,721	188,751	25,585	163,166	50,585	239,861	290,446	25,585	264,861	15,556	86,140	101,695	0	101,695
2310	1000.0	2315	0.00	-19.70	19.70	35,039	153,799	188,839	25,541	163,297	50,595	239,975	290,570	25,541	265,029	15,556	86,176	101,732	0	101,732
2320	1000.0	2325	0.00	-19.73	19.73	35,049	153,877	188,927	25,498	163,429	50,605	240,090	290,695	25,498	265,197	15,556	86,212	101,768	0	101,768
2330	1000.0	2335	0.00	-19.77	19.77	35,060	153,955	189,015	25,454	163,561	50,615	240,204	290,819	25,454	265,365	15,556	86,249	101,804	0	101,804
2340	400.0	2342	11.67	-19.79	31.46	19,477	126,893	146,369	0	146,369	25,699	185,821	211,520	0	211,520	6,222	58,928	65,151	0	65,151
2344	0.0																			
Delta-Mendota Canal																				
Total	5,700					205,177	941,966	1,147,144	135,404	1,011,740	293,844	1,457,599	1,751,443	135,404	1,616,039	88,667	515,632	604,299	0	604,299
Max					31.5															
Min					19.6															

Column Notes:

[1] Canal stations Siphon locations at 100ft increments.

[2] Canal length between calculation stations = Next Row in Coln [1] - Current Row in Coln [1].

[3] Midpoint stations between adjacent calculation stations.

[4] Ground elevation at midpoint station.

[5] Canal invert elevation at midpoint.

[6] Gound to invert depth = Coln [4] - Coln [5].

[7] 10,000cfs Canal, volume of excavation of the top 3 ft by scraper, interpolated from Cut-Fill Calc Table using Ground to Invert Depth from Coln [6].

[8] 10,000cfs Canal, volume of excavation from 3 ft below ground surface down to invert , by dragline, interpolated from Cut-Fill Calc Table using Grd to Invert Depth from Coln [6].

[9] 10,000cfs Canal, total excavation volume = Coln [7] + Coln [8].

[10] 10,000cfs Canal, required fill volume for canal embankments, interpolated from Cut-Fill Calc Table using Grd to Invert Depth from Coln [6].

[11] 10,000cfs Canal, net disposal volume = Coln [9] - Coln [10].

[12] 15,000cfs Canal, volume of excavation of the top 3 ft by scraper, interpolated from Cut-Fill Calc Table using Grd to Invert Depth from Coln [6].

[13] 15,000cfs Canal, volume of excavation from 3 ft below ground surface down to invert, by dragline, interpolated from Cut-Fill Calc Table using Grd to Invert Depth from Coln [6].

[14] 15,000cfs Canal, total excavation volume = Coln [12] + Coln [13]

[15] 15,000cfs Canal, required fill volume for canal embankments , interpolated from Cut-Fill Calc Table using Grd to Invert Depth from Coln [6].

[16] 15,000cfs Canal, net disposal volume = Coln [14] - Coln [15]

[17] Difference in scraper excavation volume (10,000cfs and 15,000cfs canals) = Coln [12] - Coln [7]

[18] Difference in dragline excavation volume (10,000cfs and 15,000cfs canals) = Coln [13] - Coln [8]

[19] Difference in total excavation volume (10,000cfs and 15,000cfs canals) = Coln [14] - Coln [9]

[20] Difference in embankment volume (10,000cfs and 15,000cfs canals) = Coln [15] - Coln [10]

[21] Difference in net disposal volume (10,000cfs and 15,000cfs canals) = Coln [16] - Coln [11]

Table A-9, Canal Route #1B Quantity Calculation (Old River to California Aqueduct)

Canal Profile						Route #1B, 10,000cfs (12-ft Raised) Bottom width = 200ft					Route #1B, 15,000cfs (12-ft Raised) Bottom width = 340ft					Excavation and Embankment Quantity Increase from 10,000cfs to 15,000cfs				
[1] Canal Station (x100ft)	[2] Step Length (ft)	[3] Mid-Point Station (x100ft)	[4] Mid-Point Ground Elev. (ft)	[5] Mid-Point Canal Invert EL (ft)	[6] Ground To Invert Depth (ft)	[7] Scraper Excav Volume $V_{scraper}$ (cy)	[8] Dragline Excav Volume $V_{dragline}$ (cy)	[9] Total Excav Volume V_{ex} (cy)	[10] Total Embank Volume V_{em} (cy)	[11] Net Disposal Volume V_{dis} (cy)	[12] Scraper Excav Volume $V_{scraper}$ (cy)	[13] Dragline Excav Volume $V_{dragline}$ (cy)	[14] Total Excav Volume V_{ex} (cy)	[15] Total Embank Volume V_{em} (cy)	[16] Net Disposal Volume V_{dis} (cy)	[17] Scraper Volume Diff. $V_{scraper,diff}$ (cy)	[18] Dragline Volume Diff. $V_{dragline,diff}$ (cy)	[19] Total Excav Diff. V_{ex} (cy)	[20] Total Embank Diff. V_{dis} (cy)	[21] Disposal Volume Diff. V_{diff} (cy)
Old River Siphon																				
2287	300.0	2289	0.00	-19.60	19.60	10,504	46,077	56,580	7,698	48,883	15,170	71,900	87,070	7,698	79,373	4,667	25,823	30,490	0	30,490
2290	1000.0	2295	0.00	-19.62	19.62	35,017	153,625	188,642	25,639	163,004	50,573	239,720	290,293	25,639	264,654	15,556	86,095	101,650	0	101,650
2300	1000.0	2305	0.00	-19.64	19.64	35,024	153,681	188,705	25,607	163,097	50,580	239,802	290,381	25,607	264,774	15,556	86,121	101,676	0	101,676
2310	1000.0	2315	2.50	-19.67	22.17	39,144	181,617	220,760	12,772	207,988	54,699	280,312	335,011	12,772	322,239	15,556	98,695	114,250	0	114,250
2320	1000.0	2325	7.50	-19.69	27.19	45,776	249,840	295,616	0	295,616	61,332	374,487	435,818	0	435,818	15,556	124,647	140,202	0	140,202
2330	1000.0	2335	12.50	-19.72	32.22	49,219	329,893	379,112	0	379,112	64,775	481,321	546,096	0	546,096	15,556	151,428	166,984	0	166,984
2340	1000.0	2345	17.50	-19.74	37.24	52,556	413,122	465,678	0	465,678	68,112	590,502	658,614	0	658,614	15,556	177,380	192,936	0	192,936
2350	1000.0	2355	22.50	-19.77	42.27	55,893	501,918	557,811	0	557,811	71,448	705,250	776,698	0	776,698	15,556	203,332	218,887	0	218,887
2360	1000.0	2365	27.50	-19.79	47.29	59,229	596,281	655,510	0	655,510	74,785	825,565	900,350	0	900,350	15,556	229,284	244,839	0	244,839
2370	1000.0	2375	32.50	-19.82	52.32	62,566	696,210	758,776	0	758,776	78,122	951,446	1,029,568	0	1,029,568	15,556	255,236	270,791	0	270,791
2380	1000.0	2385	37.50	-19.84	57.34	65,903	801,706	867,609	0	867,609	81,458	1,082,894	1,164,352	0	1,164,352	15,556	281,187	296,743	0	296,743
2390	1000.0	2395	42.50	-19.87	62.37	69,239	912,769	982,008	0	982,008	84,795	1,219,908	1,304,703	0	1,304,703	15,556	307,139	322,695	0	322,695
2400	1000.0	2405	47.50	-19.89	67.39	72,576	1,029,399	1,101,975	0	1,101,975	88,132	1,362,490	1,450,621	0	1,450,621	15,556	333,091	348,647	0	348,647
2410	1000.0	2415	52.50	-19.92	72.42	76,019	1,155,592	1,231,611	0	1,231,611	91,575	1,515,465	1,607,040	0	1,607,040	15,556	359,873	375,428	0	375,428
2420	1000.0	2425	57.50	-19.94	77.44	77,750	1,221,257	1,299,007	0	1,299,007	93,306	1,594,591	1,687,896	0	1,687,896	15,556	373,333	388,889	0	388,889
2430	1000.0	2435	62.50	-19.97	82.47	77,750	1,221,257	1,299,007	0	1,299,007	93,306	1,594,591	1,687,896	0	1,687,896	15,556	373,333	388,889	0	388,889
2440	700.0	2444	66.75	-19.99	86.74	54,425	854,880	909,305	0	909,305	65,314	1,116,214	1,181,527	0	1,181,527	10,889	261,333	272,222	0	272,222
2447	0.0																			
California Aqueduct																				
Total	16,000					938,590	10,519,126	11,457,716	71,716	11,386,001	1,187,479	14,246,456	15,433,935	71,716	15,362,220	248,889	3,727,330	3,976,219	0	3,976,219
Max					86.7															
Min					19.6															

Column Notes:
[1] Canal stations Siphon locations at 100ft increments.
[2] Canal length between calculation stations = Next Row in Coln [1] - Current Row in Coln [1].
[3] Midpoint stations between adjacent calculation stations.
[4] Ground elevation at midpoint station.
[5] Canal invert elevation at midpoint.
[6] Gound to invert depth = Coln [4] - Coln [5].
[7] 10,000cfs Canal, volume of excavation of the top 3 ft by scraper, interpolated from Cut-Fill Calc Table using Ground to Invert Depth from Coln [6].
[8] 10,000cfs Canal, volume of excavation from 3 ft below ground surface down to invert , by dragline, interpolated from Cut-Fill Calc Table using Grd to Invert Depth from Coln [6].
[9] 10,000cfs Canal, total excavation volume = Coln [7] + Coln [8].
[10] 10,000cfs Canal, required fill volume for canal embankments, interpolated from Cut-Fill Calc Table using Grd to Invert Depth from Coln [6].
[11] 10,000cfs Canal, net disposal volume = Coln [9] - Coln [10].
[12] 15,000cfs Canal, volume of excavation of the top 3 ft by scraper, interpolated from Cut-Fill Calc Table using Grd to Invert Depth from Coln [6].
[13] 15,000cfs Canal, volume of excavation from 3 ft below ground surface down to invert, by dragline, interpolated from Cut-Fill Calc Table using Grd to Invert Depth from Coln [6].
[14] 15,000cfs Canal, total excavation volume = Coln [12] + Coln [13]
[15] 15,000cfs Canal, required fill volume for canal embankments , interpolated from Cut-Fill Calc Table using Grd to Invert Depth from Coln [6].
[16] 15,000cfs Canal, net disposal volume = Coln [14] - Coln [15]
[17] Difference in scraper excavation volume (10,000cfs and 15,000cfs canals) = Coln [12] - Coln [7]
[18] Difference in dragline excavation volume (10,000cfs and 15,000cfs canals) = Coln [13] - Coln [8]
[19] Difference in total excavation volume (10,000cfs and 15,000cfs canals) = Coln [14] - Coln [9]
[20] Difference in embankment volume (10,000cfs and 15,000cfs canals) = Coln [15] - Coln [10]
[21] Difference in net disposal volume (10,000cfs and 15,000cfs canals) = Coln [16] - Coln [11]

Table A-10, Route #1 Incised Canal Quantities Comparison Summary

Sacramento River to U/S of Disappointment Slough

Description	Unit	10,000cfs Canal Bottom Width b=200ft	15,000cfs Canal Bottom Width b=340ft	Net Increase
Hydraulic Excavation	CY	0	0	0
Scraper Excavation	CY	4,479,501	6,007,056	1,527,556
Dragline Excavation	CY	24,339,999	36,505,107	12,165,107
Total Excavation	CY	28,819,500	42,512,163	13,692,663
Embank. Fill (Local)	CY	65,266	65,266	0
Embank. Fill (Import)	CY	0	0	0
Net Disposal	CY	28,754,234	42,446,897	13,692,663

D/S of Disappointment Slough to U/S of Old River

Description	Unit	10,000cfs Canal Bottom Width b=200ft	15,000cfs Canal Bottom Width b=340ft	Net Increase
Hydraulic Excavation	CY	9,185,541	9,185,541	0
Scraper Excavation	CY	3,243,320	4,815,987	1,572,667
Dragline Excavation	CY	20,227,935	30,926,519	10,698,585
Total Excavation	CY	32,656,795	44,928,047	12,271,252
Embank. Fill (Local)	CY	1,872,222	1,872,222	0
Embank. Fill (Import)	CY	7,291,608	7,291,608	0
Net Disposal	CY	30,784,573	43,055,825	12,271,252

Branch A - D/S of Old River to Delta-Mendota Canal

Description	Unit	10,000cfs Canal Bottom Width b=200ft	15,000cfs Canal Bottom Width b=340ft	Net Increase
Hydraulic Excavation	CY	0	0	0
Scraper Excavation	CY	205,177	293,844	88,667
Dragline Excavation	CY	941,966	1,457,599	515,632
Total Excavation	CY	1,147,144	1,751,443	604,299
Embank. Fill (Local)	CY	135,404	135,404	0
Embank. Fill (Import)	CY	0	0	0
Net Disposal	CY	1,011,740	1,616,039	604,299

Table A-10, Route #1 Incised Canal Quantities Comparison Summary

Branch B - D/S of Old River to California Aqueduct

Description	Unit	10,000cfs Canal Bottom Width b=200ft	15,000cfs Canal Bottom Width b=340ft	Net Increase
Hydraulic Excavation	CY	0	0	0
Scraper Excavation	CY	938,590	1,187,479	248,889
Dragline Excavation	CY	10,519,126	14,246,456	3,727,330
Total Excavation	CY	11,457,716	15,433,935	3,976,219
Embank. Fill (Local)	CY	71,716	71,716	0
Embank. Fill (Import)	CY	0	0	0
Net Disposal	CY	11,386,001	15,362,220	3,976,219

For the Whole Canal

Description	Unit	10,000cfs Canal Bottom Width b=200ft	15,000cfs Canal Bottom Width b=340ft	Net Increase
Hydraulic Excavation	CY	9,185,541	9,185,541	0
Scraper Excavation	CY	8,866,589	12,304,367	3,437,778
Dragline Excavation	CY	56,029,026	83,135,681	27,106,654
Total Excavation	CY	74,081,156	104,625,588	30,544,432
Embank. Fill (Local)	CY	2,144,607	2,144,607	0
Embank. Fill (Import)	CY	7,291,608	7,291,608	0
Net Disposal	CY	71,936,548	102,480,980	30,544,432

Notes:

1. **Quantities do not include siphons and check structure stations**

Table A-11, Route 1A Raised Canal Invert Data from Reference Report
(Raised Canal D/S of Disappointment Slough)

[1] Canal or Channel Station (x100ft)	[2] Canal Invert Elev. (ft)	[3] Canal Slope s (V:1H)	[4] Canal W.S. Elev. (ft)	[5] Canal Freeboard Elev. (ft)	[6] Raised Invert Elev. (ft)	[7] Raised W.S. Elev. (ft)	[8] Raised Freeboard Elev. (ft)	
0	-20.7	-0.0011	2.8	5.8	-20.7	2.8	5.8	
174	-20.9	-0.0750	2.6	5.6	-20.9	2.6	5.6	Stone Lake
186	-21.8	-0.0011	1.7	4.7	-21.8	1.7	4.7	
376	-22.0	-0.0444	1.5	4.5	-22.0	1.5	4.5	Lost Slough
385	-22.4	-0.0029	1.1	4.1	-22.4	1.1	4.1	
420	-22.5	-0.4250	1.0	4.0	-22.5	1.0	4.0	Mokelumne River
424	-24.2	-0.0020	-0.7	2.3	-24.2	-0.7	2.3	
625	-24.6	-0.1667	-1.1	1.9	-24.6	-1.1	1.9	Beaver Slough
628	-25.1	-0.0017	-1.6	1.4	-25.1	-1.6	1.4	
744	-25.3	-0.0500	-1.8	1.2	-25.3	-1.8	1.2	Hog Slough
748	-25.5	-0.0009	-2.0	1.0	-25.5	-2.0	1.0	
1084	-25.8	-0.0750	-2.3	0.7	-25.8	-2.3	0.7	White Slough
1088	-26.1	-0.0021	-2.6	0.4	-26.1	-2.6	0.4	
1136	-26.2	-0.0750	-2.7	0.3	-26.2	-2.7	0.3	Telephone Cut
1140	-26.5	-0.0030	-3.0	0.0	-26.5	-3.0	0.0	
1241	-26.8	-0.1000	-3.3	-0.3	-26.8	-3.3	-0.3	Disappointment Slough
1246	-27.3	-0.0008	-3.8	-0.8	-15.3	8.2	11.2	
1365	-27.4	-0.1167	-3.9	-0.9	-15.4	8.1	11.1	Fourteenmile Slough
1371	-28.1	-0.0021	-4.6	-1.6	-16.1	7.4	10.4	
1467	-28.3	-0.0875	-4.8	-1.8	-16.3	7.2	10.2	San Joaquin River
1475	-29.0	-0.0015	-5.5	-2.5	-17.0	6.5	9.5	
1939	-29.7	-0.0727	-6.2	-3.2	-17.7	5.8	8.8	Middle River
1950	-30.5	-0.0004	-7.0	-4.0	-18.5	5.0	8.0	
2174	-30.6	-0.0037	-7.1	-4.1	-18.6	4.9	7.9	
2282	-31.0	2.2800	-7.5	-4.5	-19.0	4.5	7.5	Old River
2287	-19.6	0.0000	3.9	6.9	-19.6	3.9	6.9	
2287	-19.6	-0.0035	3.9	6.9	-19.6	3.9	6.9	
2344	-19.8	-	3.7	6.7	-19.8	3.7	6.7	Delta-Mendota Canal

Column Notes:

[1] Stationing at Significant Points of Reach

[2] Canal Invert for 10,000 cfs canal

[3] Slope between Significant Points in Canal = (Next Row in Coln [2] - Current Row in Coln [2]) / (Next Row in Coln [1] - Current Row in Coln [1])

[4] Canal W.S. elevation = Coln [2] + 23.5ft (depth of flow)

[5] Canal freeboard elevation = Coln [4] + 3 ft freeboard

[6] Canal invert is raised 12ft higher after Disappointment Slough

[7] Canal W.S. is raised 12ft higher after Disappointment Slough (lifted by pump station)

[8] Canal Freeboard elevation = Coln [7] + 3 ft freeboard

Reference: Isolated Facility, Conceptual Analysis of Incised Canal Configuration, by CALFED Bay-Delta Program, Water Management Planning Branch, dated September 1999, Table 3.4, Two Sheets (pages 30 and 31).

Table A-12, Route 1B Raised Canal Invert Data from Reference Report
(Raised Canal D/S of Disappointment Slough)

[1] Canal or Channel Station (x100ft)	[2] Canal Invert Elev. (ft)	[3] Canal Slopes (V:1H)	[4] Canal W.S. Elev. (ft)	[5] Canal Freeboard Elev. (ft)	[6] Raised Invert Elev. (ft)	[7] Raised W.S. Elev. (ft)	[8] Raised Freeboard Elev. (ft)	
0	-20.7	-0.0011	2.8	5.8	-20.7	2.8	5.8	
174	-20.9	-0.0750	2.6	5.6	-20.9	2.6	5.6	Stone Lake
186	-21.8	-0.0011	1.7	4.7	-21.8	1.7	4.7	
376	-22.0	-0.0444	1.5	4.5	-22.0	1.5	4.5	Lost Slough
385	-22.4	-0.0029	1.1	4.1	-22.4	1.1	4.1	
420	-22.5	-0.4250	1.0	4.0	-22.5	1.0	4.0	Mokelumne River
424	-24.2	-0.0020	-0.7	2.3	-24.2	-0.7	2.3	
625	-24.6	-0.1667	-1.1	1.9	-24.6	-1.1	1.9	Beaver Slough
628	-25.1	-0.0017	-1.6	1.4	-25.1	-1.6	1.4	
744	-25.3	-0.0500	-1.8	1.2	-25.3	-1.8	1.2	Hog Slough
748	-25.5	-0.0009	-2.0	1.0	-25.5	-2.0	1.0	
1084	-25.8	-0.0750	-2.3	0.7	-25.8	-2.3	0.7	White Slough
1088	-26.1	-0.0021	-2.6	0.4	-26.1	-2.6	0.4	
1136	-26.2	-0.0750	-2.7	0.3	-26.2	-2.7	0.3	Telephone Cut
1140	-26.5	-0.0030	-3.0	0.0	-26.5	-3.0	0.0	
1241	-26.8	-0.1000	-3.3	-0.3	-26.8	-3.3	-0.3	Disappointment Slough
1246	-27.3	-0.0008	-3.8	-0.8	-15.3	8.2	11.2	
1365	-27.4	-0.1167	-3.9	-0.9	-15.4	8.1	11.1	Fourteenmile Slough
1371	-28.1	-0.0021	-4.6	-1.6	-16.1	7.4	10.4	
1467	-28.3	-0.0875	-4.8	-1.8	-16.3	7.2	10.2	San Joaquin River
1475	-29.0	-0.0015	-5.5	-2.5	-17.0	6.5	9.5	
1939	-29.7	-0.0727	-6.2	-3.2	-17.7	5.8	8.8	Middle River
1950	-30.5	-0.0004	-7.0	-4.0	-18.5	5.0	8.0	
2174	-30.6	-0.0037	-7.1	-4.1	-18.6	4.9	7.9	
2282	-31.0	2.2800	-7.5	-4.5	-19.0	4.5	7.5	Old River
2287	-19.6	0.0000	3.9	6.9	-19.6	3.9	6.9	
2287	-19.6	-0.0025	3.9	6.9	-19.6	3.9	6.9	
2447	-20.0	-	3.5	6.5	-20.0	3.5	6.5	

Column Notes:

[1] Stationing at Significant Points of Reach

[2] Canal Invert for 10,000 cfs canal

[3] Slope between Significant Points in Canal = (Next Row in Coln [2] - Current Row in Coln [2]) / (Next Row in Coln [1] - Current Row in Coln [1])

[4] Canal W.S. elevation = Coln [2] + 23.5ft (depth of flow)

[5] Canal freeboard elevation = Coln [4] + 3 ft freeboard

[6] Canal invert is raised 12ft higher after Disappointment Slough

[7] Canal W.S. is raised 12ft higher after Disappointment Slough (lifted by pump station)

[8] Canal Freeboard elevation = Coln [7] + 3 ft freeboard

Reference: Isolated Facility, Conceptual Analysis of Incised Canal Configuration, by CALFED Bay-Delta Program, Water Management Planning Branch, dated September 1999, Table 3.4, Two Sheets (pages 30 and 31).

Table A-13, Incised and Raised Canal Route #1 Quantity Calculation (Downstream of Disappointment Slought)

Canal Profile								Route #1, 10,000cfs Bottom width = 200ft							Route #1, 15,000cfs (12-ft Raised) Bottom width = 340ft							Route #1, 10,000cfs and 15,000cfs (12-ft Raised) Quantity Comparison						
[1] Canal Station (x100ft)	[2] Step Length (ft)	[3] Mid-Point Station (x100ft)	[4] Mid-Point Ground Elev. (ft)	[5] Midpoint Station Canal Invert El. (ft)	[5A] Midpoint 12-ft Raised Invert El. (ft)	[6] Ground to Invert Depth (ft)	[6A] Raised Ground to Invert Depth (ft)	[7] Hydraulic Excav Volume $V_{hydraulic}$ (cy)	[8] Scraper Excav Volume $V_{scraper}$ (cy)	[9] Dragline Excav Volume $V_{dragline}$ (cy)	[10] Total Excav Volume V_{ex} (cy)	[11] Local Embank Volume V_{em} (cy)	[12] Import Embank Volume V_{im} (cy)	[13] Net Disposal Volume V_{dis} (cy)	[14] Hydraulic Excav Volume $V_{hydraulic}$ (cy)	[15] Scraper Excav Volume $V_{scraper}$ (cy)	[16] Dragline Excav Volume $V_{dragline}$ (cy)	[17] Total Excav Volume V_{ex} (cy)	[18] Local Embank Volume V_{em} (cy)	[19] Import Embank Volume V_{im} (cy)	[20] Net Disposal Volume V_{dis} (cy)	[21] Hydraulic Volume Diff. $V_{hydraulic,diff}$ (cy)	[22] Scraper Volume Diff. $V_{scraper,diff}$ (cy)	[23] Dragline Volume Diff. $V_{dragline,diff}$ (cy)	[24] Total Excav Diff. V_{ex} (cy)	[25] Local Embank Diff. V_{em} (cy)	[26] Import Embank Diff. V_{im} (cy)	[27] Disposal Volume Diff. V_{dif} (cy)
Disappointment Slough Siphon																											
1246	400.0	1248	-0.51	-27.30	-15.30	26.79	14.79	30,815	12,540	87,546	140,902	7,407	17,744	133,494	48,660	16,269	60,598	125,527	6,944	65,004	118,583	17,845	3,729	-30,948	-15,374	-463	47,259	-14,911
1250	1000.0	1255	-1.21	-27.31	-15.31	26.00	14.00	79,176	31,716	234,771	345,663	18,519	48,230	327,145	132,509	42,973	152,245	327,727	18,519	181,887	309,208	53,333	11,256	-82,526	-17,937	0	133,657	-17,937
1260	1000.0	1265	-2.00	-27.32	-15.32	25.32	13.32	82,712	32,088	223,407	338,207	18,519	54,651	319,688	136,045	42,442	140,350	318,837	18,519	193,121	300,318	53,333	10,354	-83,058	-19,370	0	138,470	-19,370
1270	1000.0	1275	-2.00	-27.32	-15.32	25.32	13.32	82,704	32,087	223,431	338,222	18,519	54,637	319,704	136,038	42,443	140,375	318,856	18,519	193,097	300,337	53,333	10,356	-83,056	-19,367	0	138,460	-19,367
1280	1000.0	1285	-2.00	-27.33	-15.33	25.33	13.33	82,697	32,086	223,455	338,238	18,519	54,623	319,719	136,030	42,444	140,400	318,874	18,519	193,073	300,356	53,333	10,358	-83,055	-19,364	0	138,450	-19,364
1290	1000.0	1295	-2.00	-27.34	-15.34	25.34	13.34	82,689	32,086	223,478	338,253	18,519	54,610	319,735	136,023	42,446	140,425	318,893	18,519	193,049	300,374	53,333	10,360	-83,054	-19,361	0	138,440	-19,361
1300	1000.0	1305	-2.11	-27.35	-15.35	25.24	13.24	82,777	32,094	223,200	338,071	18,519	54,773	319,553	136,110	42,432	140,131	318,674	18,519	193,331	300,155	53,333	10,338	-83,069	-19,397	0	138,558	-19,397
1310	1000.0	1315	-2.61	-27.36	-15.36	24.75	12.75	85,347	32,288	215,181	332,816	18,519	59,697	314,298	138,681	42,047	131,574	312,302	18,519	201,679	293,783	53,333	9,758	-83,607	-20,515	0	141,981	-20,515
1320	1000.0	1325	-3.11	-27.37	-15.37	24.26	12.26	87,208	32,391	209,502	329,099	18,519	63,389	310,581	140,540	41,768	125,430	307,738	18,519	207,809	289,220	53,333	9,377	-84,072	-21,361	0	144,420	-21,361
1330	1000.0	1335	-3.61	-27.37	-15.37	23.77	11.77	89,777	32,479	201,824	324,079	18,519	68,677	305,561	143,110	41,382	117,002	301,494	18,519	216,413	282,976	53,333	8,904	-84,822	-22,585	0	147,736	-22,585
1340	1000.0	1345	-4.00	-27.38	-15.38	23.38	11.38	91,541	32,503	196,668	320,712	18,519	72,427	302,194	144,874	41,118	111,259	297,251	18,519	222,404	278,733	53,333	8,615	-85,409	-23,461	0	149,977	-23,461
1350	1000.0	1355	-4.00	-27.39	-15.39	23.39	11.39	91,533	32,503	196,690	320,727	18,519	72,411	302,208	144,867	41,119	111,284	297,269	18,519	222,379	278,751	53,333	8,616	-85,406	-23,457	0	149,968	-23,457
1360	500.0	1363	-4.00	-27.40	-15.40	23.40	11.40	45,764	16,252	98,353	160,369	9,259	36,200	151,110	68,809	68,809	52,868	141,210	8,796	105,621	132,413	23,045	52,557	-45,485	-19,159	-463	69,421	-18,696
1365	0.0																										
Fourteen Mile Slough Siphon																											
1371	900.0	1376	-4.00	-28.11	-16.11	24.11	12.11	79,246	29,184	186,262	294,692	16,667	58,593	278,025	123,711	123,711	107,321	287,469	16,204	184,292	283,265	44,465	94,527	-78,941	-27,223	-463	125,699	-26,760
1380	1000.0	1385	-4.00	-28.13	-16.13	24.13	12.13	88,033	32,426	207,011	327,470	18,519	65,068	308,951	141,367	41,644	122,711	305,722	18,519	210,561	287,203	53,333	9,218	-84,300	-21,748	0	145,493	-21,748
1390	1000.0	1395	-4.00	-28.15	-16.15	24.15	12.15	88,015	32,425	207,066	327,506	18,519	65,030	308,988	141,348	41,647	122,772	305,767	18,519	210,499	287,248	53,333	9,222	-84,295	-21,740	0	145,469	-21,740
1400	1000.0	1405	-4.00	-28.17	-16.17	24.17	12.17	87,996	32,424	207,122	327,543	18,519	64,992	309,024	141,330	41,650	122,833	305,812	18,519	210,438	287,293	53,333	9,225	-84,290	-21,731	0	145,445	-21,731
1410	1000.0	1415	-4.00	-28.19	-16.19	24.19	12.19	87,978	32,423	207,178	327,579	18,519	64,955	309,061	141,311	41,652	122,894	305,857	18,519	210,376	287,338	53,333	9,229	-84,284	-21,722	0	145,421	-21,722
1420	1000.0	1425	-4.00	-28.21	-16.21	24.21	12.21	87,248	32,393	209,375	329,016	18,519	63,473	310,498	140,581	41,762	125,293	307,636	18,519	207,947	289,118	53,333	9,369	-84,082	-21,380	0	144,474	-21,380
1430	1000.0	1435	-4.00	-28.23	-16.23	24.23	12.23	87,230	32,392	209,432	329,053	18,519	63,436	310,535	140,563	41,765	125,354	307,681	18,519	207,886	289,163	53,333	9,372	-84,078	-21,372	0	144,450	-21,372
1440	1000.0	1445	-4.00	-28.25	-16.25	24.25	12.25	87,211	32,391	209,488	329,090	18,519	63,399	310,572	140,544	41,767	125,415	307,727	18,519	207,824	289,208	53,333	9,376	-84,073	-21,363	0	144,426	-21,363
1450	1000.0	1455	-4.00	-28.28	-16.28	24.28	12.28	87,193	32,390	209,544	329,127	18,519	63,361	310,608	140,526	41,770	125,476	307,772	18,519	207,763	289,254	53,333	9,380	-84,068	-21,355	0	144,402	-21,355
1460	700.0	1464	-4.00	-28.29	-16.29	24.29	12.29	61,024	22,673	146,714	230,411	12,963	44,331	217,448	94,844	94,844	84,731	207,772	12,500	140,205	195,272	33,821	72,172	-61,983	-22,639	-463	95,874	-22,176
1467	0.0																										
San Joaquin River Control Structure and Siphon																											
1475	500.0	1478	-4.00	-29.00	-17.00	25.00	13.00	41,850	16,086	110,148	168,084	9,259	28,258	158,824	65,091	65,091	65,098	150,279	8,796	93,248	141,482	23,241	49,005	-45,050	-17,805	-463	64,990	-17,342
1480	1000.0	1485	-4.21	-29.02	-17.02	24.80	12.80	84,592	32,238	217,517	334,346	18,519	58,227	315,828	137,925	42,160	134,082	314,167	18,519	199,209	295,648	53,333	9,922	-83,435	-20,179	0	140,982	-20,179
1490	1000.0	1495	-3.93	-29.03	-17.03	25.10	13.10	83,615	32,164	220,565	336,344	18,519	58,355	317,825	136,948	42,307	137,334	316,589	18,519	198,035	298,071	53,333	10,143	-83,231	-19,755	0	139,680	-19,755
1500	1000.0	1505	-0.75	-29.05	-17.05	28.30	16.30	77,037	30,627	267,610	375,274	18,519	42,582	356,755	122,729	44,440	185,882	353,050	18,519	152,275	334,532	45,692	13,813	-81,729	-22,224	0	109,693	-22,224
1510	1000.0	1515	-4.25	-29.06	-17.06	24.81	12.81	84,583	32,237	217,545	334,365	18,519	58,209	315,846	137,916	42,162	134,112	314,189	18,519	199,179	295,671	53,333	9,924	-83,433	-20,175	0	140,970	-20,175
1520	1000.0	1525	-6.79	-29.08	-17.08	22.29	10.29	96,069	32,433	183,862	312,364	18,519	82,508	293,845	149,402	40,438	96,681	286,522	18,519	238,101	268,003	53,333	8,005	-87,181	-25,842	0	155,593	-25,842
1530	1000.0	1535	-5.79	-29.09	-17.09	23.30	11.30	91,611	32,504	196,465	320,580	18,519	72,577	302,061	144,944	41,107	111,032	297,084	18,519	222,643	278,565	53,333	8,603	-85,433	-23,496	0	150,066	-23,496
1540	1000.0	1545	-5.00	-29.11	-17.11	24.11	12.11	88,054	32,427	206,948	327,429	18,519	65,110	308,910	141,388	41,641	122,642	305,670	18,519	210,631	287,152	53,333	9,214	-84,306	-21,758	0	145,521	-21,758
1550	1000.0	1555	-5.00	-29.12	-17.12	24.12	12.12	88,041	32,426	206,988	327,455	18,519	65,083	308,936	141,374	41,643	122,686	305,703	18,519	210,586	287,185	53,333	9,217	-84,302	-21,752	0	145,503	-21,752
1560	1000.0	1565	-5.00	-29.14	-17.14	24.14	12.14	88,027	32,426	207,028	327,481	18,519	65,056	308,963	141,361	41,645	122,730	305,736	18,519	210,541	287,217	53,333	9,219	-84,298	-21,746	0	145,486	-21,746
1570	1000.0	1575	-5.00	-29.15	-17.15	24.15	12.15	88,014	32,425	207,069	327,508	18,519	65,029	308,989	141,347	41,647	122,774	305,769	18,519	210,497	287,250	53,333	9,222	-84,294	-21,739	0	145,468	-21,739
1580	1000.0	1585	-5.00	-29.17	-17.17	24.17	12.17	88,001	32,424	207,109	327,534	18,519	65,001	309,016	141,334	41,649	122,818	305,801	18,519	210,452	287,283	53,333	9,224	-84,291	-21,733	0	145,451	-21,733
1590	1000.0	1595	-5.00	-29.18	-17.18	24.18	12.18	87,987	32,424	207,149	327,561	18,519	64,974	309,042	141,321	41,651	122,862	305,834	18,519	210,408	287,315	53,333	9,227	-84,287	-21,727	0	145,433	-21,727
1600	1000.0	1605	-5.32	-29.20	-17.20	23.88	11.88	88,970	32,458	204,211	325,639	18,519	66,995	307,121	142,304	41,503	119,638	303,445	18,519	213,697	284,927	53,333	9,045	-84,573	-22,194	0	146,703	-22,194
1610	1000.0	1615	-6.82	-29.21	-17.21	22.39	10.39	95,979	32,436	184,110	312,525	18,519	82,501	294,007	149,312	40,452	96,967	286,732	18,519	237,987	268,213	53,333	8,016	-87,143	-25,793	0	155,486	-25,793
1620	1000.0	1625	-7.89	-29.23	-17.23	21.33	9.33	100,474	32,154	171,993	304,622	18,519	92,915	286,103	153,807	39,778	82,718	276,303	18,519	253,817	257,785	53,333	7,623	-89,275	-28,318	0	160,902	-28,318
1630	1000.0	1635	-7.39	-29.24	-17.24	21.85	9.85	97,883	32,351	178,903	309,137	18,519	86,728	290,619	151,216	40,167	90,904	282,287	18,519	244,520	263,769	53,333	7,815	-87,999	-26,850	0	157,792	-26,850
1640	1000.0	1645	-6.79	-29.26	-17.26	22.47	10.47	95,197	32,462	186,280	313,939	18,519	80,514	295,420	148,530	40,569	99,471	288,570	18,519	235,042	270,051	53,333	8,108	-86,810	-25,369	0	154,528	-25,369
1650	1000.0	1655	-5.79	-29.27	-17.27	23.49	11.49	90,739	32,496	199,000	322,235	18,519	70,709	303,716	144,072	41,238	113,865	299,176	18,519	219,671	280,657	53,333	8,742	-85,135	-23,059	0	148,962	-23,059
1660	1000.0	1665	-5.00	-29.29	-17.29	24.29	12.29	87,182	32,390	209,576	329,147	18,519	63,341	310,629	140,516	41,772	125,510	307,798	18,519	207,729	289,279	53,333	9,382	-84,066	-21,350	0	144,388	-21,350
1670	1000.0	1675	-5.00	-29.30	-17.30	24.30	12.30	87,169	32,389	209,616	329,174	18,519	63,314	310,656	140,502	41,774	125,555	307,830	18,519	207,684	289,312	53,333	9,385	-84,062	-21,344	0	144,371	-21,344
1680	1000.0	1685	-5.00	-29.32	-17.32	24.32	12.32	87,155	32,388	209,657	329,201	18,519	63,287	310,682	140,489	41,776	125,599	307,863	18,519	207,640	289,345	53,333	9,387	-84,058	-21,338	0	144,353	-21,338
1690	1000.0	1695	-5.00	-29.33	-17.33	24.33	12.33	87,142	32,388	209,698	329,227	18,519	63,260	310,709	140,475	41,778	125,643	307,896	18,519	207,596	289,377	53,333	9,390	-84,055	-21,331	0	144,336	-21,331
1700	1000.0	1705	-5.00	-29.35	-17.35	24.35	12.35	87,129	32,387	209,738	329,254	18,519	63,233	310,735	140,462	41,780	125,687	307,929	18,519	207,551	289,410	53,333	9,393	-84,051	-21,325	0	144,318	-21,325
1710	1000.0	1715	-5.00	-29.36	-17.36	24.36	12.36	87,115	32,386	209,779	329,281	18,519	63,206	310,762	140,449	41,782	125,731	307,962	18,519	207,507	289,443	53,333	9,396	-84,048	-21,319	0	144,300	-21,319
1720	1000.0	1725	-5.00	-29.38	-17.38	24.38	12.38	87,102	32,386	209,820	329,307	18,519	63,180	310,789	140,435	41,784	125,776	307,994	18,519	207,463	289,476	53,333	9,398	-84,044	-21,313	0	144,283	-21,313
1730	1000.0	1735	-5.00	-29.39	-17.39	24.39	12.39	87,088	32,385	209,861	329,334	18,519	63,153	310,816	140,422	41,786	125,820	308,027	18,519	207,418	289,509	53,333	9,401	-84,041	-21,307	0	144,265	-21,307
1740	1000.0	1745	-5.00	-29.41	-17.41	24.41	12.41	86,364	32,349	212,062	330,774	18,519	61,701	312,256	139,697	41,894	128,210	309,801	18,519	205,020	291,283	53,333	9,546	-83,852	-20,973	0	143,319	-20,973
1750	1000.0	1755	-5.00	-29.42	-17.42	24.42	12.42	86,350	32,348	212,103	330,801	18,519	61,675	312,283	139,684	41,896	128,254	309,834	18,519	204,976	291,316	53,333	9,548	-83,849	-20,967	0	143,301	-20,967
1760	1000.0	1765	-5.10	-29.44	-17.44	24.34	12.34	87,137	32,387	209,713	329,237	18,519	63,250	310,719	140,470	41,778	125,659	307,908	18,519	207,579	289,390	53,333	9,391	-84,053	-21,329	0	144,329	-21,329
1770	1000.0	1775	-5.30	-29.45	-17.45	24.15	12.15	88,013	32,425	207,073	327,511	18,519	65,025	308,992	141,346	41,647	122,779	305,772	18,519	210,492	287,254	53,333	9,222	-84,294	-21,739	0	145,466	-21,739
1780	1000.0	1785	-5.50	-29.47	-17.47	23.97	11.97	88,888	32,455	204,457	325,800	18,519	66,825	307,281	142,221	41,516	119,908	303,645	18,519	213,421	285,126	53,333	9,061	-84,549	-22,155	0	146,596	-22,155
1790	1000.0	1795	-5.70	-29.48	-17.48	23.78	11.78	89,763	32,479	201,863	324,105	18,519	68,649	305,587	143,097	41,384	117,045	301,526	18,519	216,369	283,008	53,333	8,906	-84,818	-22,579	0	147,719	-22,579
1800	1000.0	1805	-5.90	-29.50	-17.50	23.60	11.60	90,639	32,494	199,293	322,426	18,519	70,498	303,907	143,972	41,253	114,191	299,416	18,519	219,333	280,898	53,333	8,759	-85,102	-23,010	0	148,835	-23,010
1810	1000.0	1815	-5.88	-29.51	-17.51	23.64	11.64	89,892	32,482	201,482	323,856	18,519	68,918	305,338	143,226	41,365	116,624	301,215	18,519	216,802	282,696	53,333	8,884	-84,858	-22,641	0	147,884	-22,641
1820	1000.0	1825	-5.63	-29.53	-17.53	23.90	11.90	88,945	32,457	204,295	325,698	18,519	66,943	307,169	142,279	41,507	119,719	303,505	18,519	213,814	284,987	53,333	9,050	-84,566	-22,182	0	146,871	-22,182

Table A-13, Incised and Raised Canal Route #1 Quantity Calculation (Downstream of Disappointment Slough)

Canal Profile								Route #1, 10,000cfs Bottom width = 200ft							Route #1, 15,000cfs (12-ft Raised) Bottom width = 340ft							Route #1, 10,000cfs and 15,000cfs (12-ft Raised) Quantity Comparison						
[1] Canal Station (x100ft)	[2] Step Length (ft)	[3] Mid-Point Station (x100ft)	[4] Mid-Point Ground Elev. (ft)	[5] Midpoint Station Canal Invert EL (ft)	[5A] Midpoint 12-ft Raised Invert EL (ft)	[8] Ground to Invert Depth (ft)	[8A] Raised Ground to Invert Depth (ft)	[7] Hydraulic Excav Volume $V_{hydraulic}$ (cy)	[8] Scraper Excav Volume $V_{scraper}$ (cy)	[9] Dragline Excav Volume $V_{dragline}$ (cy)	[10] Total Excav Volume V_{ex} (cy)	[11] Local Embank Volume V_{em} (cy)	[12] Import Embank Volume V_{im} (cy)	[13] Net Disposal Volume V_{dis} (cy)	[14] Hydraulic Excav Volume $V_{hydraulic}$ (cy)	[15] Scraper Excav Volume $V_{scraper}$ (cy)	[16] Dragline Excav Volume $V_{dragline}$ (cy)	[17] Total Excav Volume V_{ex} (cy)	[18] Local Embank Volume V_{em} (cy)	[19] Import Embank Volume V_{im} (cy)	[20] Net Disposal Volume V_{dis} (cy)	[21] Hydraulic Volume Diff. $V_{hydraulic,diff}$ (cy)	[22] Scraper Volume Diff. $V_{scraper,diff}$ (cy)	[23] Dragline Volume Diff. $V_{dragline,diff}$ (cy)	[24] Total Excav Diff. V_{ex} (cy)	[25] Local Embank Diff. V_{em} (cy)	[26] Import Embank Diff. V_{im} (cy)	[27] Disposal Volume Diff. V_{dis} (cy)
1830	1000.0	1835	-5.38	-29.54	-17.54	24.17	12.17	87,959	32,424	207,115	327,538	18,519	84,997	309,019	141,332	41,649	122,825	305,806	18,519	210,446	287,287	53,333	9,225	-84,290	-21,732	0	145,446	-21,732
1840	1000.0	1845	-5.13	-29.56	-17.56	24.43	12.43	86,341	32,347	212,132	330,821	18,519	61,656	312,302	139,674	41,898	128,286	309,858	18,519	204,945	291,339	53,333	9,550	-83,847	-20,963	0	143,289	-20,963
1850	1000.0	1855	-4.92	-29.57	-17.57	24.66	12.66	85,431	32,294	214,922	332,647	18,519	59,861	314,128	138,764	42,034	131,296	312,095	18,519	201,953	293,576	53,333	9,740	-83,626	-20,552	0	142,092	-20,552
1860	1000.0	1865	-4.75	-29.59	-17.59	24.84	12.84	84,558	32,235	217,620	334,414	18,519	58,163	315,896	137,892	42,165	134,192	314,249	18,519	199,101	295,730	53,333	9,930	-83,428	-20,165	0	140,938	-20,165
1870	1000.0	1875	-4.58	-29.60	-17.60	25.02	13.02	83,686	32,170	220,343	336,197	18,519	56,488	317,678	137,019	42,296	137,097	316,412	18,519	196,365	297,893	53,333	10,126	-83,245	-19,785	0	139,776	-19,785
1880	1000.0	1885	-4.42	-29.62	-17.62	25.20	13.20	82,813	32,097	223,086	337,996	18,519	54,840	319,477	136,146	42,427	140,010	318,583	18,519	193,447	300,065	53,333	10,330	-83,076	-19,413	0	138,607	-19,413
1890	1000.0	1895	-4.25	-29.63	-17.63	25.38	13.38	82,652	32,082	223,598	338,332	18,519	54,539	319,813	135,985	42,451	140,551	318,987	18,519	192,928	300,469	53,333	10,369	-83,047	-19,345	0	138,389	-19,345
1900	1000.0	1905	-4.08	-29.65	-17.65	25.57	13.57	81,779	32,001	226,369	340,149	18,519	52,919	321,631	135,112	42,582	143,474	321,169	18,519	190,130	302,650	53,333	10,581	-82,895	-18,981	0	137,212	-18,981
1910	1000.0	1915	-4.20	-29.66	-17.66	25.46	13.46	81,869	32,010	226,081	339,960	18,519	53,084	321,441	135,203	42,568	143,171	320,942	18,519	190,418	302,424	53,333	10,558	-82,910	-19,018	0	137,334	-19,018
1920	1000.0	1925	-4.60	-29.68	-17.68	25.08	13.08	83,634	32,165	220,506	336,305	18,519	56,391	317,786	136,967	42,304	137,271	316,542	18,519	196,098	298,023	53,333	10,138	-83,235	-19,763	0	139,706	-19,763
1930	600.0	1935	-4.98	-29.69	-17.69	24.71	12.71	76,843	29,061	193,969	299,474	16,667	53,787	282,807	121,379	121,379	115,110	273,191	16,204	176,566	256,898	44,536	92,318	-78,859	-26,283	-463	122,779	-25,910
1936	0.0																											
Middle River Control Structure and Siphon																												
1950	1000.0	1955	-10.13	-30.50	-18.50	20.38	8.38	104,882	31,561	160,677	297,119	18,519	103,781	278,600	154,258	154,258	87,250	259,646	18,056	263,220	241,591	49,376	122,696	-93,426	-37,472	-463	159,439	-37,008
1960	1000.0	1965	-10.38	-30.51	-18.51	20.13	8.13	105,809	31,422	158,332	295,563	18,519	106,129	277,045	159,147	38,978	66,102	264,222	18,519	273,433	245,704	53,333	7,556	-92,230	-31,341	0	167,304	-31,341
1970	1000.0	1975	-10.63	-30.51	-18.51	19.89	7.89	106,738	31,283	155,997	294,018	18,519	108,496	275,499	160,072	38,838	63,240	262,150	18,519	276,915	243,631	53,333	7,556	-92,757	-31,868	0	168,419	-31,868
1980	1000.0	1985	-10.88	-30.52	-18.52	19.64	7.64	107,668	31,143	153,671	292,482	18,519	110,882	273,963	161,001	38,699	60,388	260,088	18,519	280,417	241,569	53,333	7,556	-93,283	-32,394	0	169,534	-32,394
1990	1000.0	1995	-10.92	-30.52	-18.52	19.60	7.60	108,417	31,031	151,802	291,251	18,519	112,824	272,732	161,751	38,586	58,094	258,431	18,519	283,258	239,913	53,333	7,556	-93,708	-32,819	0	170,434	-32,819
2000	1000.0	2005	-10.77	-30.52	-18.52	19.76	7.76	107,566	31,159	153,926	292,650	18,519	110,620	274,132	160,899	38,714	60,701	260,314	18,519	280,032	241,795	53,333	7,556	-93,225	-32,337	0	169,412	-32,337
2010	1000.0	2015	-10.62	-30.53	-18.53	19.91	7.91	106,714	31,286	156,058	294,058	18,519	108,434	275,540	160,047	38,842	63,315	262,204	18,519	276,823	243,686	53,333	7,556	-92,743	-31,854	0	168,390	-31,854
2020	1000.0	2025	-10.46	-30.53	-18.53	20.07	8.07	105,862	31,414	158,188	295,474	18,519	106,283	276,956	159,195	38,970	65,938	264,103	18,519	273,631	245,585	53,333	7,556	-92,250	-31,371	0	167,368	-31,371
2030	1000.0	2035	-10.31	-30.54	-18.54	20.23	8.23	105,010	31,542	160,347	296,899	18,519	104,109	278,380	158,343	39,097	68,569	266,010	18,519	270,454	247,492	53,333	7,556	-91,777	-30,888	0	166,346	-30,888
2040	1000.0	2045	-10.15	-30.54	-18.54	20.39	8.39	104,869	31,563	160,703	297,135	18,519	103,756	278,617	158,203	39,118	69,005	266,327	18,519	269,932	247,808	53,333	7,556	-91,698	-30,809	0	166,177	-30,809
2050	1000.0	2055	-10.00	-30.55	-18.55	20.55	8.55	104,018	31,691	162,861	298,569	18,519	101,621	280,051	157,351	39,246	71,646	268,243	18,519	266,775	249,725	53,333	7,556	-91,215	-30,326	0	165,154	-30,326
2060	1000.0	2065	-10.25	-30.55	-18.55	20.30	8.30	104,947	31,551	160,507	297,005	18,519	103,950	278,486	158,280	39,107	68,765	266,152	18,519	270,220	247,634	53,333	7,556	-91,742	-30,853	0	166,270	-30,853
2070	1000.0	2075	-10.75	-30.56	-18.56	19.81	7.81	106,810	31,272	155,817	293,899	18,519	108,678	275,380	160,143	38,828	63,020	261,991	18,519	277,185	243,472	53,333	7,556	-92,797	-31,908	0	168,505	-31,908
2080	1000.0	2085	-10.83	-30.56	-18.56	19.73	7.73	107,591	31,155	153,863	292,609	18,519	110,685	274,090	160,924	38,710	60,623	260,258	18,519	280,128	241,739	53,333	7,556	-93,240	-32,351	0	169,442	-32,351
2090	1000.0	2095	-10.50	-30.56	-18.56	20.06	8.06	105,868	31,413	158,182	295,464	18,519	106,279	276,945	159,202	38,969	65,918	264,089	18,519	273,655	245,570	53,333	7,556	-92,264	-31,375	0	167,375	-31,375
2100	1000.0	2105	-10.17	-30.57	-18.57	20.40	8.40	104,146	31,672	162,535	298,352	18,519	101,940	279,834	157,479	39,227	71,247	267,953	18,519	267,248	249,435	53,333	7,556	-91,288	-30,399	0	165,308	-30,399
2110	1000.0	2115	-10.00	-30.57	-18.57	20.57	8.57	103,994	31,694	162,921	298,609	18,519	101,561	280,091	157,327	39,250	71,720	268,297	18,519	266,687	249,778	53,333	7,556	-91,201	-30,313	0	165,126	-30,313
2120	1000.0	2125	-10.00	-30.58	-18.58	20.58	8.58	103,990	31,695	162,931	298,616	18,519	101,551	280,098	157,323	39,250	71,732	268,306	18,519	266,672	249,787	53,333	7,556	-91,199	-30,310	0	165,121	-30,310
2130	1000.0	2135	-10.00	-30.58	-18.58	20.58	8.58	103,986	31,696	162,941	298,623	18,519	101,541	280,104	157,319	39,251	71,744	268,315	18,519	266,658	249,796	53,333	7,556	-91,197	-30,308	0	165,116	-30,308
2140	1000.0	2145	-10.00	-30.59	-18.59	20.59	8.59	103,982	31,696	162,951	298,629	18,519	101,532	280,111	157,315	39,252	71,757	268,324	18,519	266,643	249,805	53,333	7,556	-91,195	-30,306	0	165,112	-30,306
2150	1000.0	2155	-10.00	-30.59	-18.59	20.59	8.59	103,978	31,697	162,962	298,636	18,519	101,522	280,118	157,311	39,252	71,769	268,333	18,519	266,629	249,814	53,333	7,556	-91,192	-30,304	0	165,107	-30,304
2160	1000.0	2165	-10.00	-30.60	-18.60	20.60	8.60	103,974	31,697	162,973	298,643	18,519	101,512	280,124	157,307	39,253	71,781	268,342	18,519	266,614	249,823	53,333	7,556	-91,190	-30,301	0	165,102	-30,301
2170	1000.0	2175	-10.00	-30.60	-18.60	20.60	8.60	103,256	31,805	164,797	299,858	18,519	99,724	281,339	156,589	39,361	74,013	269,963	18,519	263,965	251,445	53,333	7,556	-90,783	-29,894	0	164,240	-29,894
2180	1000.0	2185	-8.00	-30.64	-18.64	22.64	10.64	94,334	32,483	188,694	315,511	18,519	78,567	296,993	147,667	40,699	102,238	290,604	18,519	232,033	272,086	53,333	8,216	-86,456	-24,907	0	153,466	-24,907
2190	1000.0	2195	-6.00	-30.68	-18.68	24.68	12.68	85,412	32,293	214,980	332,685	18,519	59,624	314,166	138,745	42,037	131,358	312,141	18,519	201,892	293,623	53,333	9,744	-83,621	-20,544	0	142,068	-20,544
2200	1000.0	2205	-5.00	-30.71	-18.71	25.71	13.71	80,935	31,916	229,071	341,922	18,519	51,375	323,403	134,268	42,709	146,310	323,287	18,519	187,441	304,768	53,333	10,793	-82,761	-18,635	0	136,066	-18,635
2210	1000.0	2215	-5.00	-30.75	-18.75	25.75	13.75	80,902	31,913	229,177	341,992	18,519	51,315	323,473	134,235	42,714	146,421	323,370	18,519	187,336	304,851	53,333	10,801	-82,757	-18,622	0	136,021	-18,622
2220	1000.0	2225	-5.00	-30.79	-18.79	25.79	13.79	80,869	31,909	229,283	342,061	18,519	51,256	323,543	134,202	42,719	146,531	323,453	18,519	187,232	304,934	53,333	10,810	-82,752	-18,609	0	135,976	-18,609
2230	1000.0	2235	-5.00	-30.83	-18.83	25.83	13.83	80,125	31,828	231,683	343,636	18,519	49,913	325,118	133,458	42,830	149,038	325,326	18,519	184,874	306,808	53,333	11,002	-82,645	-18,310	0	134,961	-18,310
2240	1000.0	2245	-5.00	-30.86	-18.86	25.86	13.86	80,092	31,824	231,790	343,706	18,519	49,855	325,188	133,426	42,835	149,149	325,410	18,519	184,770	306,891	53,333	11,011	-82,641	-18,297	0	134,916	-18,297
2250	1000.0	2255	-5.00	-30.90	-18.90	25.90	13.90	80,059	31,820	231,897	343,777	18,519	49,796	325,258	133,393	42,840	149,260	325,493	18,519	184,667	306,974	53,333	11,020	-82,637	-18,284	0	134,870	-18,284
2260	1000.0	2265	-5.00	-30.94	-18.94	25.94	13.94	80,026	31,816	232,004	343,847	18,519	49,738	325,328	133,360	42,845	149,372	325,576	18,519	184,563	307,058	53,333	11,029	-82,633	-18,271	0	134,825	-18,271
2270	1000.0	2275	-5.00	-30.97	-18.97	25.97	13.97	79,993	31,813	232,111	343,917	18,519	49,679	325,399	133,327	42,850	149,483	325,659	18,519	184,459	307,141	53,333	11,037	-82,629	-18,258	0	134,780	-18,258
2280	200.0	2281	-4.38	-31.00	-19.00	26.62	14.62	15,407	8,274	48,874	70,356	3,704	6,881	66,652	22,734	22,734	38,191	58,513	3,241	30,414	55,273	7,326	16,460	-20,484	-11,843	-463	21,534	-11,380
2282	0.0																											
Old River Siphon																												
Total	101,100							9,185,541	3,243,320	30,227,935	32,656,795	1,872,222	7,291,608	30,784,573	14,541,553	4,624,281	11,519,641	30,221,421	1,888,519	22,277,300	28,352,902	5,356,012	1,380,961	-8,708,294	-2,435,375	-3,704	14,980,752	-2,431,671
Max						26.3	16.3																					
Min						19.6	7.6																					

Column Notes:

[1] Canal stations Siphon locations at 100ft increments.

[2] Canal length between calculation stations = Next Row in Coln [1] - Current Row in Coln [1].

[3] Midpoint stations between adjacent calculation stations.

[4] Ground elevation at midpoint station.

[5] Canal invert elevation at midpoint.

[5A] Canal invert elevation at midpoint (Raised canal, raised 12 ft after Disappointment Slough Siphon).

[8] Gound to invert depth = Coln [4] - Coln [5].

[8A] Gound to invert depth = Coln [4] - Coln [5A] (Raised canal, raised 12 ft after Disappointment Slough Siphon).

Table A-13, Incised and Raised Canal Route #1 Quantity Calculation (Downstream of Disappointment Slought)

Canal Profile								Route #1, 10,000cfs Bottom width = 200ft						Route #1, 15,000cfs (12-ft Raised) Bottom width = 340ft							Route #1, 10,000cfs and 15,000cfs (12-ft Raised) Quantity Comparison						
[1] Canal Station (x100ft)	[2] Step Length (ft)	[3] Mid-Point Station (x100ft)	[4] Mid-Point Ground Elev. (ft)	[5] Midpoint Station Invert EL (ft)	[5A] Midpoint 12-ft Raised Invert EL (ft)	[6] Ground to Invert Depth (ft)	[6A] Raised Ground to Invert Depth (ft)	[7] Hydraulic Excav Volume $V_{Hydraulic}$ (cy)	[8] Scraper Excav Volume $V_{scraper}$ (cy)	[9] Dragline Excav Volume $V_{dragline}$ (cy)	[10] Total Excav Volume V_{ex} (cy)	[11] Local Embank Volume V_{em} (cy)	[12] Import Embank Volume V_{em} (cy)	[13] Net Disposal Volume V_{dis} (cy)	[14] Hydraulic Excav Volume $V_{Hydraulic}$ (cy)	[15] Scraper Excav Volume $V_{scraper}$ (cy)	[16] Dragline Excav Volume $V_{dragline}$ (cy)	[17] Total Excav Volumes V_{ex} (cy)	[18] Local Embank Volume V_{em} (cy)	[19] Import Embank Volume V_{em} (cy)	[20] Net Disposal Volume V_{dis} (cy)	[21] Hydraulic Volume Diff. $V_{Hydraulic,diff}$ (cy)	[22] Scraper Volume Diff. $V_{scraper,diff}$ (cy)	[23] Dragline Volume Diff. $V_{dragline,diff}$ (cy)	[24] Total Excav Diff. V_{ex} (cy)	[25] Local Embank Diff. V_{dis} (cy)	[26] Import Embank Diff. V_{dis} (cy)	[27] Disposal Volume Diff. V_{diff} (cy)

[7] 10,000cfs Canal, volume of excavation by hydraulic excavators, interpolated from Cut-Fill Calc Table using Ground to Invert Depth from Colin [6].

[8] 10,000cfs Canal, volume of excavation of the top 3 ft by scraper, interpolated from Cut-Fill Calc Table using Ground to Invert Depth from Colin [6].

[9] 10,000cfs Canal, volume of excavation from 3 ft below ground surface down to invert , by dragline, interpolated from Cut-Fill Calc Table using Grd to Invert Depth from Colin [6].

[10] 10,000cfs Canal, total excavation volume = Colin [7] + Colin [8] + Colin [9].

[11] 10,000cfs Canal, local canal excavated volume used for canal embankments, interpolated from Cut-Fill Calc Table using Grd to Invert Depth from Colin [6].

[12] 10,000cfs Canal, imported soil volume used for canal embankments, interpolated from Cut-Fill Calc Table using Grd to Invert Depth from Colin [6].

[13] 10,000cfs Canal, net disposal volume = Colin [10] - Colin [11].

[14] 15,000cfs Raised Canal, volume of excavation by hydraulic excavators, interpolated from Cut-Fill Calc Table using Ground to Invert Depth from Colin [6].

[15] 15,000cfs Raised Canal, volume of excavation of the top 3 ft by scraper, interpolated from Cut-Fill Calc Table using Ground to Invert Depth from Colin [6].

[16] 15,000cfs Raised Canal, volume of excavation from 3 ft below ground surface down to invert , by dragline, interpolated from Cut-Fill Calc Table using Grd to Invert Depth from Colin [6].

[17] 15,000cfs Raised Canal, total excavation volume = Colin [14] + Colin [15] + Colin [16].

[18] 15,000cfs Raised Canal, local canal excavated volume used for canal embankments, interpolated from Cut-Fill Calc Table using Grd to Invert Depth from Colin [6].

[19] 15,000cfs Raised Canal, imported soil volume used for canal embankments, interpolated from Cut-Fill Calc Table using Grd to Invert Depth from Colin [6].

[20] 15,000cfs Raised Canal, net disposal volume = Colin [17] - Colin [18].

[21] Difference in hydraulic excavation volume (10,000cfs and 15,000cfs raised canals) = Colin [14] - Colin [7]

[22] Difference in scraper excavation volume (10,000cfs and 15,000cfs raised canals) = Colin [15] - Colin [8]

[23] Difference in dragline excavation volume (10,000cfs and 15,000cfs raised canals) = Colin [16] - Colin [9]

[24] Difference in total excavation volume (10,000cfs and 15,000cfs raised canals) = Colin [17] - Colin [10]

[25] Difference in local canal excavated volume used for canal embankments (10,000cfs and 15,000cfs raised canals) = Colin [18] - Colin [11]

[26] Difference in imported soil volume used for canal embankments (10,000cfs and 15,000cfs raised canals) = Colin [19] - Colin [12]

[27] Difference in net disposal volume (10,000cfs and 15,000cfs raised canals) = Colin [20] - Colin [13]

Table A-14, Incised and RaisedCanal Route #1A Quantity Calculation (Old River to Delta-Mendota Canal)

Canal Profile						Route #1A, 10,000cfs (12-ft Raised) Bottom width = 200ft					Route #1A, 15,000cfs (12-ft Raised) Bottom width = 340ft					Route #1A, 10,000cfs and 15,000cfs (12-ft Raised) Quantity Comparison				
[1] Canal Station (x100ft)	[2] Step Length (ft)	[3] Mid-Point Station (x100ft)	[4] Mid-Point Ground Elev. (ft)	[5] Mid-Point Canal Invert EL (ft)	[6] Ground To Invert Depth (ft)	[7] Scraper Excav Volume $V_{scraper}$ (cy)	[8] Dragline Excav Volume $V_{dragline}$ (cy)	[9] Total Excav Volume V_{ex} (cy)	[10] Total Embank Volume V_{em} (cy)	[11] Net Disposal Volume V_{dis} (cy)	[12] Scraper Excav Volume $V_{scraper}$ (cy)	[13] Dragline Excav Volume $V_{dragline}$ (cy)	[14] Total Excav Volume V_{ex} (cy)	[15] Total Embank Volume V_{em} (cy)	[16] Net Disposal Volume V_{dis} (cy)	[17] Scraper Volume Diff. $V_{scraper,diff}$ (cy)	[18] Dragline Volume Diff. $V_{dragline,diff}$ (cy)	[19] Total Excav Diff. V_{ex} (cy)	[20] Total Embank Diff. V_{dis} (cy)	[21] Disposal Volume Diff. V_{diff} (cy)
Old River Siphon																				
2287	300.0	2289	0.00	-19.61	19.61	10,504	46,078	56,582	7,697	48,885	15,170	71,902	87,072	7,697	79,375	4,667	25,824	30,491	0	30,491
2290	1000.0	2295	0.00	-19.63	19.63	35,019	153,643	188,662	25,628	163,034	50,575	239,746	290,321	25,628	264,693	15,556	86,103	101,659	0	101,659
2300	1000.0	2305	0.00	-19.66	19.66	35,029	153,721	188,751	25,585	163,166	50,585	239,861	290,446	25,585	264,861	15,556	86,140	101,695	0	101,695
2310	1000.0	2315	0.00	-19.70	19.70	35,039	153,799	188,839	25,541	163,297	50,595	239,975	290,570	25,541	265,029	15,556	86,176	101,732	0	101,732
2320	1000.0	2325	0.00	-19.73	19.73	35,049	153,877	188,927	25,498	163,429	50,605	240,090	290,695	25,498	265,197	15,556	86,212	101,768	0	101,768
2330	1000.0	2335	0.00	-19.77	19.77	35,060	153,955	189,015	25,454	163,561	50,615	240,204	290,819	25,454	265,365	15,556	86,249	101,804	0	101,804
2340	400.0	2342	11.67	-19.79	31.46	19,477	126,893	146,369	0	146,369	25,699	185,821	211,520	0	211,520	6,222	58,928	65,151	0	65,151
2344	0.0																			
Delta-Mendota Canal																				
Total	5,700					205,177	941,966	1,147,144	135,404	1,011,740	293,844	1,457,599	1,751,443	135,404	1,616,039	88,667	515,632	604,299	0	604,299
Max					31.5															
Min					19.6															

Column Notes:

[1] Canal stations Siphon locations at 100ft increments.
[2] Canal length between calculation stations = Next Row in Coln [1] - Current Row in Coln [1].
[3] Midpoint stations between adjacent calculation stations.
[4] Ground elevation at midpoint station.
[5] Canal invert elevation at midpoint.
[6] Gound to invert depth = Coln [4] - Coln [5].
[7] 10,000cfs Canal, volume of excavation of the top 3 ft by scraper, interpolated from Cut-Fill Calc Table using Ground to Invert Depth from Coln [6].
[8] 10,000cfs Canal, volume of excavation from 3 ft below ground surface down to invert , by dragline, interpolated from Cut-Fill Calc Table using Grd to Invert Depth from Coln [6].
[9] 10,000cfs Canal, total excavation volume = Coln [7] + Coln [8].
[10] 10,000cfs Canal, required fill volume for canal embankments, interpolated from Cut-Fill Calc Table using Grd to Invert Depth from Coln [6].
[11] 10,000cfs Canal, net disposal volume = Coln [9] - Coln [10].
[12] 15,000cfs Canal, volume of excavation of the top 3 ft by scraper, interpolated from Cut-Fill Calc Table using Grd to Invert Depth from Coln [6].
[13] 15,000cfs Canal, volume of excavation from 3 ft below ground surface down to invert, by dragline, interpolated from Cut-Fill Calc Table using Grd to Invert Depth from Coln [6].
[14] 15,000cfs Canal, total excavation volume = Coln [12] + Coln [13].
[15] 15,000cfs Canal, required fill volume for canal embankments , interpolated from Cut-Fill Calc Table using Grd to Invert Depth from Coln [6].
[16] 15,000cfs Canal, net disposal volume = Coln [14] - Coln [15]
[17] Difference in scraper excavation volume (10,000cfs and 15,000cfs canals) = Coln [12] - Coln [7]
[18] Difference in dragline excavation volume (10,000cfs and 15,000cfs canals) = Coln [13] - Coln [8]
[19] Difference in total excavation volume (10,000cfs and 15,000cfs canals) = Coln [14] - Coln [9]
[20] Difference in embankment volume (10,000cfs and 15,000cfs canals) = Coln [15] - Coln [10]
[21] Difference in net disposal volume (10,000cfs and 15,000cfs canals) = Coln [16] - Coln [11]

Table A-15, Incised and RaisedCanal Route #1B Quantity Calculation (Old River to California Aqueduct)

Canal Profile						Route #1B, 10,000cfs (12-ft Raised) Bottom width = 200ft					Route #1B, 15,000cfs (12-ft Raised) Bottom width = 340ft					Route #1B, 10,000cfs and 15,000cfs (12-ft Raised) Quantity Comparison				
[1] Canal Station (x100ft)	[2] Step Length (ft)	[3] Mid-Point Station (x100ft)	[4] Mid-Point Ground Elev. (ft)	[5] Mid-Point Canal Invert EL (ft)	[6] Ground To Invert Depth (ft)	[7] Scraper Excav Volume $V_{scraper}$ (cy)	[8] Dragline Excav Volume $V_{dragline}$ (cy)	[9] Total Excav Volume V_{ex} (cy)	[10] Total Embank Volume V_{em} (cy)	[11] Net Disposal Volume V_{dis} (cy)	[12] Scraper Excav Volume $V_{scraper}$ (cy)	[13] Dragline Excav Volume $V_{dragline}$ (cy)	[14] Total Excav Volume V_{ex} (cy)	[15] Total Embank Volume V_{em} (cy)	[16] Net Disposal Volume V_{dis} (cy)	[17] Scraper Volume Diff. $V_{scraper,diff}$ (cy)	[18] Dragline Volume Diff. $V_{dragline,diff}$ (cy)	[19] Total Excav Diff. V_{ex} (cy)	[20] Total Embank Diff. V_{dis} (cy)	[21] Disposal Volume Diff. V_{diff} (cy)
Old River Siphon																				
2267	300.0	2289	0.00	-19.60	19.60	10,504	46,077	56,580	7,698	48,883	15,170	71,900	87,070	7,698	79,373	4,667	25,823	30,490	0	30,490
2270	1000.0	2295	0.00	-19.62	19.62	35,017	153,625	188,642	25,639	163,004	50,573	239,720	290,293	25,639	264,654	15,556	86,095	101,650	0	101,650
2280	1000.0	2305	0.00	-19.64	19.64	35,024	153,681	188,705	25,607	163,097	50,580	239,802	290,381	25,607	264,774	15,556	86,121	101,676	0	101,676
2310	1000.0	2315	2.50	-19.67	22.17	39,144	181,617	220,760	12,772	207,988	54,699	280,312	335,011	12,772	322,239	15,556	98,695	114,250	0	114,250
2320	1000.0	2325	7.50	-19.69	27.19	45,776	249,840	295,616	0	295,616	61,332	374,487	435,818	0	435,818	15,556	124,647	140,202	0	140,202
2330	1000.0	2335	12.50	-19.72	32.22	49,219	329,893	379,112	0	379,112	64,775	481,321	546,096	0	546,096	15,556	151,428	166,984	0	166,984
2340	1000.0	2345	17.50	-19.74	37.24	52,556	413,122	465,678	0	465,678	68,112	590,502	658,614	0	658,614	15,556	177,380	192,936	0	192,936
2350	1000.0	2355	22.50	-19.77	42.27	55,893	501,918	557,811	0	557,811	71,448	705,250	776,698	0	776,698	15,556	203,332	218,887	0	218,887
2360	1000.0	2365	27.50	-19.79	47.29	59,229	596,281	655,510	0	655,510	74,785	825,565	900,350	0	900,350	15,556	229,284	244,839	0	244,839
2370	1000.0	2375	32.50	-19.82	52.32	62,566	696,210	758,776	0	758,776	78,122	951,446	1,029,568	0	1,029,568	15,556	255,236	270,791	0	270,791
2380	1000.0	2385	37.50	-19.84	57.34	65,903	801,706	867,609	0	867,609	81,458	1,082,894	1,164,352	0	1,164,352	15,556	281,187	296,743	0	296,743
2390	1000.0	2395	42.50	-19.87	62.37	69,239	912,769	982,008	0	982,008	84,795	1,219,908	1,304,703	0	1,304,703	15,556	307,139	322,695	0	322,695
2400	1000.0	2405	47.50	-19.89	67.39	72,576	1,029,399	1,101,975	0	1,101,975	88,132	1,362,490	1,450,621	0	1,450,621	15,556	333,091	348,647	0	348,647
2410	1000.0	2415	52.50	-19.92	72.42	76,019	1,155,592	1,231,611	0	1,231,611	91,575	1,515,465	1,607,040	0	1,607,040	15,556	359,873	375,428	0	375,428
2420	1000.0	2425	57.50	-19.94	77.44	77,750	1,221,257	1,299,007	0	1,299,007	93,306	1,594,591	1,687,896	0	1,687,896	15,556	373,333	388,889	0	388,889
2430	1000.0	2435	62.50	-19.97	82.47	77,750	1,221,257	1,299,007	0	1,299,007	93,306	1,594,591	1,687,896	0	1,687,896	15,556	373,333	388,889	0	388,889
2440	700.0	2444	66.75	-19.99	86.74	54,425	854,880	909,305	0	909,305	65,314	1,116,214	1,181,527	0	1,181,527	10,889	261,333	272,222	0	272,222
2447	0.0																			
California Aqueduct																				
Total	16,000					938,590	10,519,126	11,457,716	71,716	11,386,001	1,187,479	14,246,456	15,433,935	71,716	15,362,220	248,889	3,727,330	3,976,219	0	3,976,219
Max					86.7															
Min					19.6															

Column Notes:

[1] Canal stations Siphon locations at 100ft increments.

[2] Canal length between calculation stations = Next Row in Coln [1] - Current Row in Coln [1].

[3] Midpoint stations between adjacent calculation stations.

[4] Ground elevation at midpoint station.

[5] Canal invert elevation at midpoint.

[6] Gound to invert depth = Coln [4] - Coln [5].

[7] 10,000cfs Canal, volume of excavation of the top 3 ft by scraper, interpolated from Cut-Fill Calc Table using Ground to Invert Depth from Coln [6].

[8] 10,000cfs Canal, volume of excavation from 3 ft below ground surface down to invert , by dragline, interpolated from Cut-Fill Calc Table using Grd to Invert Depth from Coln [6].

[9] 10,000cfs Canal, total excavation volume = Coln [7] + Coln [8].

[10] 10,000cfs Canal, required fill volume for canal embankments, interpolated from Cut-Fill Calc Table using Grd to Invert Depth from Coln [6].

[11] 10,000cfs Canal, net disposal volume = Coln [9] - Coln [10].

[12] 15,000cfs Canal, volume of excavation of the top 3 ft by scraper, interpolated from Cut-Fill Calc Table using Grd to Invert Depth from Coln [6].

[13] 15,000cfs Canal, volume of excavation from 3 ft below ground surface down to invert, by dragline, interpolated from Cut-Fill Calc Table using Grd to Invert Depth from Coln [6].

[14] 15,000cfs Canal, total excavation volume = Coln [12] + Coln [13]

[15] 15,000cfs Canal, required fill volume for canal embankments , interpolated from Cut-Fill Calc Table using Grd to Invert Depth from Coln [6].

[16] 15,000cfs Canal, net disposal volume = Coln [14] - Coln [15]

[17] Difference in scraper excavation volume (10,000cfs and 15,000cfs canals) = Coln [12] - Coln [7]

[18] Difference in dragline excavation volume (10,000cfs and 15,000cfs canals) = Coln [13] - Coln [8]

[19] Difference in total excavation volume (10,000cfs and 15,000cfs canals) = Coln [14] - Coln [9]

[20] Difference in embankment volume (10,000cfs and 15,000cfs canals) = Coln [15] - Coln [10]

[21] Difference in net disposal volume (10,000cfs and 15,000cfs canals) = Coln [16] - Coln [11]

Table A-16, Route #1 Incised and Raised Canal Quantities Comparison Summary

Sacramento River to U/S of Disappointment Slough

Description	Unit	10,000cfs Canal Bottom Width b=200ft	15,000cfs Raised Canal Bottom Width b=340ft	Net Increase
Hydraulic Excavation	CY	0	0	0
Scraper Excavation	CY	4,460,923	5,982,256	1,521,333
Dragline Excavation	CY	24,234,037	36,347,208	12,113,171
Total Excavation	CY	28,694,961	42,329,465	13,634,504
Embank. Fill (Local)	CY	65,266	65,266	0
Embank. Fill (Import)	CY	0	0	0
Net Disposal	CY	28,629,695	42,264,199	13,634,504

D/S of Disappointment Slough to U/S of Old River

Description	Unit	10,000cfs Canal Bottom Width b=200ft	15,000cfs Raised Canal Bottom Width b=340ft	Net Increase
Hydraulic Excavation	CY	9,185,541	14,541,553	5,356,012
Scraper Excavation	CY	3,243,320	4,624,281	1,380,961
Dragline Excavation	CY	20,227,935	11,519,641	-8,708,294
Total Excavation	CY	32,656,795	30,221,421	-2,435,375
Embank. Fill (Local)	CY	1,872,222	1,868,519	-3,704
Embank. Fill (Import)	CY	7,291,608	22,272,360	14,980,752
Net Disposal	CY	30,784,573	28,352,902	-2,431,671

Branch A - D/S of Old River to Delta-Mendota Canal

Description	Unit	10,000cfs Canal Bottom Width b=200ft	15,000cfs Raised Canal Bottom Width b=340ft	Net Increase
Hydraulic Excavation	CY	0	0	0
Scraper Excavation	CY	205,177	293,844	88,667
Dragline Excavation	CY	941,966	1,457,599	515,632
Total Excavation	CY	1,147,144	1,751,443	604,299
Embank. Fill (Local)	CY	135,404	135,404	0
Embank. Fill (Import)	CY	0	0	0
Net Disposal	CY	1,011,740	1,616,039	604,299

Table A-16, Route #1 Incised and Raised Canal Quantities Comparison Summary

Branch B - D/S of Old River to California Aqueduct

Description	Unit	10,000cfs Canal Bottom Width b=200ft	15,000cfs Raised Canal Bottom Width b=340ft	Net Increase
Hydraulic Excavation	CY	0	0	0
Scraper Excavation	CY	938,590	1,187,479	248,889
Dragline Excavation	CY	10,519,126	14,246,456	3,727,330
Total Excavation	CY	11,457,716	15,433,935	3,976,219
Embank. Fill (Local)	CY	71,716	71,716	0
Embank. Fill (Import)	CY	0	0	0
Net Disposal	CY	11,386,001	15,362,220	3,976,219

For the Whole Canal

Description	Unit	10,000cfs Canal Bottom Width b=200ft	15,000cfs Raised Canal Bottom Width b=340ft	Net Increase
Hydraulic Excavation	CY	9,185,541	14,541,553	5,356,012
Scraper Excavation	CY	8,848,011	12,087,861	3,239,849
Dragline Excavation	CY	55,923,065	63,570,903	7,647,839
Total Excavation	CY	73,956,616	89,736,263	15,779,647
Embank. Fill (Local)	CY	2,144,607	2,140,904	-3,704
Embank. Fill (Import)	CY	7,291,608	22,272,360	14,980,752
Net Disposal	CY	71,812,009	87,595,360	15,783,351

Notes:

1. Quantities do not include siphons and check structure stations

Table A-17, Route 2A Raised Canal Invert Data from Reference Report
(Raised Canal D/S of Disappointment Slough)

[1] Canal or Channel Station (x100ft)	[2] Canal Invert Elev. (ft)	[3] Canal Slope s (V:1H)	[4] Canal W.S. Elev. (ft)	[5] Canal Freeboard Elev. (ft)	[6] Raised Invert Elev. (ft)	[7] Raised W.S. Elev. (ft)	[8] Raised Freeboard Elev. (ft)	
0	-20.7	-0.0011	2.8	5.8	-20.7	2.8	5.8	
174	-20.9	-0.0750	2.6	5.6	-20.9	2.6	5.6	Stone Lake
186	-21.8	-0.0011	1.7	4.7	-21.8	1.7	4.7	
376	-22.0	-0.0444	1.5	4.5	-22.0	1.5	4.5	Lost Slough
385	-22.4	-0.0029	1.1	4.1	-22.4	1.1	4.1	
420	-22.5	-0.4250	1.0	4.0	-22.5	1.0	4.0	Mokelumne River
424	-24.2	-0.0020	-0.7	2.3	-24.2	-0.7	2.3	
625	-24.6	-0.1667	-1.1	1.9	-24.6	-1.1	1.9	Beaver Slough
628	-25.1	0.0017	-1.6	1.4	-25.1	-1.6	1.4	
745	-24.9	-0.1667	-1.4	1.6	-24.9	-1.4	1.6	Hog Slough
748	-25.4	-0.0010	-1.9	1.1	-25.4	-1.9	1.1	
846	-25.5	-0.2667	-2.0	1.0	-25.5	-2.0	1.0	Sycamore Slough
849	-26.3	-0.0009	-2.8	0.2	-26.3	-2.8	0.2	
1074	-26.5	-0.0750	-3.0	0.0	-26.5	-3.0	0.0	White Slough
1082	-27.1	-0.0022	-3.6	-0.6	-27.1	-3.6	-0.6	
1218	-27.4	-0.0429	-3.9	-0.9	-27.4	-3.9	-0.9	Disappointment Slough
1232	-28.0	-0.0019	-4.5	-1.5	-16.0	7.5	10.5	
1393	-28.3	-0.0500	-4.8	-1.8	-16.3	7.2	10.2	San Joaquin River
1407	-29.0	-0.0014	-5.5	-2.5	-17.0	6.5	9.5	
1892	-29.7	-0.0727	-6.2	-3.2	-17.7	5.8	8.8	Middle River
1903	-30.5	-0.0004	-7.0	-4.0	-18.5	5.0	8.0	
2127	-30.6	-0.0037	-7.1	-4.1	-18.6	4.9	7.9	
2235	-31.0	2.5333	-7.5	-4.5	-19.0	4.5	7.5	Old River
2239	-19.6	0.0000	3.9	6.9	-19.6	3.9	6.9	
2239	-19.6	-0.0035	3.9	6.9	-19.6	3.9	6.9	
2296	-19.8	-	3.7	6.7	-19.8	3.7	6.7	

Column Notes:

[1] Stationing at Significant Points of Reach

[2] Canal Invert for 10,000 cfs canal

[3] Slope between Significant Points in Canal = (Next Row in Coln [2] - Current Row in Coln [2]) / (Next Row in Coln [1] - Current Row in Coln [1])

[4] Canal W.S. elevation = Coln [2] + 23.5ft (depth of flow)

[5] Canal freeboard elevation = Coln [4] + 3 ft freeboard

[6] Canal invert is raised 12ft higher after Disappointment Slough

[7] Canal W.S. is raised 12ft higher after Disappointment Slough (lifted by pump station)

[8] Canal Freeboard elevation = Coln [7] + 3 ft freeboard

Reference: Isolated Facility, Conceptual Analysis of Incised Canal Configuration, by CALFED Bay-Delta Program, Water Management Planning Branch, dated September 1999, Table 3.4, Two Sheets (pages 30 and 31).

Table A-18, Route 2B Raised Canal Invert Data from Reference Report
(Raised Canal D/S of Disappointment Slough)

[1] Canal or Channel Station (x100ft)	[2] Canal Invert Elev. (ft)	[3] Canal Slope s (V:1H)	[4] Canal W.S. Elev. (ft)	[5] Canal Freeboard Elev. (ft)	[6] Raised Invert Elev. (ft)	[7] Raised W.S. Elev. (ft)	[8] Raised Freeboard Elev. (ft)	
0	-20.7	-0.0011	2.8	5.8	-20.7	2.8	5.8	
174	-20.9	-0.0750	2.6	5.6	-20.9	2.6	5.6	Stone Lake
186	-21.8	-0.0011	1.7	4.7	-21.8	1.7	4.7	
376	-22.0	-0.0444	1.5	4.5	-22.0	1.5	4.5	Lost Slough
385	-22.4	-0.0029	1.1	4.1	-22.4	1.1	4.1	
420	-22.5	-0.4250	1.0	4.0	-22.5	1.0	4.0	Mokelumne River
424	-24.2	-0.0020	-0.7	2.3	-24.2	-0.7	2.3	
625	-24.6	-0.0333	-1.1	1.9	-24.6	-1.1	1.9	Beaver Slough
628	-24.7	-0.0017	-1.2	1.8	-24.7	-1.2	1.8	
745	-24.9	-0.1667	-1.4	1.6	-24.9	-1.4	1.6	Hog Slough
748	-25.4	-0.0010	-1.9	1.1	-25.4	-1.9	1.1	
846	-25.5	-0.2667	-2.0	1.0	-25.5	-2.0	1.0	Sycamore Slough
849	-26.3	-0.0009	-2.8	0.2	-26.3	-2.8	0.2	
1074	-26.5	-0.0750	-3.0	0.0	-26.5	-3.0	0.0	White Slough
1082	-27.1	-0.0022	-3.6	-0.6	-27.1	-3.6	-0.6	
1218	-27.4	-0.0429	-3.9	-0.9	-27.4	-3.9	-0.9	Disappointment Slough
1232	-28.0	-0.0019	-4.5	-1.5	-16.0	7.5	10.5	
1393	-28.3	-0.0500	-4.8	-1.8	-16.3	7.2	10.2	San Joaquin River
1407	-29.0	-0.0014	-5.5	-2.5	-17.0	6.5	9.5	
1892	-29.7	-0.0727	-6.2	-3.2	-17.7	5.8	8.8	Middle River
1903	-30.5	-0.0004	-7.0	-4.0	-18.5	5.0	8.0	
2127	-30.6	-0.0037	-7.1	-4.1	-18.6	4.9	7.9	
2235	-31.0	2.5333	-7.5	-4.5	-19.0	4.5	7.5	Old River
2239	-19.6	0.0000	3.9	6.9	-19.6	3.9	6.9	
2239	-19.6	-0.0025	3.9	6.9	-19.6	3.9	6.9	
2399	-20.0	-	3.5	6.5	-20.0	3.5	6.5	

Column Notes:

[1] Stationing at Significant Points of Reach

[2] Canal Invert for 10,000 cfs canal

[3] Slope between Significant Points in Canal = (Next Row in Coln [2] - Current Row in Coln [2]) / (Next Row in Coln [1] - Current Row in Coln [1])

[4] Canal W.S. elevation = Coln [2] + 23.5ft (depth of flow)

[5] Canal freeboard elevation = Coln [4] + 3 ft freeboard

[6] Canal invert is raised 12ft higher after Disappointment Slough

[7] Canal W.S. is raised 12ft higher after Disappointment Slough (lifted by pump station)

[8] Canal Freeboard elevation = Coln [7] + 3 ft freeboard

Reference: Isolated Facility, Conceptual Analysis of Incised Canal Configuration, by CALFED Bay-Delta Program, Water Management Planning Branch, dated September 1999, Table 3.4, Two Sheets (pages 30 and 31).

Table A-19, Route 2A Ground Elevations
(for Both Incised and Raised Canals)

[1] Cannel Station (x100ft)	[2] Ground Elev. (ft)	[3] Diff Station (ft)	[4] Diff Elev. (ft)	[5] Slope (V:H)
0	5.5	200	-0.5	-0.0025
200	5	20	0	0.0000
220	5	20	-1	-0.0500
240	4	170	0	0.0000
410	4	30	1	0.0333
440	5	10	-10	-1.0000
450	-5	11	10	0.9091
461	5	19	-3	-0.1579
480	2	16	1	0.0625
496	3	20	0	0.0000
516	3	20	-1	-0.0500
536	2	10	-3	-0.3000
546	-1	10	1	0.1000
556	0	30	0	0.0000
586	0	40	0	0.0000
626	0	15	-5	-0.3333
641	-5	10	2	0.2000
651	-3	35	0	0.0000
686	-3	30	0	0.0000
716	-3	30	2	0.0667
746	-1	20	0	0.0000
766	-1	35	1	0.0286
801	0	75	0	0.0000
876	0	40	-5	-0.1250
916	-5	40	0	0.0000
956	-5	40	0	0.0000
996	-5	10	-1	-0.1000
1006	-6	20	0	0.0000
1026	-6	20	1	0.0500
1046	-5	30	0	0.0000
1076	-5	5	-3	-0.6000
1081	-8	25	-2	-0.0800
1106	-10	30	-2	-0.0667
1136	-12	50	1	0.0200
1186	-11	30	-1	-0.0333
1216	-12	90	2	0.0222
1306	-10	40	-2	-0.0500
1346	-12	40	2	0.0500
1386	-10	20	4	0.2000
1406	-6	10	1	0.1000
1416	-5	10	0	0.0000
1426	-5	10	-5	-0.5000
1436	-10	30	0	0.0000

Table A-19, Route 2A Ground Elevations
(for Both Incised and Raised Canals)

[1] Cannel Station (x100ft)	[2] Ground Elev. (ft)	[3] Diff Station (ft)	[4] Diff Elev. (ft)	[5] Slope (V:H)
1466	-10	80	0	0.0000
1546	-10	30	2	0.0667
1576	-8	20	1	0.0500
1596	-7	20	2	0.1000
1616	-5	36.5	0	0.0000
1653	-5	60	0	0.0000
1713	-5	50	-1	-0.0200
1763	-6	40	1	0.0250
1803	-5	60	1	0.0167
1863	-4	25	-1	-0.0400
1888	-5	15	-5	-0.3333
1903	-10	40	-1	-0.0250
1943	-11	65	1	0.0154
2008	-10	5	0	0.0000
2013	-10	20	-1	-0.0500
2033	-11	30	1	0.0333
2063	-10	65	0	0.0000
2128	-10	25	5	0.2000
2153	-5	79.5	0	0.0000
2232	-5	8	5	0.6250
2240	0	22	0	0.0000
2262	0	25	0	0.0000
2287	0	9	15	1.6667
2296	15	-	-	-

Table A-20, Route 2B Ground Elevations
(for Both Incised and Raised Canals)

[1] Cannel Station (x100ft)	[2] Ground Elev. (ft)	[3] Diff Station (ft)	[4] Diff Elev. (ft)	[5] Slope (V:H)
0	5.5	200	-0.5	-0.0025
200	5	20	0	0.0000
220	5	20	-1	-0.0500
240	4	170	0	0.0000
410	4	30	1	0.0333
440	5	10	-10	-1.0000
450	-5	11	10	0.9091
461	5	19	-3	-0.1579
480	2	16	1	0.0625
496	3	20	0	0.0000
516	3	20	-1	-0.0500
536	2	10	-3	-0.3000
546	-1	10	1	0.1000
556	0	30	0	0.0000
586	0	40	0	0.0000
626	0	15	-5	-0.3333
641	-5	10	2	0.2000
651	-3	35	0	0.0000
686	-3	30	0	0.0000
716	-3	30	2	0.0667
746	-1	20	0	0.0000
766	-1	35	1	0.0286
801	0	75	0	0.0000
876	0	40	-5	-0.1250
916	-5	40	0	0.0000
956	-5	40	0	0.0000
996	-5	10	-1	-0.1000
1006	-6	20	0	0.0000
1026	-6	20	1	0.0500
1046	-5	30	0	0.0000
1076	-5	5	-3	-0.6000
1081	-8	25	-2	-0.0800
1106	-10	30	-2	-0.0667
1136	-12	50	1	0.0200
1186	-11	30	-1	-0.0333
1216	-12	90	2	0.0222
1306	-10	40	-2	-0.0500
1346	-12	40	2	0.0500
1386	-10	20	4	0.2000
1406	-6	10	1	0.1000
1416	-5	10	0	0.0000
1426	-5	10	-5	-0.5000
1436	-10	30	0	0.0000

Table A-20, Route 2B Ground Elevations
(for Both Incised and Raised Canals)

[1] Cannel Station (x100ft)	[2] Ground Elev. (ft)	[3] Diff Station (ft)	[4] Diff Elev. (ft)	[5] Slope (V:H)
1466	-10	80	0	0.0000
1546	-10	30	2	0.0667
1576	-8	20	1	0.0500
1596	-7	20	2	0.1000
1616	-5	36.5	0	0.0000
1653	-5	60	0	0.0000
1713	-5	50	-1	-0.0200
1763	-6	40	1	0.0250
1803	-5	60	1	0.0167
1863	-4	25	-1	-0.0400
1888	-5	15	-5	-0.3333
1903	-10	40	-1	-0.0250
1943	-11	65	1	0.0154
2008	-10	5	0	0.0000
2013	-10	20	-1	-0.0500
2033	-11	30	1	0.0333
2063	-10	65	0	0.0000
2128	-10	25	5	0.2000
2153	-5	82.5	0	0.0000
2235	-5	5	5	1.0000
2240	0	22	0	0.0000
2262	0	10	5	0.5000
2272	5	10	5	0.5000
2282	10	10	5	0.5000
2292	15	20	5	0.2500
2312	20	35	10	0.2857
2347	30	55	10	0.1818
2402	40	-	-	-

Table A-21, Canal Route #2 Quantity Calculation (Sacramento River to Disappointment Slough)

Canal Profile								Route #2, 10,000cfs Bottom width = 200ft					Route #2, 15,000cfs Bottom width = 340ft					Route #2 (12-ft Raised) with 15,000cfs Bottom width = 340ft				
[1] Canal Station (x100ft)	[2] Step Length (ft)	[3] Mid-Point Station (x100ft)	[4] Mid-Point Ground Elev. (ft)	[5] Canal Midpoint Invert EL (ft)	[5A] 12-ft Raised Canal Invert EL (ft)	[6] Canal Ground to Invert Depth (ft)	[6A] Raised Ground to Invert Depth (ft)	[7] Scraper Excav Volume $V_{scraper}$ (cy)	[8] Dragline Excav Volume $V_{dragline}$ (cy)	[9] Total Excav Volume V_{ex} (cy)	[10] Total Embank Volume V_{em} (cy)	[11] Net Disposal Volume V_{dis} (cy)	[12] Scraper Excav Volume $V_{scraper}$ (cy)	[13] Dragline Excav Volume $V_{dragline}$ (cy)	[14] Total Excav Volume V_{ex} (cy)	[15] Total Embank Volume V_{em} (cy)	[16] Net Disposal Volume V_{dis} (cy)	[17] Scraper Excav Volume $V_{scraper}$ (cy)	[18] Dragline Excav Volume $V_{dragline}$ (cy)	[19] Total Excav Volume V_{ex} (cy)	[20] Total Embank Volume V_{em} (cy)	[21] Net Disposal Volume V_{dis} (cy)
Sacramento River																						
0	1000.0	5	5.49	-20.71	-20.71	26.19	26.19	45,069	235,061	280,130	869	279,261	60,624	354,521	415,145	869	414,276	60,624	354,521	415,145	869	414,276
10	1000.0	15	5.46	-20.72	-20.72	26.18	26.18	45,066	235,022	280,088	874	279,214	60,622	354,468	415,089	874	414,215	60,622	354,468	415,089	874	414,215
20	1000.0	25	5.44	-20.73	-20.73	26.17	26.17	45,064	234,983	280,047	879	279,167	60,620	354,414	415,034	879	414,155	60,620	354,414	415,034	879	414,155
30	1000.0	35	5.41	-20.74	-20.74	26.15	26.15	45,062	234,943	280,005	885	279,120	60,617	354,361	414,978	885	414,094	60,617	354,361	414,978	885	414,094
40	1000.0	45	5.39	-20.75	-20.75	26.14	26.14	45,060	234,904	279,964	890	279,074	60,615	354,308	414,923	890	414,033	60,615	354,308	414,923	890	414,033
50	1000.0	55	5.36	-20.76	-20.76	26.13	26.13	45,058	234,865	279,922	895	279,027	60,613	354,254	414,867	895	413,972	60,613	354,254	414,867	895	413,972
60	1000.0	65	5.34	-20.77	-20.77	26.11	26.11	45,055	234,825	279,881	901	278,980	60,611	354,201	414,812	901	413,911	60,611	354,201	414,812	901	413,911
70	1000.0	75	5.31	-20.79	-20.79	26.10	26.10	45,053	234,786	279,839	906	278,933	60,609	354,147	414,756	906	413,850	60,609	354,147	414,756	906	413,850
80	1000.0	85	5.29	-20.80	-20.80	26.09	26.09	45,051	234,747	279,797	911	278,886	60,606	354,094	414,701	911	413,789	60,606	354,094	414,701	911	413,789
90	1000.0	95	5.26	-20.81	-20.81	26.07	26.07	45,049	234,707	279,756	916	278,839	60,604	354,041	414,645	916	413,729	60,604	354,041	414,645	916	413,729
100	1000.0	105	5.24	-20.82	-20.82	26.06	26.06	45,047	234,668	279,714	922	278,793	60,602	353,987	414,589	922	413,668	60,602	353,987	414,589	922	413,668
110	1000.0	115	5.21	-20.83	-20.83	26.04	26.04	45,044	234,628	279,673	927	278,746	60,600	353,934	414,534	927	413,607	60,600	353,934	414,534	927	413,607
120	1000.0	125	5.19	-20.84	-20.84	26.03	26.03	45,042	234,589	279,631	932	278,699	60,598	353,881	414,478	932	413,546	60,598	353,881	414,478	932	413,546
130	1000.0	135	5.16	-20.86	-20.86	26.02	26.02	45,040	234,550	279,590	938	278,652	60,595	353,827	414,423	938	413,485	60,595	353,827	414,423	938	413,485
140	1000.0	145	5.14	-20.87	-20.87	26.00	26.00	45,038	234,510	279,548	943	278,605	60,593	353,774	414,367	943	413,424	60,593	353,774	414,367	943	413,424
150	1000.0	155	5.11	-20.88	-20.88	25.99	25.99	44,893	232,159	277,052	1,275	275,777	60,449	350,579	411,028	1,275	409,753	60,449	350,579	411,028	1,275	409,753
160	1000.0	165	5.09	-20.89	-20.89	25.98	25.98	44,891	232,120	277,011	1,281	275,730	60,446	350,526	410,972	1,281	409,692	60,446	350,526	410,972	1,281	409,692
170	400.0	172	5.07	-20.90	-20.90	25.97	25.97	17,956	92,837	110,793	514	110,279	24,178	140,196	164,373	514	163,860	24,178	140,196	164,373	514	163,860
174	0.0																					
Stone Lake Siphon																						
186	400.0	188	5.03	-21.80	-21.80	26.83	26.83	18,248	98,550	116,798	0	116,798	24,471	147,926	172,397	0	172,397	24,471	147,926	172,397	0	172,397
190	1000.0	195	5.01	-21.81	-21.81	26.82	26.82	45,620	246,344	291,964	0	291,964	61,175	369,774	430,949	0	430,949	61,175	369,774	430,949	0	430,949
200	1000.0	205	5.00	-21.82	-21.82	26.82	26.82	45,619	246,338	291,958	0	291,958	61,175	369,766	430,941	0	430,941	61,175	369,766	430,941	0	430,941
210	1000.0	215	5.00	-21.83	-21.83	26.83	26.83	45,621	246,370	291,990	0	291,990	61,176	369,809	430,985	0	430,985	61,176	369,809	430,985	0	430,985
220	1000.0	225	4.75	-21.84	-21.84	26.59	26.59	45,374	240,915	286,289	146	286,143	60,930	362,446	423,376	146	423,230	60,930	362,446	423,376	146	423,230
230	1000.0	235	4.25	-21.85	-21.85	26.10	26.10	45,054	234,794	279,848	905	278,943	60,609	354,159	414,768	905	413,863	60,609	354,159	414,768	905	413,863
240	1000.0	245	4.00	-21.86	-21.86	25.86	25.86	44,870	231,788	276,658	1,328	275,330	60,426	350,074	410,500	1,328	409,172	60,426	350,074	410,500	1,328	409,172
250	1000.0	255	4.00	-21.87	-21.87	25.87	25.87	44,872	231,818	276,690	1,324	275,367	60,428	350,116	410,543	1,324	409,220	60,428	350,116	410,543	1,324	409,220
260	1000.0	265	4.00	-21.88	-21.88	25.88	25.88	44,874	231,849	276,723	1,319	275,403	60,430	350,157	410,587	1,319	409,267	60,430	350,157	410,587	1,319	409,267
270	1000.0	275	4.00	-21.89	-21.89	25.89	25.89	44,876	231,879	276,755	1,315	275,440	60,431	350,198	410,630	1,315	409,315	60,431	350,198	410,630	1,315	409,315
280	1000.0	285	4.00	-21.90	-21.90	25.90	25.90	44,878	231,909	276,787	1,311	275,476	60,433	350,240	410,673	1,311	409,362	60,433	350,240	410,673	1,311	409,362
290	1000.0	295	4.00	-21.91	-21.91	25.91	25.91	44,880	231,940	276,819	1,306	275,513	60,435	350,281	410,716	1,306	409,410	60,435	350,281	410,716	1,306	409,410
300	900.0	305	4.00	-21.92	-21.92	25.92	25.92	40,393	208,772	249,165	1,172	247,993	54,393	315,288	369,682	1,172	368,509	54,393	315,288	369,682	1,172	368,509
309	1100.0	315	4.00	-21.94	-21.94	25.94	25.94	[illegible]	[illegible]	[illegible]	1,428	[illegible]	[illegible]	[illegible]	[illegible]	1,428	[illegible]	[illegible]	[illegible]	[illegible]	1,428	[illegible]
320	600.0	323	4.00	-21.94	-21.94	25.94	25.94	[illegible]	[illegible]	[illegible]	777	[illegible]	[illegible]	[illegible]	[illegible]	777	[illegible]	[illegible]	[illegible]	[illegible]	777	[illegible]
326	1400.0	333	4.00	-21.95	-21.95	25.95	25.95	62,841	324,878	387,719	1,806	385,913	84,619	490,613	575,233	1,806	573,427	84,619	490,613	575,233	1,806	573,427
340	1000.0	345	4.00	-21.97	-21.97	25.97	25.97	44,889	232,092	276,981	1,285	275,696	60,445	350,488	410,932	1,285	409,647	60,445	350,488	410,932	1,285	409,647
350	1000.0	355	4.00	-21.98	-21.98	25.98	25.98	44,891	232,122	277,013	1,281	275,733	60,446	350,529	410,976	1,281	409,695	60,446	350,529	410,976	1,281	409,695
360	1000.0	365	4.00	-21.99	-21.99	25.99	25.99	44,893	232,153	277,046	1,276	275,769	60,448	350,570	411,019	1,276	409,742	60,448	350,570	411,019	1,276	409,742
370	600.0	373	4.00	-22.00	-22.00	26.00	26.00	26,937	139,306	166,243	764	165,479	36,270	210,362	246,632	764	245,868	36,270	210,362	246,632	764	245,868
376	0.0																					
Lost Slough Siphon																						
385	500.0	388	4.00	-22.41	-22.41	26.41	26.41	22,675	120,185	142,860	89	142,770	30,452	180,856	211,308	89	211,219	30,452	180,856	211,308	89	211,219
390	1000.0	395	4.00	-22.43	-22.43	26.43	26.43	45,352	240,434	285,786	175	285,611	60,908	361,797	422,704	175	422,530	60,908	361,797	422,704	175	422,530
400	1000.0	405	4.00	-22.46	-22.46	26.46	26.46	45,356	240,518	285,874	170	285,705	60,911	361,911	422,822	170	422,653	60,911	361,911	422,822	170	422,653
410	1000.0	415	4.17	-22.49	-22.49	26.65	26.65	45,490	243,464	288,955	0	288,955	61,046	365,889	426,935	0	426,935	61,046	365,889	426,935	0	426,935
420	0.0																					
Mokelumne River Control Structure and Siphon																						
424	600.0	427	4.57	-24.21	-24.21	28.77	28.77	28,104	164,362	192,466	0	192,466	37,437	244,114	281,551	0	281,551	37,437	244,114	281,551	0	281,551
430	1000.0	435	4.83	-24.22	-24.22	29.06	29.06	47,091	279,705	326,796	0	326,796	62,646	414,577	477,224	0	477,224	62,646	414,577	477,224	0	477,224

Table A-21, Canal Route #2 Quantity Calculation (Sacramento River to Disappointment Slough)

Canal Profile								Route #2, 10,000cfs Bottom width = 200ft					Route #2, 15,000cfs Bottom width = 340ft					Route #2 (12-ft Raised) with 15,000cfs Bottom width = 340ft				
[1] Canal Station (x100ft)	[2] Step Length (ft)	[3] Mid-Point Station (x100ft)	[4] Mid-Point Ground Elev. (ft)	[5] Canal Midpoint Invert EL (ft)	[5A] 12-ft Raised Canal Invert EL (ft)	[6] Canal Ground to Invert Depth (ft)	[6A] Raised Ground to Invert Depth (ft)	[7] Scraper Excav Volume $V_{scraper}$ (cy)	[8] Dragline Excav Volume $V_{dragline}$ (cy)	[9] Total Excav Volume V_{ex} (cy)	[10] Total Embank Volume V_{em} (cy)	[11] Net Disposal Volume V_{dis} (cy)	[12] Scraper Excav Volume $V_{scraper}$ (cy)	[13] Dragline Excav Volume $V_{dragline}$ (cy)	[14] Total Excav Volume V_{ex} (cy)	[15] Total Embank Volume V_{em} (cy)	[16] Net Disposal Volume V_{dis} (cy)	[17] Scraper Excav Volume $V_{scraper}$ (cy)	[18] Dragline Excav Volume $V_{dragline}$ (cy)	[19] Total Excav Volume V_{ex} (cy)	[20] Total Embank Volume V_{em} (cy)	[21] Net Disposal Volume V_{dis} (cy)
440	1000.0	445	0.00	-24.24	-24.24	24.24	24.24	42,916	209,454	252,371	5,241	247,129	58,472	319,424	377,895	5,241	372,654	58,472	319,424	377,895	5,241	372,654
450	1000.0	455	-0.45	-24.26	-24.26	23.81	23.81	42,269	204,031	246,300	6,416	239,884	57,825	311,890	369,715	6,416	363,299	57,825	311,890	369,715	6,416	363,299
460	1000.0	465	4.37	-24.28	-24.28	28.65	28.65	46,823	273,562	320,385	0	320,385	62,379	406,354	468,733	0	468,733	62,379	406,354	468,733	0	468,733
470	1000.0	475	2.79	-24.30	-24.30	27.09	27.09	45,762	249,529	295,291	0	295,291	61,318	374,068	435,386	0	435,386	61,318	374,068	435,386	0	435,386
480	1000.0	485	2.31	-24.32	-24.32	26.63	26.63	45,488	243,409	288,897	0	288,897	61,043	365,815	426,858	0	426,858	61,043	365,815	426,858	0	426,858
490	1000.0	495	2.94	-24.34	-24.34	27.28	27.28	45,894	252,481	298,375	0	298,375	61,449	378,045	439,494	0	439,494	61,449	378,045	439,494	0	439,494
500	1000.0	505	3.00	-24.36	-24.36	27.36	27.36	45,905	252,728	298,633	0	298,633	61,460	378,377	439,837	0	439,837	61,460	378,377	439,837	0	439,837
510	1000.0	515	3.00	-24.38	-24.38	27.38	27.38	45,907	252,788	298,695	0	298,695	61,463	378,457	439,920	0	439,920	61,463	378,457	439,920	0	439,920
520	1000.0	525	2.55	-24.40	-24.40	26.95	26.95	45,637	246,728	292,365	0	292,365	61,192	370,292	431,485	0	431,485	61,192	370,292	431,485	0	431,485
530	1000.0	535	2.05	-24.42	-24.42	26.47	26.47	45,358	240,559	285,917	167	285,750	60,913	361,966	422,879	167	422,712	60,913	361,966	422,879	167	422,712
540	1100.0	546	-0.85	-24.44	-24.44	23.59	23.59	45,804	219,205	265,009	8,282	256,727	62,915	335,779	398,694	8,282	390,412	62,915	335,779	398,694	8,282	390,412
549	900.0	556	-0.05	-24.46	-24.46	24.41	24.41	[illegible]	[illegible]	[illegible]	4,236	[illegible]	[illegible]	[illegible]	[illegible]	4,236	[illegible]	[illegible]	[illegible]	[illegible]	4,236	[illegible]
560	1000.0	565	0.00	-24.48	-24.48	24.48	24.48	[illegible]	[illegible]	[illegible]	4,670	[illegible]	[illegible]	[illegible]	[illegible]	4,670	[illegible]	[illegible]	[illegible]	[illegible]	4,670	[illegible]
570	1000.0	575	0.00	-24.50	-24.50	24.50	24.50	[illegible]	[illegible]	[illegible]	4,660	[illegible]	[illegible]	[illegible]	[illegible]	4,660	[illegible]	[illegible]	[illegible]	[illegible]	4,660	[illegible]
580	1000.0	585	0.00	-24.52	-24.52	24.52	24.52	[illegible]	[illegible]	[illegible]	4,649	[illegible]	[illegible]	[illegible]	[illegible]	4,649	[illegible]	[illegible]	[illegible]	[illegible]	4,649	[illegible]
590	1000.0	595	0.00	-24.54	-24.54	24.54	24.54	[illegible]	[illegible]	[illegible]	4,639	[illegible]	[illegible]	[illegible]	[illegible]	4,639	[illegible]	[illegible]	[illegible]	[illegible]	4,639	[illegible]
600	1000.0	605	0.00	-24.56	-24.56	24.56	24.56	[illegible]	[illegible]	[illegible]	4,628	[illegible]	[illegible]	[illegible]	[illegible]	4,628	[illegible]	[illegible]	[illegible]	[illegible]	4,628	[illegible]
610	600.0	613	0.00	-24.58	-24.58	24.58	24.58	[illegible]	[illegible]	[illegible]	2,772	[illegible]	[illegible]	[illegible]	[illegible]	2,772	[illegible]	[illegible]	[illegible]	[illegible]	2,772	[illegible]
620	800.0	620	0.00	-24.59	-24.59	24.59	24.59	34,603	170,048	204,651	3,690	200,961	47,047	258,976	306,023	3,690	302,333	47,047	258,976	306,023	3,690	302,333
624	0.0																					
Beaver Slough Siphon																						
628	200.0	629	-1.00	-25.10	-25.10	24.10	24.10	8,525	41,386	49,910	1,155	48,755	11,636	63,184	74,820	1,155	73,664	11,636	63,184	74,820	1,155	73,664
630	1000.0	635	-3.00	-25.09	-25.09	22.09	22.09	39,115	181,417	220,531	12,842	207,690	54,670	280,027	334,697	12,842	321,855	54,670	280,027	334,697	12,842	321,855
640	1000.0	645	-4.20	-25.07	-25.07	20.87	20.87	36,975	167,225	204,200	18,629	185,571	52,531	259,595	312,126	18,629	293,496	52,531	259,595	312,126	18,629	293,496
650	1000.0	655	-3.00	-25.05	-25.05	22.05	22.05	39,102	181,333	220,436	12,871	207,565	54,658	279,908	334,566	12,871	321,695	54,658	279,908	334,566	12,871	321,695
660	1000.0	665	-3.00	-25.04	-25.04	22.04	22.04	39,096	181,292	220,388	12,885	207,503	54,652	279,848	334,500	12,885	321,615	54,652	279,848	334,500	12,885	321,615
670	1000.0	675	-3.00	-25.02	-25.02	22.02	22.02	39,090	181,250	220,340	12,900	207,440	54,646	279,789	334,435	12,900	321,535	54,646	279,789	334,435	12,900	321,535
680	1000.0	685	-3.00	-25.00	-25.00	22.00	22.00	39,084	181,208	220,292	12,914	207,378	54,640	279,729	334,369	12,914	321,455	54,640	279,729	334,369	12,914	321,455
690	1000.0	695	-3.00	-24.99	-24.99	21.99	21.99	38,794	179,234	218,028	13,636	204,392	54,349	276,908	331,257	13,636	317,621	54,349	276,908	331,257	13,636	317,621
700	1000.0	705	-3.00	-24.97	-24.97	21.97	21.97	38,788	179,193	217,980	13,651	204,329	54,343	276,849	331,192	13,651	317,541	54,343	276,849	331,192	13,651	317,541
710	1000.0	715	-3.00	-24.95	-24.95	21.95	21.95	38,782	179,152	217,933	13,666	204,267	54,337	276,790	331,127	13,666	317,461	54,337	276,790	331,127	13,666	317,461
720	1000.0	725	-2.40	-24.93	-24.93	22.53	22.53	39,842	186,439	226,281	11,143	215,138	55,398	287,170	342,568	11,143	331,425	55,398	287,170	342,568	11,143	331,425
730	1000.0	735	-1.73	-24.92	-24.92	23.18	23.18	40,926	194,107	235,034	8,864	226,169	56,482	298,001	354,483	8,864	345,619	56,482	298,001	354,483	8,864	345,619
740	500.0	743	-1.23	-24.90	-24.90	23.67	23.67	20,975	100,785	121,760	3,491	118,269	28,753	154,229	182,982	3,491	179,491	28,753	154,229	182,982	3,491	179,491
745	0.0																					
Hog Slough Siphon																						
749	100.0	750	-1.00	-25.40	-25.40	24.40	24.40	4,320	21,205	25,525	471	25,053	5,876	32,301	38,177	471	37,705	5,876	32,301	38,177	471	37,705
750	1000.0	755	-1.00	-25.41	-25.41	24.41	24.41	43,202	212,061	255,263	4,710	250,554	58,758	323,032	381,789	4,710	377,080	58,758	323,032	381,789	4,710	377,080
760	1000.0	765	-1.00	-25.42	-25.42	24.42	24.42	43,205	212,089	255,294	4,704	250,590	58,760	323,070	381,831	4,704	377,127	58,760	323,070	381,831	4,704	377,127
770	1000.0	775	-0.74	-25.43	-25.43	24.68	24.68	43,504	214,999	258,503	4,136	254,366	59,060	327,087	386,146	4,136	382,010	59,060	327,087	386,146	4,136	382,010
780	1000.0	785	-0.46	-25.44	-25.44	24.98	24.98	43,794	218,014	261,808	3,575	258,233	59,349	331,239	390,588	3,575	387,013	59,349	331,239	390,588	3,575	387,013
790	1000.0	795	-0.17	-25.45	-25.45	25.28	25.28	44,254	223,296	267,550	2,651	264,899	59,810	338,487	398,296	2,651	395,645	59,610	338,487	398,296	2,651	395,645
800	1000.0	805	0.00	-25.46	-25.46	25.46	25.46	44,471	226,065	270,536	2,199	268,337	60,027	342,273	402,300	2,199	400,101	60,027	342,273	402,300	2,199	400,101
810	1000.0	815	0.00	-25.47	-25.47	25.47	25.47	44,473	226,094	270,567	2,194	268,373	60,029	342,313	402,342	2,194	400,148	60,029	342,313	402,342	2,194	400,148
820	1000.0	825	0.00	-25.48	-25.48	25.48	25.48	44,476	226,123	270,598	2,190	268,409	60,031	342,352	402,383	2,190	400,194	60,031	342,352	402,383	2,190	400,194
830	1000.0	835	0.00	-25.49	-25.49	25.49	25.49	44,478	226,152	270,629	2,185	268,444	60,033	342,392	402,425	2,185	400,240	60,033	342,392	402,425	2,185	400,240
840	600.0	843	0.00	-25.50	-25.50	25.50	25.50	26,688	135,706	162,393	1,309	161,084	36,021	205,454	241,475	1,309	240,166	36,021	205,454	241,475	1,309	240,166
846	0.0																					
Sycamore Slough Siphon																						
849	100.0	850	0.00	-26.30	-26.30	26.30	26.30	4,521	23,771	28,292	52	28,241	6,077	35,811	41,888	52	41,836	6,077	35,811	41,888	52	41,836
850	1000.0	855	0.00	-26.31	-26.31	26.31	26.31	45,216	237,721	282,937	514	282,423	60,771	358,127	418,898	514	418,384	60,771	358,127	418,898	514	418,384

Table A-21, Canal Route #2 Quantity Calculation (Sacramento River to Disappointment Slough)

Canal Profile								Route #2, 10,000cfs Bottom width = 200ft					Route #2, 15,000cfs Bottom width = 340ft					Route #2 (12-ft Raised) with 15,000cfs Bottom width = 340ft				
[1] Canal Station (x100ft)	[2] Step Length (ft)	[3] Mid-Point Station (x100ft)	[4] Mid-Point Ground Elev. (ft)	[5] Canal Midpoint Invert EL (ft)	[5A] 12-ft Raised Canal Invert EL (ft)	[6] Canal Ground to Invert Depth (ft)	[6A] Raised Ground to Invert Depth (ft)	[7] Scraper Excav Volume $V_{scraper}$ (cy)	[8] Dragline Excav Volume $V_{dragline}$ (cy)	[9] Total Excav Volume V_{ex} (cy)	[10] Total Embank Volume V_{em} (cy)	[11] Net Disposal Volume V_{dis} (cy)	[12] Scraper Excav Volume $V_{scraper}$ (cy)	[13] Dragline Excav Volume $V_{dragline}$ (cy)	[14] Total Excav Volume V_{ex} (cy)	[15] Total Embank Volume V_{em} (cy)	[16] Net Disposal Volume V_{dis} (cy)	[17] Scraper Excav Volume $V_{scraper}$ (cy)	[18] Dragline Excav Volume $V_{dragline}$ (cy)	[19] Total Excav Volume V_{ex} (cy)	[20] Total Embank Volume V_{em} (cy)	[21] Net Disposal Volume V_{dis} (cy)
860	1000.0	865	0.00	-26.31	-26.31	26.31	26.31	45,217	237,747	282,964	511	282,454	60,772	358,162	418,935	511	418,424	60,772	358,162	418,935	511	418,424
870	1000.0	875	0.00	-26.32	-26.32	26.32	26.32	45,218	237,774	282,992	507	282,484	60,774	358,198	418,971	507	418,464	60,774	358,198	418,971	507	418,464
880	1000.0	885	-1.13	-26.33	-26.33	25.21	25.21	44,239	223,100	267,339	2,683	264,655	59,794	338,219	398,013	2,683	395,329	59,794	338,219	398,013	2,683	395,329
890	1000.0	895	-2.38	-26.34	-26.34	23.97	23.97	42,321	204,452	246,773	6,323	240,450	57,876	312,476	370,352	6,323	364,030	57,876	312,476	370,352	6,323	364,030
900	1000.0	905	-3.63	-26.35	-26.35	22.72	22.72	40,194	188,905	229,100	10,369	218,730	55,750	290,664	346,414	10,369	336,045	55,750	290,664	346,414	10,369	336,045
910	1000.0	915	-4.88	-26.36	-26.36	21.48	21.48	38,046	174,223	212,270	15,584	196,686	53,602	269,718	323,320	15,584	307,736	53,602	269,718	323,320	15,584	307,736
920	1000.0	925	-5.00	-26.37	-26.37	21.37	21.37	37,721	172,073	209,794	16,480	193,314	53,276	266,617	319,894	16,480	303,414	53,276	266,617	319,894	16,480	303,414
930	1000.0	935	-5.00	-26.38	-26.38	21.38	21.38	37,724	172,094	209,818	16,471	193,347	53,279	266,648	319,927	16,471	303,456	53,279	266,648	319,927	16,471	303,456
940	1000.0	945	-5.00	-26.39	-26.39	21.39	21.39	37,727	172,115	209,842	16,462	193,380	53,283	266,678	319,960	16,462	303,498	53,283	266,678	319,960	16,462	303,498
950	1000.0	955	-5.00	-26.39	-26.39	21.39	21.39	37,730	172,136	209,866	16,454	193,412	53,286	266,708	319,993	16,454	303,540	53,286	266,708	319,993	16,454	303,540
960	1000.0	965	-5.00	-26.40	-26.40	21.40	21.40	38,018	174,033	212,050	15,660	196,390	53,573	269,443	323,017	15,660	307,356	53,573	269,443	323,017	15,660	307,356
970	1000.0	975	-5.00	-26.41	-26.41	21.41	21.41	38,021	174,054	212,075	15,652	196,423	53,576	269,474	323,050	15,652	307,398	53,576	269,474	323,050	15,652	307,398
980	1000.0	985	-5.00	-26.42	-26.42	21.42	21.42	38,024	174,075	212,099	15,644	196,455	53,580	269,504	323,083	15,644	307,440	53,580	269,504	323,083	15,644	307,440
990	1000.0	995	-5.00	-26.43	-26.43	21.43	21.43	38,027	174,096	212,123	15,635	196,488	53,583	269,534	323,117	15,635	307,482	53,583	269,534	323,117	15,635	307,482
1000	1000.0	1005	-5.90	-26.44	-26.44	20.54	20.54	36,296	162,842	199,138	20,739	178,400	51,852	253,208	305,060	20,739	284,321	51,852	253,208	305,060	20,739	284,321
1010	1000.0	1015	-6.00	-26.45	-26.45	20.45	20.45	36,265	162,636	198,901	20,840	178,061	51,820	252,908	304,728	20,840	283,888	51,820	252,908	304,728	20,840	283,888
1020	1000.0	1025	-6.00	-26.46	-26.46	20.46	20.46	36,268	162,656	198,924	20,830	178,094	51,823	252,937	304,761	20,830	283,930	51,823	252,937	304,761	20,830	283,930
1030	1000.0	1035	-5.55	-26.47	-26.47	20.92	20.92	36,991	167,327	204,318	18,583	185,735	52,547	259,743	312,289	18,583	293,707	52,547	259,743	312,289	18,583	293,707
1040	1000.0	1045	-5.05	-26.47	-26.47	21.42	21.42	38,025	174,083	212,108	15,640	196,468	53,581	269,515	323,096	15,640	307,456	53,581	269,515	323,096	15,640	307,456
1050	1000.0	1055	-5.00	-26.48	-26.48	21.48	21.48	38,046	174,222	212,268	15,585	196,684	53,602	269,716	323,318	15,585	307,733	53,602	269,716	323,318	15,585	307,733
1060	1000.0	1065	-5.00	-26.49	-26.49	21.49	21.49	38,049	174,243	212,293	15,576	196,716	53,605	269,746	323,351	15,576	307,775	53,605	269,746	323,351	15,576	307,775
1070	400.0	1072	-5.00	-26.50	-26.50	21.50	21.50	15,221	69,703	84,924	6,228	78,696	21,443	107,907	129,350	6,228	123,122	21,443	107,907	129,350	6,228	123,122
1074	0.0																					
White Slough Control Structure and Siphon																						
1082	800.0	1086	-8.40	-27.11	-27.11	18.71	18.71	27,057	114,266	141,323	25,765	115,558	39,502	179,068	218,569	25,765	192,804	39,502	179,068	218,569	25,765	192,804
1090	1000.0	1095	-9.12	-27.13	-27.13	18.01	18.01	33,250	136,130	169,380	36,755	132,624	48,805	213,917	262,722	36,755	225,966	48,805	213,917	262,722	36,755	225,966
1100	1000.0	1105	-9.92	-27.15	-27.15	17.23	17.23	32,693	127,655	160,348	43,020	117,327	48,249	201,316	249,565	43,020	206,544	48,249	201,316	249,565	43,020	206,544
1110	1000.0	1115	-10.60	-27.17	-27.17	16.57	16.57	32,179	119,570	151,749	49,392	102,357	47,734	189,231	236,965	49,392	187,573	47,734	189,231	236,965	49,392	187,573
1120	1000.0	1125	-11.27	-27.19	-27.19	15.93	15.93	31,773	113,283	145,055	54,605	90,450	47,328	179,786	227,114	54,605	172,509	47,328	179,786	227,114	54,605	172,509
1130	1000.0	1135	-11.93	-27.22	-27.22	15.28	15.28	31,367	107,078	138,444	59,984	78,461	46,922	170,424	217,346	59,984	157,362	46,922	170,424	217,346	59,984	157,362
1140	1000.0	1145	-11.82	-27.24	-27.24	15.42	15.42	31,491	108,975	140,466	58,313	82,153	47,047	173,291	220,338	58,313	162,025	47,047	173,291	220,338	58,313	162,025
1150	1000.0	1155	-11.62	-27.26	-27.26	15.64	15.64	31,628	111,057	142,685	56,506	86,179	47,183	176,433	223,616	56,506	167,110	47,183	176,433	223,616	56,506	167,110
1160	1000.0	1165	-11.42	-27.28	-27.28	15.86	15.86	31,764	113,149	144,913	54,718	90,195	47,320	179,585	226,904	54,718	172,186	47,320	179,585	226,904	54,718	172,186
1170	1000.0	1175	-11.22	-27.31	-27.31	16.09	16.09	31,900	115,250	147,150	52,948	94,202	47,456	182,745	230,201	52,948	177,253	47,456	182,745	230,201	52,948	177,253
1180	1000.0	1185	-11.02	-27.33	-27.33	16.31	16.31	32,037	117,360	149,396	51,197	98,199	47,592	185,916	233,508	51,197	182,310	47,592	185,916	233,508	51,197	182,310
1190	1000.0	1195	-11.30	-27.35	-27.35	16.05	16.05	31,895	115,176	147,071	53,010	94,061	47,451	182,634	230,085	53,010	177,075	47,451	182,634	230,085	53,010	177,075
1200	1000.0	1205	-11.63	-27.37	-27.37	15.74	15.74	31,641	111,256	142,896	56,336	86,560	47,196	176,732	223,928	56,336	167,592	47,196	176,732	223,928	56,336	167,592
1210	800.0	1214	-11.93	-27.39	-27.39	15.46	15.46	25,197	87,243	112,441	46,595	65,845	37,642	138,728	176,370	46,595	129,775	37,642	138,728	176,370	46,595	129,775
1218	0.0																					
Disappointment Slough Siphon																						
Total	117,400							4,534,554	22,289,263	26,823,817	1,267,022	25,556,795	6,233,221	33,938,386	40,171,607	1,267,022	38,904,585	6,233,221	33,938,386	40,171,607	1,267,022	38,904,585
Max						29.1	29.1															
Min						15.3	15.3															

Column Notes:

[1] Canal stations Siphon locations at 100ft increments.

[2] Canal length between calculation stations = Next Row in Coln [1] - Current Row in Coln [1].

[3] Midpoint stations between adjacent calculation stations.

[4] Ground elevation at midpoint station.

[5] Canal invert elevation at midpoint.

[5A] Canal invert elevation at midpoint (Raised canal, raised 12 ft after Disappointment Slough Siphon).

Table A-21, Canal Route #2 Quantity Calculation (Sacramento River to Disappointment Slough)

Canal Profile								Route #2, 10,000cfs Bottom width = 200ft					Route #2, 15,000cfs Bottom width = 340ft					Route #2 (12-ft Raised) with 15,000cfs Bottom width = 340ft				
[1] Canal Station (x100ft)	[2] Step Length (ft)	[3] Mid-Point Station (x100ft)	[4] Mid-Point Ground Elev. (ft)	[5] Canal Midpoint Invert EL (ft)	[5A] 12-ft Raised Canal Invert EL (ft)	[6] Canal Ground to Invert Depth (ft)	[6A] Raised Ground to Invert Depth (ft)	[7] Scraper Excav Volume $V_{scraper}$ (cy)	[8] Dragline Excav Volume $V_{dragline}$ (cy)	[9] Total Excav Volume V_{ex} (cy)	[10] Total Embank Volume V_{em} (cy)	[11] Net Disposal Volume V_{dis} (cy)	[12] Scraper Excav Volume $V_{scraper}$ (cy)	[13] Dragline Excav Volume $V_{dragline}$ (cy)	[14] Total Excav Volume V_{ex} (cy)	[15] Total Embank Volume V_{em} (cy)	[16] Net Disposal Volume V_{dis} (cy)	[17] Scraper Excav Volume $V_{scraper}$ (cy)	[18] Dragline Excav Volume $V_{dragline}$ (cy)	[19] Total Excav Volume V_{ex} (cy)	[20] Total Embank Volume V_{em} (cy)	[21] Net Disposal Volume V_{dis} (cy)

[6] Gound to invert depth = Coln [4] - Coln [5].

[6A] Gound to invert depth = Coln [4] - Coln [5A] (Raised canal, raised 12 ft after Disappointment Slough Siphon).

[7] 10,000cfs Canal, volume of excavation of the top 3 ft by scraper, interpolated from Cut-Fill Calc Table using Ground to Invert Depth from Coln [6].

[8] 10,000cfs Canal, volume of excavation from 3 ft below ground surface down to invert , by dragline, interpolated from Cut-Fill Calc Table using Grd to Invert Depth from Coln [6].

[9] 10,000cfs Canal, total excavation volume = Coln [7] + Coln [8].

[10] 10,000cfs Canal, required fill volume for canal embankments, interpolated from Cut-Fill Calc Table using Grd to Invert Depth from Coln [6].

[11] 10,000cfs Canal, net disposal volume = Coln [9] - Coln [10].

[12] 15,000cfs Canal, volume of excavation of the top 3 ft by scraper, interpolated from Cut-Fill Calc Table using Grd to Invert Depth from Coln [6].

[13] 15,000cfs Canal, volume of excavation from 3 ft below ground surface down to invert, by dragline, interpolated from Cut-Fill Calc Table using Grd to Invert Depth from Coln [6].

[14] 15,000cfs Canal, total excavation volume = Coln [12] + Coln [13]

[15] 15,000cfs Canal, required fill volume for canal embankments , interpolated from Cut-Fill Calc Table using Grd to Invert Depth from Coln [6].

[16] 15,000cfs Canal, net disposal volume = Coln [14] - Coln [15]

[17] 15,000cfs Raised Canal, volume of excavation of the top 3 ft by scraper, interpolated from Cut-Fill Calc Table using Grd to Invert Depth from Coln [6A].

[18] 15,000cfs Raised Canal, volume of excavation from 3 ft below ground surface down to invert, by dragline, interpolated from Cut-Fill Calc Table using Grd to Invert Depth from Coln [6A].

[19] 15,000cfs Raised Canal, total excavation volume = Coln [17] + Coln [18]

[20] 15,000cfs Raised Canal, required fill volume for canal embankments , interpolated from Cut-Fill Calc Table using Grd to Invert Depth from Coln [6A].

[21] 15,000cfs Raised Canal, net disposal volume = Coln [19] - Coln [20]

Table A-22, Incised and Raised Canal Route #2 Quantity Calculation (Downstream of Disappointment Slought)

Canal Profile								Route #2, 10,000cfs Bottom width = 200ft							Route #2, 15,000cfs Bottom width = 340ft							Route #2 (12-ft Raised) with 15,000cfs Bottom width = 340ft						
[1] Canal Station (x100ft)	[2] Step Length (ft)	[3] Mid-Point Station (x100ft)	[4] Mid-Point Ground Elev. (ft)	[5] Canal Midpoint Invert El. (ft)	[5A] 12-ft Raised Canal Invert El. (ft)	[6] Canal Ground to Invert Depth (ft)	[6A] Raised Ground to Invert Depth (ft)	[7] Hydraulic Excav Volume $V_{Hydraulic}$ (cy)	[8] Scraper Excav Volume $V_{scraper}$ (cy)	[9] Dragline Excav Volume $V_{dragline}$ (cy)	[10] Total Excav Volume V_{ex} (cy)	[11] Local Embank Volume V_{em} (cy)	[12] Import Embank Volume V_{em} (cy)	[13] Net Disposal Volume V_{dis} (cy)	[14] Hydraulic Excav Volume $V_{Hydraulic}$ (cy)	[15] Scraper Excav Volume $V_{scraper}$ (cy)	[16] Dragline Excav Volume $V_{dragline}$ (cy)	[17] Total Excav Volume V_{ex} (cy)	[18] Local Embank Volume V_{em} (cy)	[19] Import Embank Volume V_{em} (cy)	[20] Net Disposal Volume V_{dis} (cy)	[21] Hydraulic Excav Volume $V_{Hydraulic}$ (cy)	[22] Scraper Excav Volume $V_{scraper}$ (cy)	[23] Dragline Excav Volume $V_{dragline}$ (cy)	[23] Total Excav Volume V_{ex} (cy)	[24] Local Embank Volume V_{em} (cy)	[25] Import Embank Volume V_{em} (cy)	[26] Net Disposal Volume V_{dis} (cy)
Disappointment Slough Siphon																												
1232	800.0	1236	-11.56	-28.01	-16.01	16.45	4.45	97,504	23,209	95,455	216,168	14,815	119,844	201,353	97,504	35,654	151,083	284,240	14,815	119,844	269,426	139,780	39,339	13,808	178,065	14,552	360,706	163,713
1240	1000.0	1245	-11.36	-28.02	-16.02	16.67	4.67	120,976	29,147	121,435	271,558	18,519	147,194	253,040	120,976	44,703	192,025	357,704	18,519	147,194	339,185	174,309	36,703	20,811	231,823	18,519	332,899	213,104
1250	1000.0	1255	-11.13	-28.04	-16.04	16.91	4.91	120,051	29,286	123,612	272,949	18,519	144,541	254,430	120,051	44,841	195,281	360,173	18,519	144,541	341,655	173,384	36,841	23,312	233,537	18,519	328,935	215,019
1260	1000.0	1265	-10.91	-28.06	-16.06	17.15	5.15	119,126	29,425	125,798	274,349	18,519	141,908	255,830	119,126	44,980	198,547	362,653	18,519	141,908	344,134	172,459	36,980	26,022	235,461	18,519	325,192	216,943
1270	1000.0	1275	-10.69	-28.08	-16.08	17.39	5.39	118,200	29,563	127,994	275,756	18,519	139,293	257,240	118,200	45,119	201,822	365,142	18,519	139,293	346,623	171,534	37,119	28,743	237,395	18,519	321,467	218,877
1280	1000.0	1285	-10.47	-28.10	-16.10	17.63	5.63	116,564	29,809	131,901	278,274	18,519	134,715	259,755	116,564	45,364	207,638	369,566	18,519	134,715	351,048	169,897	37,364	33,577	240,838	18,519	314,925	222,320
1290	1000.0	1295	-10.24	-28.12	-16.12	17.87	5.87	115,639	29,948	134,124	279,710	18,519	132,154	261,192	115,639	45,503	210,840	372,982	18,519	132,154	353,564	168,972	37,503	36,323	242,799	18,519	311,254	224,280
1300	1000.0	1305	-10.02	-28.14	-16.14	18.11	6.11	114,714	30,086	136,358	281,158	18,519	129,612	262,639	114,714	45,642	214,252	374,607	18,519	129,612	356,089	168,047	37,642	39,060	244,769	18,519	307,601	226,250
1310	1000.0	1315	-10.45	-28.15	-16.15	17.70	5.70	116,500	29,818	132,056	278,374	18,519	134,536	259,856	116,500	45,374	207,668	369,742	18,519	134,536	351,223	169,833	37,374	33,768	240,975	18,519	314,669	222,456
1320	1000.0	1325	-10.99	-28.17	-16.17	17.22	5.22	118,350	29,541	127,839	275,530	18,519	139,713	257,011	118,350	45,097	201,293	364,739	18,519	139,713	346,220	171,683	37,097	28,303	237,083	18,519	322,065	218,564
1330	1000.0	1335	-11.45	-28.18	-16.18	16.74	4.74	120,911	29,157	121,589	271,656	18,519	147,008	253,138	120,911	44,712	192,254	357,877	18,519	147,008	338,359	174,244	36,712	20,801	231,757	18,519	332,434	213,239
1340	1000.0	1345	-11.95	-28.21	-16.21	16.26	4.26	122,781	28,879	117,263	268,924	18,519	152,368	250,385	122,781	44,435	185,771	352,986	18,519	152,368	334,448	176,094	36,435	15,427	227,956	18,519	340,014	209,439
1350	1000.0	1355	-11.55	-28.23	-16.23	16.68	4.68	120,967	29,148	121,457	271,572	18,519	147,168	253,054	120,967	44,704	192,058	357,729	18,519	147,168	338,210	174,300	36,704	20,638	231,642	18,519	332,661	213,123
1360	1000.0	1365	-11.05	-28.25	-16.25	17.20	5.20	119,083	29,431	125,899	274,413	18,519	141,788	255,894	119,083	44,986	198,686	362,766	18,519	141,788	344,248	172,417	36,986	26,146	235,550	18,519	325,022	217,031
1370	1000.0	1375	-10.55	-28.27	-16.27	17.72	5.72	116,489	29,820	132,081	278,390	18,519	134,507	258,872	116,489	45,376	207,906	369,770	18,519	134,507	351,252	169,822	37,376	33,769	240,967	18,519	314,627	222,479
1380	1000.0	1385	-10.05	-28.29	-16.29	18.24	6.24	113,895	30,209	138,340	282,443	18,519	127,377	263,925	113,895	45,765	217,191	376,850	18,519	127,377	358,332	167,228	37,765	41,526	246,520	18,519	304,384	228,032
1385	500.0	1392	-9.90	-28.30	-16.30	19.40	7.40	32,752	9,289	44,875	86,945	5,556	34,542	81,384	32,752	13,555	70,140	116,868	5,556	34,542	111,312	44,736	10,579	15,230	70,581	5,093	78,806	83,438
1385	0.0																											
San Joaquin River Control Structure and Siphon																												
1397	300.0	1409	-5.75	-29.00	-17.00	23.25	11.25	27,497	8,751	58,899	95,147	5,556	21,803	90,592	27,497	14,418	90,337	132,253	5,556	21,803	126,697	39,672	11,393	30,492	81,557	5,093	91,270	76,875
1410	1000.0	1415	-5.10	-29.01	-17.01	23.91	11.91	88,938	32,457	204,308	325,703	18,519	66,926	307,184	88,938	46,912	312,275	449,226	18,519	66,926	430,707	142,271	41,308	119,744	303,324	18,519	213,589	283,009
1420	1000.0	1425	-5.00	-29.03	-17.03	24.03	12.03	88,125	32,430	206,735	327,289	18,519	65,254	308,771	88,125	47,885	315,650	451,781	18,519	65,254	433,242	141,458	41,830	122,409	305,488	18,519	210,865	286,979
1430	1000.0	1435	-9.50	-29.04	-17.04	19.54	7.54	108,468	31,023	151,677	291,168	18,519	112,954	272,649	108,468	46,579	236,860	391,906	18,519	112,954	373,388	161,801	39,579	57,940	259,320	18,519	283,448	239,602
1440	1000.0	1445	-10.00	-29.05	-17.05	19.05	7.05	110,322	30,745	147,084	288,150	18,519	117,806	269,632	110,322	46,301	230,103	386,726	18,519	117,806	368,207	163,655	39,301	52,296	254,252	18,519	290,525	235,734
1450	1000.0	1455	-10.00	-29.07	-17.07	19.07	7.07	110,309	30,747	147,115	288,171	18,519	117,772	269,653	110,309	46,303	230,150	386,762	18,519	117,772	368,243	163,642	39,303	52,335	254,280	18,519	290,476	235,762
1460	1000.0	1465	-10.00	-29.08	-17.08	19.08	7.08	110,296	30,749	147,147	288,192	18,519	117,738	269,673	110,296	46,305	230,197	386,797	18,519	117,738	368,279	163,629	39,305	52,374	254,308	18,519	290,427	235,790
1470	1000.0	1475	-10.00	-29.10	-17.10	19.10	7.10	110,283	30,751	147,179	288,213	18,519	117,704	269,694	110,283	46,307	230,244	386,833	18,519	117,704	368,315	163,616	39,307	52,413	254,336	18,519	290,377	235,818
1480	1000.0	1485	-10.00	-29.11	-17.11	19.11	7.11	110,270	30,753	147,211	288,234	18,519	117,671	269,715	110,270	46,308	230,290	386,869	18,519	117,671	368,350	163,604	39,308	52,452	254,364	18,519	290,328	235,846
1490	1000.0	1495	-10.00	-29.13	-17.13	19.13	7.13	110,257	30,755	147,242	288,254	18,519	117,637	269,736	110,257	46,310	230,337	386,905	18,519	117,637	368,386	163,591	39,310	52,492	254,393	18,519	290,279	235,874
1500	1000.0	1505	-10.00	-29.14	-17.14	19.14	7.14	110,245	30,757	147,274	288,275	18,519	117,603	269,757	110,245	46,312	230,384	386,941	18,519	117,603	368,422	163,578	39,312	52,531	254,421	18,519	290,230	235,902
1510	1000.0	1515	-10.00	-29.16	-17.16	19.16	7.16	110,232	30,759	147,306	288,296	18,519	117,569	269,778	110,232	46,314	230,431	386,976	18,519	117,569	368,458	163,565	39,314	52,570	254,449	18,519	290,181	235,930
1520	1000.0	1525	-10.00	-29.17	-17.17	19.17	7.17	110,219	30,761	147,338	288,317	18,519	117,536	269,798	110,219	46,316	230,477	387,012	18,519	117,536	368,494	163,552	39,316	52,609	254,477	18,519	290,131	235,958
1530	1000.0	1535	-10.00	-29.18	-17.18	19.18	7.18	110,206	30,763	147,369	288,338	18,519	117,502	269,819	110,206	46,318	230,524	387,048	18,519	117,502	368,530	163,539	39,318	52,648	254,505	18,519	290,082	235,986
1540	1000.0	1545	-10.00	-29.20	-17.20	19.20	7.20	110,193	30,764	147,401	288,359	18,519	117,468	269,840	110,193	46,320	230,571	387,084	18,519	117,468	368,565	163,526	39,320	52,687	254,533	18,519	290,033	236,015
1550	1000.0	1555	-9.40	-29.21	-17.21	19.81	7.81	106,803	31,273	155,835	293,911	18,519	108,660	275,392	106,803	46,829	242,961	396,593	18,519	108,660	378,073	160,136	39,829	63,042	262,007	18,519	277,156	243,488
1560	1000.0	1565	-8.73	-29.23	-17.23	20.49	8.49	104,064	31,684	162,743	298,491	18,519	101,735	279,972	104,064	47,239	253,064	404,367	18,519	101,735	385,849	157,397	39,239	71,502	268,139	18,519	266,945	249,620
1570	1000.0	1575	-8.07	-29.24	-17.24	21.18	9.18	101,325	32,062	169,768	303,155	18,519	94,980	284,637	101,325	47,618	263,284	412,227	18,519	94,980	393,708	154,658	39,650	80,047	274,355	18,519	256,903	255,837
1580	1000.0	1585	-7.55	-29.26	-17.26	21.71	9.71	98,720	32,301	176,650	307,671	18,519	88,709	289,152	98,720	47,856	273,206	419,782	18,519	88,709	401,263	152,053	40,041	88,253	280,347	18,519	247,505	261,828
1590	1000.0	1595	-7.05	-29.27	-17.27	22.22	10.22	96,129	32,431	183,695	312,255	18,519	82,644	293,736	96,129	47,987	283,273	427,389	18,519	82,644	408,870	149,462	40,430	96,498	286,380	18,519	238,313	267,861
1600	1000.0	1605	-6.10	-29.29	-17.29	23.19	11.19	92,427	32,505	194,113	319,045	18,519	74,349	300,526	92,427	48,060	298,010	438,497	18,519	74,349	419,978	145,761	40,885	108,387	295,133	18,519	225,441	276,614
1610	1000.0	1615	-5.10	-29.30	-17.30	24.20	12.20	87,259	32,394	209,343	328,995	18,519	63,494	310,477	87,259	47,949	319,269	454,477	18,519	63,494	435,959	140,592	41,780	125,258	307,610	18,519	207,982	289,092
1620	1000.0	1625	-5.00	-29.31	-17.31	24.31	12.31	87,157	32,388	209,652	329,198	18,519	63,290	310,679	87,157	47,944	319,697	454,798	18,519	63,290	436,280	140,490	41,775	125,593	307,859	18,519	207,845	289,341
1630	1000.0	1635	-5.00	-29.33	-17.33	24.33	12.33	87,144	32,388	209,691	329,223	18,519	63,265	310,705	87,144	47,943	319,751	454,839	18,519	63,265	436,320	140,478	41,777	125,636	307,891	18,519	207,803	289,372
1640	1000.0	1645	-5.00	-29.34	-17.34	24.34	12.34	87,131	32,387	209,730	329,249	18,519	63,239	310,730	87,131	47,943	319,805	454,879	18,519	63,239	436,361	140,465	41,779	125,678	307,922	18,519	207,760	289,404
1650	1000.0	1655	-5.00	-29.36	-17.36	24.36	12.36	87,119	32,386	209,769	329,274	18,519	63,213	310,756	87,119	47,942	319,859	454,920	18,519	63,213	436,401	140,452	41,781	125,720	307,953	18,519	207,718	289,435
1660	1000.0	1665	-5.00	-29.37	-17.37	24.37	12.37	87,106	32,386	209,808	329,300	18,519	63,187	310,781	87,106	47,941	319,913	454,960	18,519	63,187	436,442	140,439	41,783	125,763	307,985	18,519	207,675	289,466
1670	1000.0	1675	-5.00	-29.39	-17.39	24.39	12.39	87,093	32,385	209,847	329,325	18,519	63,162	310,807	87,093	47,941	319,967	455,001	18,519	63,162	436,482	140,426	41,785	125,805	308,016	18,519	207,633	289,498
1680	1000.0	1685	-5.00	-29.40	-17.40	24.40	12.40	86,969	32,349	212,046	330,764	18,519	61,711	312,246	86,969	47,905	323,011	457,285	18,519	61,711	438,766	139,702	41,894	128,193	309,789	18,519	205,037	291,270
1690	1000.0	1695	-5.00	-29.42	-17.42	24.42	12.42	86,356	32,348	212,086	330,790	18,519	61,686	312,272	86,356	47,904	323,065	457,325	18,519	61,686	438,807	139,689	41,896	128,235	309,820	18,519	204,995	291,302
1700	1000.0	1705	-5.00	-29.43	-17.43	24.43	12.43	86,343	32,348	212,125	330,816	18,519	61,661	312,297	86,343	47,903	323,120	457,366	18,519	61,661	438,848	139,677	41,897	128,278	309,852	18,519	204,953	291,333
1710	1000.0	1715	-5.05	-29.44	-17.44	24.39	12.39	87,086	32,385	209,868	329,339	18,519	63,148	310,820	87,086	47,940	319,946	455,023	18,519	63,148	436,504	140,419	41,796	125,828	308,033	18,519	207,410	289,515
1720	1000.0	1725	-5.25	-29.46	-17.46	24.21	12.21	87,251	32,393	209,367	329,011	18,519	63,478	310,493	87,251	47,949	319,303	454,502	18,519	63,478	435,984	140,584	41,761	125,284	307,630	18,519	207,956	289,111
1730	1000.0	1735	-5.45	-29.47	-17.47	24.02	12.02	88,127	32,430	206,729	327,285	18,519	65,258	308,767	88,127	47,985	315,843	451,755	18,519	65,258	433,236	141,460	41,630	122,403	305,493	18,519	210,873	286,975
1740	1000.0	1745	-5.65	-29.49	-17.49	23.84	11.84	89,003	32,458	204,114	325,576	18,519	67,062	307,057	89,003	48,015	312,005	449,023	18,519	67,062	430,504	142,336	41,499	119,531	303,366	18,519	213,807	284,847
1750	1000.0	1755	-5.85	-29.50	-17.50	23.65	11.65	89,879	32,481	201,521	323,882	18,519	68,890	305,363	89,879	48,037	308,391	446,307	18,519	68,890	427,788	143,212	41,367	116,667	301,247	18,519	216,758	282,728
1760	1000.0	1765	-5.94	-29.52	-17.52	23.58	11.58	90,655	32,495	199,245	322,395	18,519	70,532	303,877	90,655	48,050	305,210	443,915	18,519	70,532	425,396	143,988	41,251	114,135	299,377	18,519	219,387	280,859
1770	1000.0	1775	-5.69	-29.53	-17.53	23.84	11.84	89,998	32,459	204,129	325,586	18,519	67,051	307,067	89,998	48,014	312,027	449,039	18,519	67,051	430,521	142,331	41,499	119,548	303,378	18,519	213,789	284,880
1780	1000.0	1785	-5.44	-29.55	-17.55	24.11	12.11	88,052	32,427	206,956	327,434	18,519	65,105	308,915	88,052	47,982	315,957	451,891	18,519	65,105	433,472	141,385	41,641	122,851	306,677	18,519	210,622	287,158
1790	1000.0	1795	-5.19	-29.56	-17.56	24.37	12.37	87,105	32,386	209,809	329,300	18,519	63,187	310,782	87,105	47,941	319,914	454,961	18,519	63,187	436,443	140,439	41,783	125,764	307,986	18,519	207,475	289,467
1800	1000.0	1805	-4.96	-29.58	-17.58	24.62	12.62	85,467	32,298	214,812	332,575	18,519	59,930	314,056	85,467	47,852	326,829	460,148	18,519	59,930	441,629	138,800	42,029	131,178	312,007	18,519	202,080	293,489
1810	1000.0	1815	-4.79	-29.59	-17.59	24.80	12.80	85,306	32,288	215,310	332,901	18,519	59,616	314,382	85,306	47,841	327,515	460,661	18,519	59,616	442,143	138,639	42,053	131,712	312,404	18,519	201,543	293,886
1820	1000.0	1825	-4.63	-29.60	-17.60	24.98	12.98	84,434	32,226	218,010	334,669	18,519	57,923	316,151	84,434	47,782	331,232	463,447	18,519	57,923	444,929	137,767	42,164	134,808	314,599	18,519	198,685	296,040
1830	1000.0	1835	-4.48	-29.62	-17.62	25.16	13.16	83,561	32,159	220,733	336,454	18,519	56,254	317,935	83,561	47,715	334,973	466,249	18,519	56,254	447,731	136,895	42,315	137,512	316,721	18,519	195,864	298,203
1840	1000.0	1845	-4.29	-29.63	-17.63	25.34	13.34	82,689	32,086	223,476	338,253	18,519	54,610	319,735	82,689	47,641	338,736	469,066	18,519	54,610	450,548	136,023	42,446	140,425	318,893	18,519	193,049	300,374
1850	1000.0	1855	-4.13	-29.65	-17.65	25.52	13.52	81,817	32,005	226,247	340,069	18,519	52,965	321,551	81,817	47,560	342,522	471,900	18,519	52,965	453,381	135,151	42,576	143,346	321,073	18,519	190,253	302,554
1860	1000.0	1865	-4.10	-29.66	-17.66	25.56	13.56	81,782	32,001	226,359	340,143	18,519	52,925	321,624	81,782	47,557	342,675	472,014	18,519	52,925	453,495	135,116	42,582	143,463	321,161	18,519	190,141	302,642

Table A-22, Incised and Raised Canal Route #2 Quantity Calculation (Downstream of Disappointment Slought)

Canal Profile

[1] Canal Station (x100ft)	[2] Step Length (ft)	[3] Mid-Point Station (x100ft)	[4] Mid-Point Ground Elev. (ft)	[5] Canal Midpoint Invert EL (ft)	[5A] 12-ft Raised Canal Invert EL (ft)	[6] Canal Ground to Invert Depth (ft)	[6A] Raised Ground to Invert Depth (ft)
1870	1000.0	1875	-4.50	-29.88	-17.88	25.18	13.18
1880	1000.0	1885	-4.80	-29.59	-17.59	24.79	12.79
1890	200.0	1891	-6.17	-29.70	-17.70	23.53	11.53
1892	0.0						
Middle River Control Structure and Siphon							
1903	700.0	1907	-10.10	-30.50	-18.50	20.40	8.40
1910	1000.0	1915	-10.31	-30.51	-18.51	20.19	8.19
1920	1000.0	1925	-10.56	-30.51	-18.51	19.95	7.95
1930	1000.0	1935	-10.81	-30.51	-18.51	19.70	7.70
1940	1000.0	1945	-10.96	-30.52	-18.52	19.56	7.56
1950	1000.0	1955	-10.81	-30.52	-18.52	19.72	7.72
1960	1000.0	1965	-10.65	-30.53	-18.53	19.87	7.87
1970	1000.0	1975	-10.50	-30.53	-18.53	20.03	8.03
1980	1000.0	1985	-10.35	-30.54	-18.54	20.19	8.19
1990	1000.0	1995	-10.19	-30.54	-18.54	20.35	8.35
2000	1000.0	2005	-10.04	-30.55	-18.55	20.51	8.51
2010	1000.0	2015	-10.13	-30.55	-18.55	20.43	8.43
2020	1000.0	2025	-10.63	-30.55	-18.55	19.93	7.93
2030	1000.0	2035	-10.92	-30.56	-18.56	19.64	7.64
2040	1000.0	2045	-10.58	-30.56	-18.56	19.98	7.98
2050	1000.0	2055	-10.25	-30.57	-18.57	20.32	8.32
2060	1000.0	2065	-10.00	-30.57	-18.57	20.57	8.57
2070	1000.0	2075	-10.00	-30.58	-18.58	20.58	8.58
2080	1000.0	2085	-10.00	-30.58	-18.58	20.58	8.58
2090	1000.0	2095	-10.00	-30.59	-18.59	20.59	8.59
2100	1000.0	2105	-10.00	-30.59	-18.59	20.59	8.59
2110	1000.0	2115	-10.00	-30.59	-18.59	20.59	8.59
2120	1000.0	2125	-10.00	-30.60	-18.60	20.60	8.60
2130	1000.0	2135	-8.50	-30.63	-18.63	22.13	10.13
2140	1000.0	2145	-6.50	-30.67	-18.67	24.17	12.17
2150	1000.0	2155	-5.00	-30.71	-18.71	25.71	13.71
2160	1000.0	2165	-5.00	-30.74	-18.74	25.74	13.74
2170	1000.0	2175	-5.00	-30.78	-18.78	25.78	13.78
2180	1000.0	2185	-5.00	-30.82	-18.82	25.82	13.82
2190	1000.0	2195	-5.00	-30.85	-18.85	25.85	13.85
2200	1000.0	2205	-5.00	-30.89	-18.89	25.89	13.89
2210	1000.0	2215	-5.00	-30.93	-18.93	25.93	13.93
2220	1000.0	2225	-5.00	-30.96	-18.96	25.96	13.96
2230	500.0	2233	-4.68	-30.99	-18.99	26.31	14.31
2235	0.0						
Old River Siphon							
Total	67,800						
Max						26.3	14.3
Min						19.3	4.3

Route #2, 10,000cfs — Bottom width = 200ft

[1] Canal Station	[7] Hydraulic Excav Volume $V_{hydraulic}$ (cy)	[8] Scraper Excav Volume $V_{scraper}$ (cy)	[9] Dragline Excav Volume $V_{dragline}$ (cy)	[10] Total Excav Volume V_{ex} (cy)	[11] Local Embank Volume V_{em} (cy)	[12] Import Embank Volume V_{im} (cy)	[13] Net Disposal Volume V_{dis} (cy)
1870	83,547	32,158	220,778	336,483	18,519	56,227	317,965
1880	85,312	32,298	215,290	332,899	18,519	59,629	314,369
1890	18,139	6,488	39,825	64,463	3,704	14,134	60,759
1892							
Middle River Control Structure and Siphon							
1903	72,903	22,170	113,773	208,846	12,963	71,359	195,883
1910	105,754	31,430	158,470	295,654	18,519	105,991	277,136
1920	106,684	31,291	156,134	294,108	18,519	108,357	275,590
1930	107,613	31,151	153,808	292,572	18,519	110,742	274,054
1940	108,453	31,026	151,715	291,193	18,519	112,915	272,674
1950	107,601	31,153	153,838	292,592	18,519	110,711	274,074
1960	106,749	31,281	155,970	294,000	18,519	108,523	275,481
1970	105,897	31,409	158,110	295,416	18,519	106,352	276,897
1980	105,756	31,430	158,464	295,651	18,519	105,996	277,132
1990	104,905	31,558	160,614	297,076	18,519	103,844	278,558
2000	104,053	31,686	162,771	298,510	18,519	101,708	279,991
2010	104,126	31,675	162,586	298,386	18,519	101,890	279,868
2020	106,700	31,288	156,094	294,082	18,519	108,397	275,563
2030	107,666	31,144	153,675	292,485	18,519	110,878	273,966
2040	106,655	31,295	156,207	294,157	18,519	108,283	275,638
2050	104,932	31,554	160,544	297,030	18,519	103,913	278,511
2060	103,995	31,694	162,919	298,608	18,519	101,564	280,089
2070	103,991	31,695	162,929	298,614	18,519	101,554	280,096
2080	103,987	31,695	162,938	298,621	18,519	101,544	280,103
2090	103,983	31,696	162,948	298,628	18,519	101,534	280,109
2100	103,979	31,697	162,958	298,635	18,519	101,524	280,116
2110	103,975	31,697	162,969	298,641	18,519	101,514	280,123
2120	103,971	31,698	162,979	298,648	18,519	101,504	280,129
2130	96,920	32,398	181,523	310,841	18,519	84,475	292,323
2140	87,998	32,424	207,118	327,539	18,519	64,997	309,020
2150	80,943	31,917	229,045	341,904	18,519	51,389	323,386
2160	80,910	31,913	229,151	341,974	18,519	51,330	323,456
2170	80,877	31,910	229,257	342,044	18,519	51,271	323,525
2180	80,133	31,829	231,656	343,618	18,519	49,928	325,100
2190	80,100	31,825	231,763	343,689	18,519	49,869	325,170
2200	80,067	31,821	231,870	343,759	18,519	49,811	325,241
2210	80,035	31,817	231,978	343,829	18,519	49,752	325,311
2220	80,002	31,813	232,085	343,900	18,519	49,694	325,381
2230	39,139	15,802	118,860	173,800	9,259	23,330	164,541
2235							
Old River Siphon							
Total	9,728,583	3,073,523	17,286,361	30,088,467	1,811,111	9,072,575	28,277,356

Route #2, 15,000cfs — Bottom width = 340ft

[1] Canal Station	[14] Hydraulic Excav Volume $V_{hydraulic}$ (cy)	[15] Scraper Excav Volume $V_{scraper}$ (cy)	[16] Dragline Excav Volume $V_{dragline}$ (cy)	[17] Total Excav Volume V_{ex} (cy)	[18] Local Embank Volume V_{em} (cy)	[19] Import Embank Volume V_{im} (cy)	[20] Net Disposal Volume V_{dis} (cy)
1870	83,547	47,714	335,034	466,295	18,519	56,227	447,777
1880	85,312	47,841	327,487	460,641	18,519	59,629	442,133
1890	18,139	9,610	61,008	88,757	3,704	14,134	85,053
1892							
Middle River Control Structure and Siphon							
1903	72,903	33,059	176,930	282,891	12,963	71,359	269,928
1910	105,754	46,986	246,818	399,558	18,519	105,991	381,040
1920	106,684	46,846	243,398	396,928	18,519	108,357	378,410
1930	107,613	46,707	239,987	394,307	18,519	110,742	375,789
1940	108,453	46,581	236,915	391,949	18,519	112,915	373,430
1950	107,601	46,709	240,032	394,342	18,519	110,711	375,823
1960	106,749	46,837	243,158	396,743	18,519	108,523	378,225
1970	105,897	46,964	246,291	399,153	18,519	106,352	380,634
1980	105,756	46,986	246,810	399,552	18,519	105,996	381,034
1990	104,905	47,113	249,953	401,971	18,519	103,844	383,453
2000	104,053	47,241	253,105	404,399	18,519	101,708	385,880
2010	104,126	47,230	252,834	404,190	18,519	101,890	385,672
2020	106,700	46,844	243,340	396,883	18,519	108,397	378,365
2030	107,666	46,699	239,793	394,158	18,519	110,878	375,640
2040	106,655	46,851	243,505	397,010	18,519	108,283	378,492
2050	104,932	47,109	249,852	401,893	18,519	103,913	383,375
2060	103,995	47,250	253,320	404,564	18,519	101,564	386,046
2070	103,991	47,250	253,335	404,576	18,519	101,554	386,057
2080	103,987	47,251	253,349	404,587	18,519	101,544	386,069
2090	103,983	47,252	253,364	404,598	18,519	101,534	386,080
2100	103,979	47,252	253,379	404,610	18,519	101,524	386,091
2110	103,975	47,253	253,393	404,621	18,519	101,514	386,103
2120	103,971	47,253	253,408	404,632	18,519	101,504	386,114
2130	96,920	47,954	280,178	425,052	18,519	84,475	406,533
2140	87,998	47,980	316,180	452,158	18,519	64,997	433,639
2150	80,943	47,472	346,339	474,755	18,519	51,389	456,236
2160	80,910	47,469	346,484	474,863	18,519	51,330	456,344
2170	80,877	47,465	346,628	474,971	18,519	51,271	456,452
2180	80,133	47,384	349,896	477,414	18,519	49,928	458,895
2190	80,100	47,381	350,041	477,522	18,519	49,869	459,004
2200	80,067	47,377	350,187	477,631	18,519	49,811	459,112
2210	80,035	47,373	350,332	477,740	18,519	49,752	459,221
2220	80,002	47,369	350,478	477,849	18,519	49,694	459,330
2230	39,139	23,578	179,063	241,781	9,259	23,330	232,522
2235							
Old River Siphon							
Total	9,728,583	4,594,856	26,643,384	40,966,824	1,811,111	9,072,575	39,155,713

Route #2 (12-ft Raised) with 15,000cfs — Bottom width = 340ft

[1] Canal Station	[21] Hydraulic Excav Volume $V_{hydraulic}$ (cy)	[22] Scraper Excav Volume $V_{scraper}$ (cy)	[23] Dragline Excav Volume $V_{dragline}$ (cy)	[23] Total Excav Volume V_{ex} (cy)	[24] Local Embank Volume V_{em} (cy)	[25] Import Embank Volume V_{im} (cy)	[26] Net Disposal Volume V_{dis} (cy)
1870	136,880	42,317	137,560	316,757	18,519	195,817	298,238
1880	138,645	42,052	131,691	312,389	18,519	201,564	293,870
1890	25,203	7,218	19,930	52,373	5,241	55,416	49,133
1892							
Middle River Control Structure and Siphon							
1903	105,299	25,478	48,090	180,867	12,300	180,394	168,567
1910	159,088	38,988	66,271	264,344	18,519	273,229	245,825
1920	160,017	38,846	63,409	262,272	18,519	276,710	243,753
1930	160,946	38,707	60,555	260,209	18,519	280,211	241,690
1940	161,786	38,581	57,986	258,354	18,519	283,391	239,835
1950	160,934	38,709	60,593	260,236	18,519	280,165	241,717
1960	160,082	38,837	63,207	262,126	18,519	276,955	243,607
1970	159,230	38,964	65,830	264,024	18,519	273,762	245,506
1980	159,090	38,985	66,264	264,339	18,519	273,237	245,821
1990	158,238	39,113	68,896	266,247	18,519	270,063	247,729
2000	157,386	39,241	71,536	268,164	18,519	266,905	249,645
2010	157,459	39,230	71,310	267,999	18,519	267,174	249,480
2020	160,033	38,844	63,359	262,236	18,519	276,770	243,718
2030	160,999	38,699	60,393	260,091	18,519	280,411	241,573
2040	159,988	38,851	63,498	262,336	18,519	276,601	243,818
2050	158,265	39,109	68,811	266,186	18,519	270,165	247,667
2060	157,328	39,250	71,717	268,295	18,519	266,691	249,776
2070	157,324	39,250	71,729	268,304	18,519	266,676	249,785
2080	157,320	39,251	71,741	268,313	18,519	266,661	249,794
2090	157,316	39,252	71,754	268,321	18,519	266,647	249,803
2100	157,312	39,252	71,766	268,330	18,519	266,632	249,812
2110	157,308	39,253	71,778	268,339	18,519	266,618	249,821
2120	157,304	39,253	71,791	268,348	18,519	266,603	249,830
2130	150,254	40,311	93,965	284,530	18,519	241,105	266,011
2140	141,332	41,649	122,826	305,807	18,519	210,445	287,288
2150	134,277	42,707	146,262	323,266	18,519	187,467	304,747
2160	134,244	42,712	146,393	323,349	18,519	187,362	304,830
2170	134,211	42,717	146,504	323,432	18,519	187,258	304,913
2180	133,467	42,829	149,010	325,306	18,519	184,900	306,787
2190	133,434	42,834	149,121	325,389	18,519	184,796	306,870
2200	133,401	42,839	149,232	325,472	18,519	184,693	306,954
2210	133,368	42,844	149,344	325,555	18,519	184,589	307,037
2220	133,335	42,849	149,455	325,638	18,519	184,485	307,120
2230	62,918	20,476	73,764	156,799	8,799	93,060	147,909
2235							
Old River Siphon							
Total	14,921,684	3,898,949	8,478,555	27,299,187	1,808,333	24,620,507	25,490,854

Column Notes:
[1] Canal stations Siphon locations at 100ft increments.
[2] Canal length between calculation stations = Next Row in Coln [1] - Current Row in Coln [1].
[3] Midpoint stations between adjacent calculation stations.
[4] Ground elevation at midpoint station.
[5] Canal invert elevation at midpoint.
[5A] Canal invert elevation at midpoint (Raised canal, raised 12 ft after Disappointment Slough Siphon).
[6] Gound to invert depth = Coln [4] - Coln [5].
[6A] Gound to invert depth = Coln [4] - Coln [5A] (Raised canal, raised 12 ft after Disappointment Slough Siphon).
[7] 10,000cfs Canal, volume of excavation by hydraulic excavators, interpolated from Cut-Fill Calc Table using Ground to Invert Depth from Coln [6].
[8] 10,000cfs Canal, volume of excavation of the top 3 ft by scraper, interpolated from Cut-Fill Calc Table using Ground to Invert Depth from Coln [6].
[9] 10,000cfs Canal, volume of excavation from 3 ft below ground surface down to invert , by dragline, interpolated from Cut-Fill Calc Table using Grd to Invert Depth from Coln [6].
[10] 10,000cfs Canal, total excavation volume = Coln [7] + Coln [8] + Coln [9].
[11] 10,000cfs Canal, local canal excavated volume used for canal embankments, interpolated from Cut-Fill Calc Table using Grd to Invert Depth from Coln [6].
[12] 10,000cfs Canal, imported soil volume used for canal embankments, interpolated from Cut-Fill Calc Table using Grd to Invert Depth from Coln [6].
[13] 10,000cfs Canal, net disposal volume = Coln [10] - Coln [11].
[14] 15,000cfs Canal, volume of excavation by hydraulic excavators, interpolated from Cut-Fill Calc Table using Ground to Invert Depth from Coln [6].
[15] 15,000cfs Canal, volume of excavation of the top 3 ft by scraper, interpolated from Cut-Fill Calc Table using Ground to Invert Depth from Coln [6].
[16] 15,000cfs Canal, volume of excavation from 3 ft below ground surface down to invert , by dragline, interpolated from Cut-Fill Calc Table using Grd to Invert Depth from Coln [6].
[17] 15,000cfs Canal, total excavation volume = Coln [14] + Coln [15] + Coln [16].
[18] 15,000cfs Canal, local canal excavated volume used for canal embankments, interpolated from Cut-Fill Calc Table using Grd to Invert Depth from Coln [6].
[19] 15,000cfs Canal, imported soil volume used for canal embankments, interpolated from Cut-Fill Calc Table using Grd to Invert Depth from Coln [6].

Table A-22, Incised and Raised Canal Route #2 Quantity Calculation (Downstream of Disappointment Slought)

Canal Profile								Route #2, 10,000cfs Bottom width = 200ft						Route #2, 15,000cfs Bottom width = 340ft							Route #2 (12-ft Raised) with 15,000cfs Bottom width = 340ft						
[1] Canal Station (x100ft)	[2] Step Length (ft)	[3] Mid-Point Station (x100ft)	[4] Mid-Point Ground Elev. (ft)	[5] Canal Midpoint Invert EL (ft)	[5A] 12-ft Raised Canal Invert EL (ft)	[6] Canal Ground to Invert Depth (ft)	[6A] Raised Ground to Invert Depth (ft)	[7] Hydraulic Excav Volume $V_{Hydraulic}$ (cy)	[8] Scraper Excav Volume $V_{Scraper}$ (cy)	[9] Dragline Excav Volume $V_{Dragline}$ (cy)	[10] Total Excav Volume V_{Ex} (cy)	[11] Local Embank Volume V_{Em} (cy)	[12] Import Embank Volume V_{Im} (cy)	[13] Net Disposal Volume V_{Dis} (cy)	[14] Hydraulic Excav Volume $V_{Hydraulic}$ (cy)	[15] Scraper Excav Volume $V_{Scraper}$ (cy)	[16] Dragline Excav Volume $V_{Dragline}$ (cy)	[17] Total Excav Volume V_{Ex} (cy)	[18] Local Embank Volume V_{Em} (cy)	[19] Import Embank Volume V_{Im} (cy)	[20] Net Disposal Volume V_{Dis} (cy)	[21] Hydraulic Excav Volume $V_{Hydraulic}$ (cy)	[22] Scraper Excav Volume $V_{Scraper}$ (cy)	[23] Dragline Excav Volume $V_{Dragline}$ (cy)	[23] Total Excav Volume V_{Ex} (cy)	[24] Local Embank Volume V_{Em} (cy)	[25] Import Embank Volume V_{Im} (cy)	[26] Net Disposal Volume V_{Dis} (cy)

[20] 15,000cfs Canal, net disposal volume = Colh [17] - Colh [18].
[21] 15,000cfs Raised Canal, volume of excavation by hydraulic excavators, interpolated from Cut-Fill Calc Table using Ground to Invert Depth from Colh [6].
[22] 15,000cfs Raised Canal, volume of excavation of the top 3 ft by scraper, interpolated from Cut-Fill Calc Table using Ground to Invert Depth from Colh [6].
[23] 15,000cfs Raised Canal, volume of excavation from 3 ft below ground surface down to invert , by dragline, interpolated from Cut-Fill Calc Table using Grd to Invert Depth from Colh [6].
[24] 15,000cfs Raised Canal, total excavation volume = Colh [21] + Colh [22] + Colh [23].
[25] 15,000cfs Raised Canal, local canal excavated volume used for canal embankments, interpolated from Cut-Fill Calc Table using Grd to Invert Depth from Colh [6].
[26] 15,000cfs Raised Canal, imported soil volume used for canal embankments, interpolated from Cut-Fill Calc Table using Grd to Invert Depth from Colh [6].
[27] 15,000cfs Raised Canal, net disposal volume = Colh [24] - Colh [25].

Table A-23, Incised and RaisedCanal Route #2A Quantity Calculation (Old River to Delta-Mendota Canal)

Canal Profile						Route #2A, 10,000cfs (12-ft Raised) Bottom width = 200ft					Route #2A, 15,000cfs (12-ft Raised) Bottom width = 340ft					Route #2A, 10,000cfs and 15,000cfs (12-ft Raised) Quantity Comparison				
[1] Canal Station (x100ft)	[2] Step Length (ft)	[3] Mid-Point Station (x100ft)	[4] Mid-Point Ground Elev. (ft)	[5] Mid-Point Canal Invert EL (ft)	[6] Ground To Invert Depth (ft)	[7] Scraper Excav Volume $V_{scraper}$ (cy)	[8] Dragline Excav Volume $V_{dragline}$ (cy)	[9] Total Excav Volume V_{ex} (cy)	[10] Total Embank Volume V_{em} (cy)	[11] Net Disposal Volume V_{dis} (cy)	[12] Scraper Excav Volume $V_{scraper}$ (cy)	[13] Dragline Excav Volume $V_{dragline}$ (cy)	[14] Total Excav Volume V_{ex} (cy)	[15] Total Embank Volume V_{em} (cy)	[16] Net Disposal Volume V_{dis} (cy)	[17] Scraper Volume Diff. $V_{scraper,diff}$ (cy)	[18] Dragline Volume Diff. $V_{dragline,diff}$ (cy)	[19] Total Excav Diff. V_{ex} (cy)	[20] Total Embank Diff. V_{dis} (cy)	[21] Disposal Volume Diff. V_{diff} (cy)
Old River Siphon																				
2239	300.0	2241	0.00	-19.61	19.61	10,504	46,078	56,582	7,697	48,885	15,170	71,902	87,072	7,697	79,375	4,667	25,824	30,491	0	30,491
2242	1000.0	2247	0.00	-19.63	19.63	35,019	153,643	188,662	25,628	163,034	50,575	239,746	290,321	25,628	264,693	15,556	86,103	101,659	0	101,659
2252	1000.0	2257	0.00	-19.66	19.66	35,029	153,721	188,751	25,585	163,166	50,585	239,861	290,446	25,585	264,861	15,556	86,140	101,695	0	101,695
2262	1000.0	2267	0.00	-19.70	19.70	35,039	153,799	188,839	25,541	163,297	50,595	239,975	290,570	25,541	265,029	15,556	86,176	101,732	0	101,732
2272	1000.0	2277	0.00	-19.73	19.73	35,049	153,877	188,927	25,498	163,429	50,605	240,090	290,695	25,498	265,197	15,556	86,212	101,768	0	101,768
2282	1000.0	2287	0.00	-19.77	19.77	35,060	153,955	189,015	25,454	163,561	50,615	240,204	290,819	25,454	265,365	15,556	86,249	101,804	0	101,804
2292	400.0	2294	11.67	-19.79	31.46	19,477	126,893	146,369	0	146,369	25,699	185,821	211,520	0	211,520	6,222	58,928	65,151	0	65,151
2296	0.0																			
Delta-Mendota Canal																				
Total	5,700					205,177	941,966	1,147,144	135,404	1,011,740	293,844	1,457,599	1,751,443	135,404	1,616,039	88,667	515,632	604,299	0	604,299
Max					31.5															
Min					19.6															

Column Notes:

[1] Canal stations Siphon locations at 100ft increments.
[2] Canal length between calculation stations = Next Row in Coln [1] - Current Row in Coln [1].
[3] Midpoint stations between adjacent calculation stations.
[4] Ground elevation at midpoint station.
[5] Canal invert elevation at midpoint.
[6] Gound to invert depth = Coln [4] - Coln [5].
[7] 10,000cfs Canal, volume of excavation of the top 3 ft by scraper, interpolated from Cut-Fill Calc Table using Ground to Invert Depth from Coln [6].
[8] 10,000cfs Canal, volume of excavation from 3 ft below ground surface down to invert , by dragline, interpolated from Cut-Fill Calc Table using Grd to Invert Depth from Coln [6].
[9] 10,000cfs Canal, total excavation volume = Coln [7] + Coln [8].
[10] 10,000cfs Canal, required fill volume for canal embankments, interpolated from Cut-Fill Calc Table using Grd to Invert Depth from Coln [6].
[11] 10,000cfs Canal, net disposal volume = Coln [9] - Coln [10].
[12] 15,000cfs Canal, volume of excavation of the top 3 ft by scraper, interpolated from Cut-Fill Calc Table using Grd to Invert Depth from Coln [6].
[13] 15,000cfs Canal, volume of excavation from 3 ft below ground surface down to invert, by dragline, interpolated from Cut-Fill Calc Table using Grd to Invert Depth from Coln [6].
[14] 15,000cfs Canal, total excavation volume = Coln [12] + Coln [13]
[15] 15,000cfs Canal, required fill volume for canal embankments , interpolated from Cut-Fill Calc Table using Grd to Invert Depth from Coln [6].
[16] 15,000cfs Canal, net disposal volume = Coln [14] - Coln [15]
[17] Difference in scraper excavation volume (10,000cfs and 15,000cfs canals) = Coln [12] - Coln [7]
[18] Difference in dragline excavation volume (10,000cfs and 15,000cfs canals) = Coln [13] - Coln [8]
[19] Difference in total excavation volume (10,000cfs and 15,000cfs canals) = Coln [14] - Coln [9]
[20] Difference in embankment volume (10,000cfs and 15,000cfs canals) = Coln [15] - Coln [10]
[21] Difference in net disposal volume (10,000cfs and 15,000cfs canals) = Coln [16] - Coln [11]

Table A-24, Incised and RaisedCanal Route #1B Quantity Calculation (Old River to California Aqueduct)

Canal Profile						Route #2B, 10,000cfs (12-ft Raised) Bottom width = 200ft					Route #2B, 15,000cfs (12-ft Raised) Bottom width = 340ft					Route #2B, 10,000cfs and 15,000cfs (12-ft Raised) Quantity Comparison				
[1] Canal Station (x100ft)	[2] Step Length (ft)	[3] Mid-Point Station (x100ft)	[4] Mid-Point Ground Elev. (ft)	[5] Mid-Point Canal Invert EL (ft)	[6] Ground To Invert Depth (ft)	[7] Scraper Excav Volume $V_{scraper}$ (cy)	[8] Dragline Excav Volume $V_{dragline}$ (cy)	[9] Total Excav Volume V_{ex} (cy)	[10] Total Embank Volume V_{em} (cy)	[11] Net Disposal Volume V_{dis} (cy)	[12] Scraper Excav Volume $V_{scraper}$ (cy)	[13] Dragline Excav Volume $V_{dragline}$ (cy)	[14] Total Excav Volume V_{ex} (cy)	[15] Total Embank Volume V_{em} (cy)	[16] Net Disposal Volume V_{dis} (cy)	[17] Scraper Volume Diff. $V_{scraper,diff}$ (cy)	[18] Dragline Volume Diff. $V_{dragline,diff}$ (cy)	[19] Total Excav Diff. V_{ex} (cy)	[20] Total Embank Diff. V_{dis} (cy)	[21] Disposal Volume Diff. V_{diff} (cy)
Old River Siphon																				
2239	300.0	2241	0.00	-19.60	19.60	10,504	46,077	56,580	7,698	48,883	15,170	71,900	87,070	7,698	79,373	4,667	25,823	30,490	0	30,490
2242	1000.0	2247	0.00	-19.62	19.62	35,017	153,625	188,642	25,639	163,004	50,573	239,720	290,293	25,639	264,654	15,556	86,095	101,650	0	101,650
2252	1000.0	2257	0.00	-19.64	19.64	35,024	153,681	188,705	25,607	163,097	50,580	239,802	290,381	25,607	264,774	15,556	86,121	101,676	0	101,676
2262	1000.0	2267	2.50	-19.67	22.17	39,144	181,617	220,760	12,772	207,988	54,699	280,312	335,011	12,772	322,239	15,556	98,695	114,250	0	114,250
2272	1000.0	2277	7.50	-19.69	27.19	45,776	249,840	295,616	0	295,616	61,332	374,487	435,818	0	435,818	15,556	124,647	140,202	0	140,202
2282	1000.0	2287	12.50	-19.72	32.22	49,219	329,893	379,112	0	379,112	64,775	481,321	546,096	0	546,096	15,556	151,428	166,984	0	166,984
2292	1000.0	2297	17.50	-19.74	37.24	52,556	413,122	465,678	0	465,678	68,112	590,502	658,614	0	658,614	15,556	177,380	192,936	0	192,936
2302	1000.0	2307	22.50	-19.77	42.27	55,893	501,918	557,811	0	557,811	71,448	705,250	776,698	0	776,698	15,556	203,332	218,887	0	218,887
2312	1000.0	2317	27.50	-19.79	47.29	59,229	596,281	655,510	0	655,510	74,785	825,565	900,350	0	900,350	15,556	229,284	244,839	0	244,839
2322	1000.0	2327	32.50	-19.82	52.32	62,566	696,210	758,776	0	758,776	78,122	951,446	1,029,568	0	1,029,568	15,556	255,236	270,791	0	270,791
2332	1000.0	2337	37.50	-19.84	57.34	65,903	801,706	867,609	0	867,609	81,458	1,082,894	1,164,352	0	1,164,352	15,556	281,187	296,743	0	296,743
2342	1000.0	2347	42.50	-19.87	62.37	69,239	912,769	982,008	0	982,008	84,795	1,219,908	1,304,703	0	1,304,703	15,556	307,139	322,695	0	322,695
2352	1000.0	2357	47.50	-19.89	67.39	72,576	1,029,399	1,101,975	0	1,101,975	88,132	1,362,490	1,450,621	0	1,450,621	15,556	333,091	348,647	0	348,647
2362	1000.0	2367	52.50	-19.92	72.42	76,019	1,155,592	1,231,611	0	1,231,611	91,575	1,515,465	1,607,040	0	1,607,040	15,556	359,873	375,428	0	375,428
2372	1000.0	2377	57.50	-19.94	77.44	77,750	1,221,257	1,299,007	0	1,299,007	93,306	1,594,591	1,687,896	0	1,687,896	15,556	373,333	388,889	0	388,889
2382	1000.0	2387	62.50	-19.97	82.47	77,750	1,221,257	1,299,007	0	1,299,007	93,306	1,594,591	1,687,896	0	1,687,896	15,556	373,333	388,889	0	388,889
2392	700.0	2396	66.75	-19.99	86.74	54,425	854,880	909,305	0	909,305	65,314	1,116,214	1,181,527	0	1,181,527	10,889	261,333	272,222	0	272,222
2399	0.0																			
California Aqueduct																				
Total	16,000					938,590	10,519,126	11,457,716	71,716	11,386,001	1,187,479	14,246,456	15,433,935	71,716	15,362,220	248,889	3,727,330	3,976,219	0	3,976,219
Max					86.7															
Min					19.6															

Column Notes:

[1] Canal stations Siphon locations at 100ft increments.

[2] Canal length between calculation stations = Next Row in Coln [1] - Current Row in Coln [1].

[3] Midpoint stations between adjacent calculation stations.

[4] Ground elevation at midpoint station.

[5] Canal invert elevation at midpoint.

[6] Gound to invert depth = Coln [4] - Coln [5].

[7] 10,000cfs Canal, volume of excavation of the top 3 ft by scraper, interpolated from Cut-Fill Calc Table using Ground to Invert Depth from Coln [6].

[8] 10,000cfs Canal, volume of excavation from 3 ft below ground surface down to invert , by dragline, interpolated from Cut-Fill Calc Table using Grd to Invert Depth from Coln [6].

[9] 10,000cfs Canal, total excavation volume = Coln [7] + Coln [8].

[10] 10,000cfs Canal, required fill volume for canal embankments, interpolated from Cut-Fill Calc Table using Grd to Invert Depth from Coln [6].

[11] 10,000cfs Canal, net disposal volume = Coln [9] - Coln [10].

[12] 15,000cfs Canal, volume of excavation of the top 3 ft by scraper, interpolated from Cut-Fill Calc Table using Grd to Invert Depth from Coln [6].

[13] 15,000cfs Canal, volume of excavation from 3 ft below ground surface down to invert, by dragline, interpolated from Cut-Fill Calc Table using Grd to Invert Depth from Coln [6].

[14] 15,000cfs Canal, total excavation volume = Coln [12] + Coln [13]

[15] 15,000cfs Canal, required fill volume for canal embankments , interpolated from Cut-Fill Calc Table using Grd to Invert Depth from Coln [6].

[16] 15,000cfs Canal, net disposal volume = Coln [14] - Coln [15]

[17] Difference in scraper excavation volume (10,000cfs and 15,000cfs canals) = Coln [12] - Coln [7]

[18] Difference in dragline excavation volume (10,000cfs and 15,000cfs canals) = Coln [13] - Coln [8]

[19] Difference in total excavation volume (10,000cfs and 15,000cfs canals) = Coln [14] - Coln [9]

[20] Difference in embankment volume (10,000cfs and 15,000cfs canals) = Coln [15] - Coln [10]

[21] Difference in net disposal volume (10,000cfs and 15,000cfs canals) = Coln [16] - Coln [11]

Table A-25, Route #2 Incised and Raised Canal Quantities

Sacramento River to U/S of Disappointment Slough

Description	Unit	10,000cfs Canal Bottom Width b=200ft	15,000cfs Canal Bottom Width b=340ft	15,000cfs Raised Canal Bottom Width b=340ft
Hydraulic Excavation	CY	0	0	0
Scraper Excavation	CY	4,534,554	6,233,221	6,233,221
Dragline Excavation	CY	22,289,263	33,938,386	33,938,386
Total Excavation	CY	26,823,817	40,171,607	40,171,607
Embank. Fill (Local)	CY	1,267,022	1,267,022	1,267,022
Embank. Fill (Import)	CY	0	0	0
Net Disposal	CY	25,556,795	38,904,585	38,904,585

D/S of Disappointment Slough to U/S of Old River

Description	Unit	10,000cfs Canal Bottom Width b=200ft	15,000cfs Canal Bottom Width b=340ft	15,000cfs Raised Canal Bottom Width b=340ft
Hydraulic Excavation	CY	9,728,583	9,728,583	14,921,684
Scraper Excavation	CY	3,073,523	4,594,856	3,898,949
Dragline Excavation	CY	17,286,361	26,643,384	8,478,555
Total Excavation	CY	30,088,467	40,966,824	27,299,187
Embank. Fill (Local)	CY	1,811,111	1,811,111	1,808,333
Embank. Fill (Import)	CY	9,072,575	9,072,575	24,620,507
Net Disposal	CY	28,277,356	39,155,713	25,490,854

Branch A - D/S of Old River to Delta-Mendota Canal

Description	Unit	10,000cfs Canal Bottom Width b=200ft	15,000cfs Canal Bottom Width b=340ft	15,000cfs Raised Canal Bottom Width b=340ft
Hydraulic Excavation	CY	0	0	0
Scraper Excavation	CY	205,177	293,844	88,667
Dragline Excavation	CY	941,966	1,457,599	515,632
Total Excavation	CY	1,147,144	1,751,443	604,299
Embank. Fill (Local)	CY	135,404	135,404	0
Embank. Fill (Import)	CY	0	0	0
Net Disposal	CY	1,011,740	1,616,039	604,299

Table A-25, Route #2 Incised and Raised Canal Quantities

Branch B - D/S of Old River to California Aqueduct

Description	Unit	10,000cfs Canal Bottom Width b=200ft	15,000cfs Canal Bottom Width b=340ft	15,000cfs Raised Canal Bottom Width b=340ft
Hydraulic Excavation	CY	0	0	0
Scraper Excavation	CY	938,590	1,187,479	248,889
Dragline Excavation	CY	10,519,126	14,246,456	3,727,330
Total Excavation	CY	11,457,716	15,433,935	3,976,219
Embank. Fill (Local)	CY	71,716	71,716	0
Embank. Fill (Import)	CY	0	0	0
Net Disposal	CY	11,386,001	15,362,220	3,976,219

For the Whole Canal

Description	Unit	10,000cfs Canal Bottom Width b=200ft	15,000cfs Canal Bottom Width b=340ft	15,000cfs Raised Canal Bottom Width b=340ft
Hydraulic Excavation	CY	9,728,583	9,728,583	14,921,684
Scraper Excavation	CY	8,751,845	12,309,400	10,469,725
Dragline Excavation	CY	51,036,717	76,285,825	46,659,903
Total Excavation	CY	69,517,145	98,323,809	72,051,312
Embank. Fill (Local)	CY	3,285,253	3,285,253	3,075,355
Embank. Fill (Import)	CY	9,072,575	9,072,575	24,620,507
Net Disposal	CY	66,231,892	95,038,556	68,975,956

Notes:

1. **Quantities do not include siphons and check structure stations**

Table A-26, 15,000 cfs Siphon Structure QTO - Box Culvert Barrel

Reinforced concrete box culvert 6 openings, each 30' x 30', Walls 3' Thick

L along the length	800	ft	ck
W all sides	3	ft	ck
opening	30	ft	ck
W outside total	201	ft	ck
H	36	ft	ck

A Slab on Grade

1-vertical form			
Surface Area =	6,006	ft^2	ck
2-top surface finishing			
Surface Area =	160,800	ft^2	ck
3-Volume of Concrete			
H	3		
W	201		
V	17,867	CY	ck
4-reinforcing steel	80	#/CY	
Use 80# per CY	1,429,333	LBS	
5-contraction and expansion joints			
Use 50' x 50' spacing	16	EA	
	4	EA	
Length = 50' x No. joints	1,000	LF	

B Walls

1- vertical form area			
#	7		
H	30	ft	
Surface A of 1 form =	24,000	ft^2	
Surface A of 7 forms, 2 sides =	336,000	ft^2	ck
Surface A on front & back 7 on 2 sides	1,260	ft^2	ck
CombinedSurface Area of Vert. Walls=	337,260	ft^2	ck
2-Curved Vertical form surface area	0		ck
3- Top of wall surface finish area			
Surface Area for 7 =	16,800	ft^2	ck
4-Volume of concrete			
Volume =	37,333	CY	ck
5-reinforcing steel	150	#/CY	
Assume 150 #/cy, Weight =	5,600,000	LBS	
6-contraction and expansion joints	0		
Assume none			

Table A-26, 15,000 cfs Siphon Structure QTO - Box Culvert Barrel

	C	**Elevated Slab**					
		1-vertical form					
		W	30				
		L	800				
		vertical A on side	6,006	ft^2	ck		
		2- Top surface finish area					
		A	160,800	ft^2	ck		
		3- Horizontal Form Surface Area					
		W	30				
		L	800				
		Area total of 6 vertical	144,000	ft^2	ck		
		4-Volume of concrete					
		V	17,867	CY	ck		
		5-reinforcing steel	120	#/CY			
		Use 80# per CY	2,144,000	LBS	ck		
		6-contraction and expansion joints					
		Assume none					

Table A-27, 15,000 CFS Siphon Structure QTO -			
Approach Transition			
A Retaining Wall without Buttress			
width	3 ft	Assumed Value	
min height	0 ft	Assumed Value	
max height	31.5 ft	Assumed Value	
L inclined	290 ft	Assumed Value	
Avg height	15.75 ft		
Avg verti area each side	4567.5 ft		
1-vertical form area			
Surface Area for 4 sides (2 walls)=	18,270 ft^2		
2-top surface finishing			
Surface Area (2 walls)	1,740 ft^2		
3-concrete volume			
Volume (2 walls)	1,015 CY		
B Retaining Wall Footing (Slab)			
width on the small side	3 ft	Assumed Value	
thickness of slab	4 ft	Assumed Value	
ratio of wall Height To length of fill footer	2	Assumed Value	
avg height	15.75 ft		
avg width	13.875 ft		
1-vertical form area			
Surface Area for 4 sides (2 walls)	4,862 ft^2		
2-horizontal top finishing			
Avg width without retaining wall thickness	10.875 ft^2		
Surface Area (2 walls)	6,308 ft^2		
3-Volume of concrete			
Volume (2 walls)	1,192 CY		
C Buttresses			
avg height	15.75 ft		
slope (vertical/horizontal)	2 :1	Assumed Value	
thickness	4 ft	Assumed Value	
top width	3 ft	Assumed Value	
bottom width	10.88 ft		
distance between center lines of buttresses	25 ft	Assumed Value	
# of buttresses on each side	11.00		
Total # of buttresses on both sides	22.00		

Table A-27, 15,000 CFS Siphon Structure QTO -						
		Approach Transition				
		1-vertical form area				
		Surface Area for 1 buttress 2 sides	219	ft^2		
		Surface Area for all buttresses	4,808	ft^2		
		2-inclined form area (1 side)				
		inclined avg length	17.61	ft		
		Surface Area of one buttress	70	ft^2		
		Surface Area for all buttresses	1,550	ft^2		
		3-horizontal finishing				
		Surface Area for one buttress	12	ft^2		
		Surface Area for all buttresses	264	ft^2		
		4-Volume of concrete				
		Volume for one buttress	16	CY		
		Volume for all buttresses (22)	356	CY		
	D	**Approach Slab**				
		1-Inclined portion (U/S End)				
		bottom width	340	ft	Input from Canal Calc's	
		slope (horizontal/vertcal)	3	:1	Assumed Value	
		height	30	ft	Assumed Value	
		thickness	2	ft	Assumed Value	
		length	529.7	ft		
		2-Flat Slab (D/S End)				
		width bottom	300	ft		
		length (straight)	250	ft	Assumed Value	
		Top Surface Area =	124,460	ft^2		
		3-horizontal finishing				
		Surface Area =	80,000	ft^2		
		4-inclined finishing				
		Surface Area =	23,717	ft^2		
		5-volume of concrete				
		volume of concrete slab =	9,219	CY		

APPENDIX B

CONSTRUCTION COST ESTIMATE TABLES

Table B-3, ESTIMATED CAPITAL COSTS (Including Escalation by USBR Index to Apr 2006)

ISLOLATED DELTA CONVEYANCE FACILITY - 15,000 CFS ALTERNATIVE COST ESTIMATES

[1] Line Ref No	[2] Description	[3] Quantity	[4] Unit Meas	[5] Unit Cost Oct. 1964	[6] USBR Index Oct. 1964	[7] Unit Cost Oct. 1996	[8] USBR Index Oct. 1996	[9] USBR Index Apr 2006	[10] Unit Cost Apr 2006	[11] QTO from 1997 TOTAL COST APR. 2006	[12] 2006 QTO Unit Rate	[13] Route 1-1 2006 QTO Quantity	[14] Route 1-1 2006 QTO Total Cost 2006 $'s	[15] Route 1-2 2006 QTO Quantity	[16] Route 1-2 2006 QTO Total Cost 2006 $'s	[17] Route 2-1 2006 QTO Quantity	[18] Route 2-1 2006 QTO Total Cost 2006 $'s	[19] Route 2-2 2006 QTO Quantity	[20] Route 2-2 2006 QTO Total Cost 2006 $'s	[21] Cost Ref.	[22] Comments
1	I. INTAKE FACILITIES																				
1.1	Mob/Demob Allowance @ 5%												$19,130,000		$19,130,000		$19,130,000		$19,130,000	5	
1.2	Intake Facilities from Sacramento River	JOB	LS			$45,906,000	213	296	--	$63,794,000										1	
1.3	Fish Screens	15,000	CFS			$10,000	213	296	$14,000	$210,000,000										1	
1.4	Intake Facilities & Fish Screens	15,000	CFS								$25,000		$375,000,000		$375,000,000		$375,000,000		$375,000,000		Input from SWC
1.5	**Flow Control Structures** - Radial Control Gates, based on 1999 price of $284,000 ea for 20'w by 26'h; escal to 2006 and adjust for size										$1,267,000	6	$7,602,000	6	$7,602,000	6	$7,602,000	6	$7,602,000	6	C x(w2/w1)$^{1.5}$ x (h2/h1)^{2}
1.6	Miscellaneous Cost @ 20%									$54,758,800			Not Used		Not Used		Not Used		Not Used	1	
1.7	SUBTOTAL INTAKE FACILITIES									$328,552,800			$401,732,000		$401,732,000		$401,732,000		$401,732,000		
2	II. BRIDGES																				
2.1	Mob/Demob Allowance @ 5%												$2,403,000		$2,403,000		$2,403,000		$2,403,000	5	
2.2	State Hwy. 24	22,680	SF			$100	226	311	$138	$3,129,840			$3,129,840		$3,129,840		$3,129,840		$3,129,840	3	
2.3	State Hwy. 12	22,680	SF			$100	226	311	$138	$3,129,840			$3,129,840		$3,129,840		$3,129,840		$3,129,840	3	
2.4	State Hwy. 4	22,680	SF			$100	226	311	$138	$3,129,840			$3,129,840		$3,129,840		$3,129,840		$3,129,840	3	
2.5	Tracy Road	22,680	SF			$100	226	311	$138	$3,129,840			$3,129,840		$3,129,840		$3,129,840		$3,129,840	3	
2.6	Lambert Road	16,200	SF			$100	226	311	$138	$2,235,600			$2,235,600		$2,235,600		$2,235,600		$2,235,600	3	
2.7	Laurel Lane	16,200	SF			$100	226	311	$138	$2,235,600			$2,235,600		$2,235,600		$2,235,600		$2,235,600	3	
2.8	Walnut Grove Road	16,200	SF			$100	226	311	$138	$2,235,600			$2,235,600		$2,235,600		$2,235,600		$2,235,600	3	
2.9	Peltier Road	16,200	SF			$100	226	311	$138	$2,235,600			$2,235,600		$2,235,600		$2,235,600		$2,235,600	3	
2.10	Woodbridge Road	16,200	SF			$100	226	311	$138	$2,235,600			$2,235,600		$2,235,600		$2,235,600		$2,235,600	3	
2.11	Atherton Road	16,200	SF			$100	226	311	$138	$2,235,600			$2,235,600		$2,235,600		$2,235,600		$2,235,600	3	
2.12	McDonal Road	16,200	SF			$100	226	311	$138	$2,235,600			$2,235,600		$2,235,600		$2,235,600		$2,235,600	3	
2.13	Calpack Road	16,200	SF			$100	226	311	$138	$2,235,600			$2,235,600		$2,235,600		$2,235,600		$2,235,600	3	
2.14	Borants Road	16,200	SF			$100	226	311	$138	$2,235,600			$2,235,600		$2,235,600		$2,235,600		$2,235,600	3	
2.15	Middle River O & M Road	16,200	SF			$100	226	311	$138	$2,235,600			$2,235,600		$2,235,600		$2,235,600		$2,235,600	3	
2.16	Southern Pacific R. R	JOB	LS	$578,300	43	$3,039,437	226	311	--	$4,183,000			$4,183,000		$4,183,000		$4,183,000		$4,183,000	2	
2.17	Western Pacific R. R.	JOB	LS	$573,000	43	$3,011,581	226	311	--	$4,144,000			$4,144,000		$4,144,000		$4,144,000		$4,144,000	2	
2.18	A. T. & S. F. R. R. - Main Line	JOB	LS	$672,000	43	$3,531,907	226	311	--	$4,860,000			$4,860,000		$4,860,000		$4,860,000		$4,860,000	2	
2.19	SUBTOTAL BRIDGES									$48,062,360			$50,465,360		$50,465,360		$50,465,360		$50,465,360		Assume QTO Same
3	III. CULVERTS (2)																				
3.1	Mob/Demob Allowance @ 5%												$137,000		$137,000		$137,000		$137,000	5	
3.2	Concrete including Rebar and Earthworks	285	CY			$600	196	278	$851	$242,535			$242,535		$242,535		$242,535		$242,535	3	
3.3	108" Dia. RCP	3,420	LF			$324	196	278	$460	$1,573,200			$1,573,200		$1,573,200		$1,573,200		$1,573,200	3	
3.4	Intake Structures	JOB	LS	$102,400	45	$484,693	213	296	--	$674,000			$674,000		$674,000		$674,000		$674,000	2	
3.5	Riprap	3,400	CY			$50.00	181	267	$74	$251,600			$251,600		$251,600		$251,600		$251,600	3	
3.6	SUBTOTAL CULVERTS									$2,741,335			$2,878,335		$2,878,335		$2,878,335		$2,878,335		Assume QTO Same
4	IV. PUMPING PLANT											At Old River Siphon	At Disappointment Slough		At Old River Siphon		At Disappointment Slough				
4.1	Mob/Demob Allowance @ 5%												$9,830,000		$9,830,000		$9,830,000		$9,830,000	5	
4.2	Q = 15,000 cfs, TDH = 10 feet, HP = 25,080	JOB	LS			$57,807,000	209	287	--	$79,380,904	$196,600,000		$196,600,000		$196,600,000		$196,600,000		$196,600,000	5	
4.3	SUBTOTAL PUMPING PLANT									$79,380,904			$206,430,000		$206,430,000		$206,430,000		$206,430,000		New Input on Pumping
5	V. EARTH CANAL																				
5.1	Mob/Demob Allowance @ 5%												$33,404,000		$40,868,000		$25,022,000		$31,373,000	5	
5.2	Excavation	69,373,000	CY			$2.00	181	267	$2.95	$204,650,350		104,625,589		90,200,318		98,320,992		72,049,266		3	
5.3	Scraper Excavation (1 Mi Haul)										$5.36	12,304,367	$65,951,407	12,087,861	$68,790,935	12,309,504	$65,978,941	10,469,604	$56,117,077	5	U.P. = Direct x 1.30
5.4	Dragline Excavation (0 Mi Haul)										$1.98	83,135,681	$164,608,648	63,570,904	$125,870,390	76,282,055	$151,038,469	46,657,170	$92,381,197	5	U.P. = Direct x 1.35
5.5	Hyd Excavator below Embank to Organic Soils (0.5 Mi Haul)										$2.68	9,185,341	$24,617,250	14,541,553	$38,971,362	9,729,433	$26,074,880	14,922,492	$39,992,279	5	U.P. = Direct x 1.30
5.6	Dewatering in Organic Soils for Embankment Plc	1	LS										$9,000,000		$4,500,000		$9,000,000		$4,500,000	5	Ref Dewater1.xls
5.7	Compacted Embankment											9,436,215		24,413,264		12,359,323		27,698,396			Plc & Cmpct mcf'd
5.8	Normal Above Ground Embankment	31,002,000	CY			$0.80	181	267	$1.18	$36,582,360	$0	2,144,607	$0	2,140,904	$0	3,285,253	$0	3,075,355	$0	3	w/Scraper Excav
5.9	Replace Organic Soils - Borrow, Load, Haul, Dump in Temp Stockpile - 10 Mi Haul										$8.64	7,291,608	$62,999,493	22,272,300	$192,433,190	9,074,070	$78,399,965	24,823,041	$212,743,074	5	U.P. = Direct x 1.3 + $1
5.10	Replace Organic Soils - Build Embankment Total - 0.5 Mi Haul										$3.33	7,291,608	$24,281,055	22,272,300	$74,166,959	9,074,070	$30,216,633	24,823,041	$81,994,727	5	U.P. = Direct x 1.3
5.11	Common Embankment	6,403,000	CY			$0.50	181	267	$0.74	$4,738,220		0		0		0		0		3	
5.12	Seeding @ $2,700 in 1999 $'s	2,380	AC						$3,576	$0			$8,510,880		$8,510,880		$8,510,880		$8,510,880	6	Item Added
5.13	Rights-Of-Way	5,330	AC			$5,000	319	530	$8,300	$44,239,000		6,700		6,700		6,600		6,600		3	
5.14	Secondary Zone Property 1 @ $200,000 per acre		AC								$200,000	746	$149,200,000	746	$149,200,000	0	$0	0	$0		
5.15	Secondary Zone Property 2 @ $50,000 per acre		AC								$50,000	686	$34,300,000	686	$34,300,000	0	$0	0	$0		
5.16	Primary Zone Property @ $5,000 per acre		AC								$5,000	5,268	$26,340,000	5,268	$26,340,000	6,600	$33,000,000	6,600	$33,000,000		
5.17	Relocation of Existing Property	JOB	LS	$10,616,000	40	$57,591,800	217	283	--	$75,108,000			$75,108,000		$75,108,000		$75,108,000		$75,108,000	2	Assume QTO Same
5.18	Haul Road Maintence & Replacement	200	MI								$100,000		$20,000,000		$20,000,000		$20,000,000		$20,000,000	5	Allowance
5.19	Fencing	464,000	LF			$5.00	212	298	$7.03	$3,261,920		450,000	$3,163,500	450,000	$3,163,500	443,000	$3,114,290	443,000	$3,114,290	3	
5.20	SUBTOTAL EARTH CANAL									$368,579,850			$701,484,233		$858,223,216		$525,464,079		$658,834,523		

Table B-3, ESTIMATED CAPITAL COSTS (Including Escalation by USBR Index to Apr 2006)

ISLOLATED DELTA CONVEYANCE FACILITY - 15,000 CFS ALTERNATIVE COST ESTIMATES

[1] Line Ref No.	[2] Description	[3] Quantity	[4] Unit Meas	[5] Unit Cost Oct. 1964	[6] USBR Index Oct. 1964	[7] Unit Cost Oct. 1996	[8] USBR Index Oct. 1996	[9] USBR Index Apr 2006	[10] Unit Cost Apr 2006	[11] QTO from 1997 TOTAL COST APR. 2006	[12] 2006 QTO Unit Rate	[13] Route 1-1 2006 QTO Quantity	[14] Route 1-1 2006 QTO Total Cost 2006 $'s	[15] Route 1-2 2006 QTO Quantity	[16] Route 1-2 2006 QTO Total Cost 2006 $'s	[17] Route 2-1 2006 QTO Quantity	[18] Route 2-1 2006 QTO Total Cost 2006 $'s	[19] Route 2-2 2006 QTO Quantity	[20] Route 2-2 2006 QTO Total Cost 2006 $'s	[21] Cost Ref.	[22] Comments
6	VI. MOKELUMNE RIVER SIPHON & CONTROL	250	LF									400	LF	400	LF	400	LF	400	LF		Gates added in 1999 Report
6.1	Mob/Demob Allowance @ 5%												$3,032,000		$3,032,000		$3,032,000		$3,032,000	5	
6.2	6-30'x30' Concrete Box Including Rebar & Earthwork	33,600	CY			$600	213	296	$834	$28,022,400	$423	82,197	$34,781,297	82,197	$34,781,297	82,197	$34,781,297	82,197	$34,781,297	3	Conc $409, Earth $14
6.3	Transitions Concrete	7,000	CY			$600	213	296	$834	$5,838,000	$328	23,600	$7,733,355	23,600	$7,733,355	23,600	$7,733,355	23,600	$7,733,355	3	Conc $328
6.4	Radial Control Gates, based on 1999 price of $284,000 ea for 20'w by 26'h, escal to 2006 and adjust for size										$1,267,000	6	$7,602,000	6	$7,602,000	6	$7,602,000	6	$7,602,000	6	C x(w2/w1)$^{1.5}$ x (h2/h1)^2
6.5	Riprap	27,180	CY			$50.00	181	267	$74	$2,011,320			$2,011,320		$2,011,320		$2,011,320		$2,011,320	3	Assume QTO Same
6.6	Sand and Gravel Bedding	9,060	CY			$50.00	181	267	$74	$670,440			$670,440		$670,440		$670,440		$670,440	3	Assume QTO Same
6.7	Channel Excavation	477,500	CY			$2.00	181	267	$2.95	$1,408,625		764,000	$2,253,800	764,000	$2,253,800	764,000	$2,253,800	764,000	$2,253,800	3	Length Proportion Adj
6.8	Compacted Embankment	289,000	CY			$0.80	181	267	$1.18	$341,020		462,400	$341,020	462,400	$341,020	462,400	$341,020	462,400	$341,020	3	Length Proportion Adj
6.9	Temporary Dikes	46,500	CY			$4.00	181	267	$5.90	$274,350		312,123	$274,350	312,123	$274,350	312,123	$274,350	312,123	$274,350	3	Assume QTO Same
6.10	Fill in Old River Bed	189,000	CY			$2.00	181	267	$2.95	$557,550		1,268,630	$557,550	1,268,630	$557,550	1,268,630	$557,550	1,268,630	$557,550	3	Assume QTO Same
6.11	Level Abandoned Levee	210,000	CY			$2.00	181	267	$2.95	$619,500		1,409,589	$619,500	1,409,589	$619,500	1,409,589	$619,500	1,409,589	$619,500	3	Assume QTO Same
6.12	Dewatering and Maintenance of Site	JOB	LS	$235,000	40	$1,245,500	212	298	--	$1,750,750			$2,801,200		$2,801,200		$2,801,200		$2,801,200	2	Length Proportion Adj
6.13	Turnout Structure w/200 cfs Capacity	1	LS								$1,000,000	1	$1,000,000	1	$1,000,000	1	$1,000,000	1	$1,000,000		Suggested by D. Majors
6.14	SUBTOTAL MOKELUMNE RIVER SIPHON									$41,493,955			$63,677,832		$63,677,832		$63,677,832		$63,677,832		
7	VII. SAN JOAQUIN RIVER SIPHON & CONTROL	712	LF									800	LF	850	LF	1,400	LF	1,450	LF		Gates added in 1999 Report
7.1	Mob/Demob Allowance @ 5%												$3,555,000		$3,666,000		$4,878,000		$4,968,000	5	
7.2	Dewatering and Pumping	JOB	LS	$206,000	43	$1,015,628	212	298	--	$1,427,628			$1,604,076		$1,704,331		$2,807,134		$2,907,388	2	Length Proportion Adj
7.3	Strip and Waste Peat	66,400	CY			$2.00	181	267	$2.95	$195,880			$220,090		$233,646		$385,157		$398,913	3	Length Proportion Adj
7.4	6-30'x30' Concrete Box Including Rebar & Earthwork	32,590	CY			$600	213	296	$834	$27,180,060	$423	73,064	$30,916,709	77,631	$32,849,003	127,862	$54,104,240	132,429	$56,036,534	3	Conc $409, Earth $14
7.5	Transitions Concrete	7,000	CY			$600	213	296	$834	$5,838,000	$328	23,600	$7,733,355	23,600	$7,733,355	23,600	$7,733,355	23,600	$7,733,355	3	Conc $328
7.6	Radial Control Gates, based on 1999 price of $284,000 ea for 20'w by 26'h, escal to 2006 and adjust for size										$1,267,000	6	$7,602,000	6	$7,602,000	6	$7,602,000	6	$7,602,000	6	C x(w2/w1)$^{1.5}$ x (h2/h1)^2
7.7	Trench Excavation	663,000	CY			$2.00	181	267	$2.95	$1,955,850			$2,197,584		$2,334,933		$3,845,772		$3,983,121	3	Length Proportion Adj
7.8	Spoil Unsuitable Material	82,000	CY			$2.00	181	267	$2.95	$241,900			$271,798		$288,785		$475,646		$492,633	3	Length Proportion Adj
7.9	Compacted Embankment	37,000	CY			$0.80	181	267	$1.18	$43,660			$49,056		$52,122		$85,848		$88,914	3	Length Proportion Adj
7.10	Riprap	19,800	CY			$50.00	181	267	$74	$1,465,200			$1,465,200		$1,465,200		$1,465,200		$1,465,200	3	
7.11	Gravel Bedding	4,800	CY			$50.00	181	267	$74	$355,200			$355,200		$355,200		$355,200		$355,200	3	
7.12	Sand Backfill	554,800	CY			$4.00	181	267	$5.90	$3,273,320			$3,273,320		$3,273,320		$3,273,320		$3,273,320	3	
7.13	Open Joint Tile - 6" Dia	13,900	LF			$2.00	181	267	$2.95	$41,005			$41,005		$41,005		$41,005		$41,005	3	
7.14	Gravel Filter	980	CY			$50.00	181	267	$74	$72,520			$72,520		$72,520		$72,520		$72,520	3	
7.15	Sheet Piling	32,000	SF			$25.00	181	267	$37	$1,184,000			$1,184,000		$1,184,000		$1,184,000		$1,184,000	3	
7.16	Timber Piling	380	EA	$275	43	$1,356	212	298	$1,906	$724,209			$724,209		$724,209		$724,209		$724,209	2	
7.17	Placing Fabricated Barrel Units	JOB	LS			$3,760,000	212	298	--	$5,285,283			$5,285,283		$5,285,283		$5,285,283		$5,285,283	2	
7.18	Casting Basin	JOB	LS			$4,840,000	212	298	--	$6,803,396			$6,803,396		$6,803,396		$6,803,396		$6,803,396	2	
7.19	Slide Gates and Hoists	JOB	LS			$223,000	213	296	--	$309,897			$309,897		$309,897		$309,897		$309,897	2	
7.20	Turnout Structure w/200 cfs Capacity	1	LS								$1,000,000	1	$1,000,000	1	$1,000,000	1	$1,000,000	1	$1,000,000		Suggested by D. Majors
7.21	SUBTOTAL SAN JOAQUIN RIVER SIPHON									$56,397,008			$74,663,698		$76,978,405		$102,431,183		$104,744,890		
8	VIII. OLD RIVER SIPHON	580	LF									500	LF	550	LF	500	LF	550	LF		
8.1	Mob/Demob Allowance @ 5%												$1,727,000		$1,823,000		$1,727,000		$1,823,000	5	
8.2	6-30'x30' Concrete Box Including Rebar & Earthwork	74,400	CY			$600	213	296	$834	$62,049,600	$423	45,665	$19,322,943	50,232	$21,255,237	45,665	$19,322,943	50,232	$21,255,237	3	Conc $409, Earth $14
8.3	Transitions Concrete	7,000	CY			$600	213	296	$834	$5,838,000	$328	23,600	$7,733,355	23,600	$7,733,355	23,600	$7,733,355	23,600	$7,733,355	3	Conc $328
8.4	Compacted Embankment	136,000	CY			$0.80	181	267	$1.18	$160,480			$160,480		$160,480		$160,480		$160,480	3	
8.5	Sand and Gravel Bedding	6,040	CY			$50.00	181	267	$74	$446,960			$446,960		$446,960		$446,960		$446,960	3	
8.6	Riprap	24,000	CY			$50.00	181	267	$74	$1,776,000			$1,776,000		$1,776,000		$1,776,000		$1,776,000	3	
8.7	Replace Levee Road	1,700	LF	$4.20	43	$23.00	237	331	$32	$54,961			$54,961		$54,961		$54,961		$54,961	2	
8.8	Cofferdams (2)	72,000	CY			$2.80	181	267	$4.13	$297,360			$297,360		$297,360		$297,360		$297,360	3	
8.9	Remove Old Levees and Two Cofferdams	204,000	CY			$1.50	181	267	$2.21	$450,840			$450,840		$450,840		$450,840		$450,840	3	
8.10	Bypass Channel	JOB	LS	$240,000	43	$1,183,256	212	298	--	$1,663,000			$1,663,000		$1,663,000		$1,663,000		$1,663,000	2	
8.11	Dewatering	JOB	LS	$235,000	43	$1,158,605	212	298	--	$1,629,000			$1,629,000		$1,629,000		$1,629,000		$1,629,000	2	
8.12	Turnout Structure w/200 cfs Capacity	1	LS								$1,000,000	1	$1,000,000	1	$1,000,000	1	$1,000,000	1	$1,000,000		Suggested by D. Majors
8.13	SUBTOTAL OLD RIVER SIPHON									$74,366,201			$36,261,899		$38,290,193		$36,261,899		$38,290,193		

Table B-3, ESTIMATED CAPITAL COSTS (Including Escalation by USBR Index to Apr 2006)

ISLOLATED DELTA CONVEYANCE FACILITY - 15,000 CFS ALTERNATIVE COST ESTIMATES

[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]	[13]	[14]	[15]	[16]	[17]	[18]	[19]	[20]	[21]	[22]
Line Ref. No.	Description	Quantity	Unit Meas	Unit Cost Oct. 1964	USBR Index Oct. 1964	Unit Cost Oct. 1996	USBR Index Oct. 1996	USBR Index Apr 2006	Unit Cost Apr 2006	QTO from 1997 TOTAL COST AFR. 2006	2006 QTO Unit Rate	Route 1-1 2006 QTO Quantity	Route 1-1 2006 QTO Total Cost 2006 $'s	Route 1-2 2006 QTO Quantity	Route 1-2 2006 QTO Total Cost 2006 $'s	Route 2-1 2006 QTO Quantity	Route 2-1 2006 QTO Total Cost 2006 $'s	Route 2-2 2006 QTO Quantity	Route 2-2 2006 QTO Total Cost 2006 $'s	Cost Ref.	Comments
9	IX. MIDDLE RIVER SIPHON & CONTROL	730	LF									1,100	LF	1,150	LF	1,100	LF	1,150	LF		Gates added in 1999 Report
9.1	Mob/Demob Allowance @ 5%												$4,687,000		$4,848,000		$4,687,000		$4,848,000	5	
9.2	Temporary River Realignment	JOB	LS	$7,149,000	189	$7,527,254	199	285	--	$10,780,238			$16,244,194		$16,982,567		$16,244,194		$16,982,567	4	Length Proportion Adj
9.3	Dewatering	JOB	LS	$100,000	178	$119,101	212	298	--	$167,416			$252,270		$263,737		$252,270		$263,737	4	Length Proportion Adj
9.4	Siphon - Concrete Including Rebar Earthworks	86,800	CY			$600	213	296	$834	$72,391,200	$423	100,463	$42,510,474	105,030	$44,442,769	100,463	$42,510,474	105,030	$44,442,769	3	Conc $409, Earth $14
9.5	Riprap	64,710	TON	$27.00	181	$27.00	181	267	$40	$2,588,400			$2,588,400		$2,588,400		$2,588,400		$2,588,400	4	
9.6	Access Road	0.27	MILE	$500,000	208	$526,442	219	293	$704,327	$190,168			$190,168		$190,168		$190,168		$190,168	4	
9.7	Inlet and Outlet Transitions - Concrete	7,000	CY			$600	213	296	$834	$5,838,000	$328	23,600	$7,733,355	23,600	$7,733,355	23,600	$7,733,355	23,600	$7,733,355	3	
9.8	Radial Control Gates, based on 1999 price of $284,000 ea for 20'w by 26'h, excal to 2006 and adjust for size										$1,267,000	6	$7,602,000	6	$7,602,000	6	$7,602,000	6	$7,602,000	6	$C x(w2/w1)^{1.5} x (h2/h1)^2$
9.9	Turnout Structure w/200 cfs Capacity	1	LS								$1,000,000	1	$1,000,000	1	$1,000,000	1	$1,000,000	1	$1,000,000		Suggested by D. Majors
9.10	Miscellaneous @ 20%									$18,391,084			$15,624,172		$16,160,599		$15,624,172		$16,160,599		
9.11	SUBTOTAL MIDDLE RIVER SIPHON									$110,346,506			$98,432,034		$101,811,594		$98,432,034		$101,811,594		
10	X. 14-MILE SLOUGH SIPHON	373	LF									600	LF	650	LF	0	LF	0	LF		
10.1	Mob/Demob Allowance @ 5%												$2,309,000		$2,456,000		$0		$0	5	
10.2	Temporary River Realignment	JOB	LS	$2,466,000	189	$2,596,476	199	285	--	$3,718,571			$5,949,714		$6,445,524		$0		$0	4	Length Proportion Adj
10.3	Dewatering	JOB	LS	$100,000	178	$119,101	212	298	--	$167,416			$267,865		$290,187		$0		$0	4	Length Proportion Adj
10.4	Siphon - Concrete Including Rebar Earthworks	9,820	CY			$600	213	296	$834	$8,189,880	$423	54,798	$23,187,531	59,365	$25,119,826	0	$0	0	$0	3	Conc $409, Earth $14
10.5	Riprap	3,690	TON	$27.00	181	$27.00	181	267	$40	$147,600			$147,600		$147,600		$0		$0	4	
10.6	Access Road	0.27	MILE	$500,000	208	$526,442	219	293	$704,327	$190,168			$190,168		$190,168		$0		$0	4	
10.7	Inlet and Outlet Transitions - Concrete	7,000	CY			$600	213	296	$834	$5,838,000	$328	23,600	$7,733,355	23,600	$7,733,355	0	$0	0	$0	3	
10.8	Turnout Structure w/200 cfs Capacity	1	LS								$1,000,000	1	$1,000,000	1	$1,000,000	0	$0	0	$0		Suggested by D. Majors
10.9	Miscellaneous @ 20%									$3,650,327			$7,695,247		$8,185,332		$0		$0		
10.10	SUBTOTAL 14-MILE SLOUGH SIPHON									$21,901,962			$48,480,481		$51,567,992		$0		$0		
11	XI. WHITE SLOUGH SIPHON & CONTROL	205	LF									400	LF	400	LF	800	LF	800	LF		Gates added in 1999 Report
11.1	Mob/Demob Allowance @ 5%												$2,156,000		$2,156,000		$3,264,000		$3,264,000	5	
11.2	Temporary River Realignment	JOB	LS	$912,000	189	$960,254	199	285	--	$1,375,238			$2,683,391		$2,683,391		$5,366,783		$5,366,783	4	Length Proportion Adj
11.3	Dewatering	JOB	LS	$100,000	178	$119,101	212	298	--	$167,416			$326,665		$326,665		$653,330		$653,330	4	Length Proportion Adj
11.4	Siphon - Concrete Including Rebar and Earthworks	3,930	CY			$600	213	296	$834	$3,277,620	$423	36,532	$15,458,354	36,532	$15,458,354	73,064	$30,916,709	73,064	$30,916,709	3	Conc $409, Earth $14
11.5	Riprap	23,600	TON	$27.00	181	$27.00	181	267	$40	$944,000			$944,000		$944,000		$944,000		$944,000	4	
11.6	Access Road	0.27	MILE	$500,000	208	$526,442	219	293	$704,327	$190,168			$190,168		$190,168		$190,168		$190,168	4	
11.7	Inlet and Outlet Transitions - Concrete	7,000	CY			$600	213	296	$834	$5,838,000	$328	23,600	$7,733,355	23,600	$7,733,355	23,600	$7,733,355	23,600	$7,733,355	3	Conc $328
11.8	Radial Control Gates, based on 1999 price of $284,000 ea for 20'w by 26'h, excal to 2006 and adjust for size										$1,267,000	6	$7,602,000	6	$7,602,000	6	$7,602,000	6	$7,602,000	6	$C x(w2/w1)^{1.5} x (h2/h1)^2$
11.9	Turnout Structure w/200 cfs Capacity	1	LS								$1,000,000	1	$1,000,000	1	$1,000,000	1	$1,000,000	1	$1,000,000		Suggested by D. Majors
11.10	Miscellaneous @ 20%									$2,358,488			$7,187,587		$7,187,587		$10,881,269		$10,881,269		
11.11	SUBTOTAL WHITE SLOUGH SIPHON									$14,150,930			$45,281,520		$45,281,520		$68,551,613		$68,551,613		
12	XII. SYCAMORE SLOUGH SIPHON	160	LF									0	LF	0	LF	300	LF	300	LF		
12.1	Mob/Demob Allowance @ 5%												$0		$0		$1,383,000		$1,383,000	5	
12.2	Temporary River Realignment	JOB	LS	$502,000	189	$528,561	199	285	--	$756,984			$0		$0		$1,419,345		$1,419,343	4	Length Proportion Adj
12.3	Dewatering	JOB	LS	$100,000	178	$119,101	212	298	--	$167,416			$0		$0		$313,904		$313,904	4	Length Proportion Adj
12.4	Siphon - Concrete Including Rebar and Earthworks	1,960	CY			$600	213	296	$834	$1,634,640	$423	0	$0	0	$0	27,399	$11,593,766	27,399	$11,593,766	3	Conc $409, Earth $14
12.5	Riprap	20,080	TON	$27.00	181	$27.00	181	267	$40	$803,200			$0		$0		$803,200		$803,200	4	
12.6	Access Road	0.27	MILE	$500,000	208	$526,442	219	293	$704,327	$190,168			$0		$0		$190,168		$190,168	4	
12.7	Inlet and Outlet Transitions - Concrete	7,000	CY			$600	213	296	$834	$5,838,000	$328	0	$0	0	$0	23,600	$7,733,355	23,600	$7,733,355	3	Conc $328
12.8	Turnout Structure w/200 cfs Capacity	1	LS								$1,000,000	0	$0	0	$0	1	$1,000,000	1	$1,000,000		Suggested by D. Majors
12.9	Miscellaneous @ 20%									$1,878,082			$0		$0		$4,610,748		$4,610,748		
12.10	SUBTOTAL SYCAMORE SLOUGH SIPHON									$11,268,490			$0		$0		$29,047,486		$29,047,486		
13	XIII. HOG SLOUGH SIPHON	190	LF									400	LF	600	LF	400	LF	400	LF		
13.1	Mob/Demob Allowance @ 5%												$1,679,000		$1,679,000		$1,679,000		$1,679,000	5	
13.2	Temporary River Realignment	JOB	LS	$742,000	189	$781,259	199	285	--	$1,118,889			$2,355,556		$2,355,556		$2,355,556		$2,355,556	4	Length Proportion Adj
13.3	Dewatering	JOB	LS	$100,000	178	$119,101	212	298	--	$167,416			$352,454		$352,454		$352,454		$352,454	4	Length Proportion Adj
13.4	Siphon - Concrete Including Rebar and Earthworks	2,950	CY			$600	213	296	$834	$2,460,300	$423	36,532	$15,458,354	36,532	$15,458,354	36,532	$15,458,354	36,532	$15,458,354	3	Conc $409, Earth $14
13.5	Riprap	22,430	TON	$27.00	181	$27.00	181	267	$40	$897,200			$897,200		$897,200		$897,200		$897,200	4	
13.6	Access Road	0.27	MILE	$500,000	208	$526,442	219	293	$704,327	$190,168			$190,168		$190,168		$190,168		$190,168	4	
13.7	Inlet and Outlet Transitions - Concrete	7,000	CY			$600	213	296	$834	$5,838,000	$328	23,600	$7,733,355	23,600	$7,733,355	23,600	$7,733,355	23,600	$7,733,355	3	Conc $328
13.8	Turnout Structure w/200 cfs Capacity	1	LS								$1,000,000	1	$1,000,000	1	$1,000,000	1	$1,000,000	1	$1,000,000		Suggested by D. Majors
13.9	Miscellaneous @ 20%									$2,134,395			$5,597,417		$5,597,417		$5,597,417		$5,597,417		
13.10	SUBTOTAL HOG SLOUGH SIPHON									$12,806,368			$35,263,504		$35,263,504		$35,263,504		$35,263,504		

Table B-3, ESTIMATED CAPITAL COSTS (Including Escalation by USBR Index to Apr 2006)

ISLOLATED DELTA CONVEYANCE FACILITY - 15,000 CFS ALTERNATIVE COST ESTIMATES

[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]	[13]	[14]	[15]	[16]	[17]	[18]	[19]	[20]	[21]	[22]
Line No.	Description	Quantity	Unit Meas	Unit Cost Oct. 1964	USBR Index Oct. 1964	Unit Cost Oct. 1996	USBR Index Oct. 1996	USBR Index Apr 2006	Unit Cost Apr 2006	QTO from 1997 TOTAL COST APRIL 2006	2006 QTO Unit Rate	Route 1-1 2006 QTO Quantity	Route 1-1 2006 QTO Total Cost 2006 $'s	Route 1-2 2006 QTO Quantity	Route 1-2 2006 QTO Total Cost 2006 $'s	Route 2-1 2006 QTO Quantity	Route 2-1 2006 QTO Total Cost 2006 $'s	Route 2-2 2006 QTO Quantity	Route 2-2 2006 QTO Total Cost 2006 $'s	Cost Ref.	Comments
14	XIV. BEAVER SLOUGH SIPHON	385	LF									400	LF	400	LF	400	LF	400	LF		
14.1	Mob/Demob Allowance @ 5%												$1,802,000		$1,802,000		$1,802,000		$1,802,000	5	
14.2	Temporary River Realignment	JOB	LS	$2,533,000	189	$2,667,021	199	285	--	$3,819,603			$3,968,419		$3,968,419		$3,968,419		$3,968,419	4	Length Proportion Adj
14.3	Dewatering	JOB	LS	$100,000	178	$119,101	212	298	--	$167,416			$173,938		$173,938		$173,938		$173,938	4	Length Proportion Adj
14.4	Siphon - Concrete Including Rebar and Earthwork	9,820	CY			$600	213	296	$834	$8,189,880	$423	36,532	$15,458,354	36,532	$15,458,354	36,532	$15,458,354	36,532	$15,458,354	3	Conc $409, Earth $14
14.5	Riprap	37,700	TON	$27.00	181	$27.00	181	267	$40	$1,508,000			$1,508,000		$1,508,000		$1,508,000		$1,508,000	4	
14.6	Access Road	0.27	MILE	$500,000	208	$526,442	219	293	$704,327	$190,168			$190,168		$190,168		$190,168		$190,168	4	
14.7	Inlet and Outlet Transitions - Concrete	7,000	CY			$600	213	296	$834	$5,838,000	$328	23,600	$7,733,355	23,600	$7,733,355	23,600	$7,733,355	23,600	$7,733,355	3	Conc $328
14.8	Turnout Structure w/200 cfs Capacity	1	LS								$1,000,000	1	$1,000,000	1	$1,000,000	1	$1,000,000	1	$1,000,000		Suggested by D. Majors
14.9	Miscellaneous @ 20%									$3,942,613			$6,006,447		$6,006,447		$6,006,447		$6,006,447		
14.10	SUBTOTAL BEAVER SLOUGH SIPHON									$23,655,680			$37,840,682		$37,840,682		$37,840,682		$37,840,682		
15	XV. LOST SLOUGH SIPHON	250	LF									900	LF	900	LF	900	LF	900	LF		
15.1	Mob/Demob Allowance @ 5%												$2,753,000		$2,753,000		$2,753,000		$2,753,000	5	
15.2	Dewatering	JOB	LS	$100,000	178	$119,101	212	298	--	$167,416			$602,697		$602,697		$602,697		$602,697	4	Length Proportion Adj
15.3	Siphon - Concrete Including Rebar and Earthwork	4,910	CY			$600	213	296	$834	$4,094,940	$423	82,197	$34,781,297	82,197	$34,781,297	82,197	$34,781,297	82,197	$34,781,297	3	Conc $409, Earth $14
15.4	Riprap	27,100	TON	$27.00	181	$27.00	181	267	$40	$1,084,000			$1,084,000		$1,084,000		$1,084,000		$1,084,000	4	
15.5	Access Road	0.27	MILE	$500,000	208	$526,442	219	293	$704,327	$190,168			$684,606		$684,606		$684,606		$684,606	4	
15.6	Inlet and Outlet Transitions - Concrete	7,000	CY			$600	213	296	$834	$5,838,000	$328	23,600	$7,733,355	23,600	$7,733,355	23,600	$7,733,355	23,600	$7,733,355	3	Conc $328
15.7	Turnout Structure w/200 cfs Capacity	1	LS								$1,000,000	1	$1,000,000	1	$1,000,000	1	$1,000,000	1	$1,000,000		Suggested by D. Majors
15.8	Miscellaneous @ 20%									$2,274,905			$9,177,191		$9,177,191		$9,177,191		$9,177,191		
15.9	SUBTOTAL LOST SLOUGH SIPHON									$13,649,429			$57,816,145		$57,816,145		$57,816,145		$57,816,145		
16	XVI. SNODGRASS SLOUGH SIPHON	225	LF	new STONE LAKE SIPHON								1,200	LF	1,200	LF	1,200	LF	1,200	LF		Length Proportion Adj
16.1	Mob/Demob Allowance @ 5%												$3,940,000		$3,940,000		$3,940,000		$3,940,000	5	
16.2	Temporary River Realignment	JOB	LS	$950,000	189	$1,000,265	199	285	--	$1,432,540			$7,640,212		$7,640,212		$7,640,212		$7,640,212	4	Length Proportion Adj
16.3	Dewatering	JOB	LS	$100,000	178	$119,101	212	298	--	$167,416			$892,884		$892,884		$892,884		$892,884	4	Length Proportion Adj
16.4	Siphon - Concrete Including Rebar and Earthworks	3,930	CY			$600	213	296	$834	$3,277,620	$423	109,596	$46,375,063	109,596	$46,375,063	109,596	$46,375,063	109,596	$46,375,063	3	Conc $409, Earth $14
16.5	Riprap	25,200	TON	$27.00	181	$27.00	181	267	$40	$1,008,000			$1,008,000		$1,008,000		$1,008,000		$1,008,000	4	
16.6	Access Road	0.27	MILE	$500,000	208	$526,442	219	293	$704,327	$190,168			$1,014,231		$1,014,231		$1,014,231		$1,014,231	4	Length Proportion Adj
16.7	Inlet and Outlet Transitions - Concrete	7,000	CY			$600	213	296	$834	$5,838,000	$328	23,600	$7,733,355	23,600	$7,733,355	23,600	$7,733,355	23,600	$7,733,355	3	Conc $328
16.8	Turnout Structure w/200 cfs Capacity	1	LS								$1,000,000	1	$1,000,000	1	$1,000,000	1	$1,000,000	1	$1,000,000		Suggested by D. Majors
16.9	Miscellaneous @ 20%									$2,382,749			$13,132,749		$13,132,749		$13,132,749		$13,132,749		
16.10	SUBTOTAL SNODGRASS SLOUGH SIPHON									$14,296,493			$82,736,493		$82,736,493		$82,736,493		$82,736,493		
17	XVII. DISAPPOINTMENT SLOUGH SIPHON	0	LF	Use QTO for Beaver Slough (385 LF in 1997 Report) as base								400	LF	400	LF	1,400	LF	1,400	LF		Base QTO from Beaver
17.1	Mob/Demob Allowance @ 5%												$1,802,000		$1,802,000		$4,742,000		$4,742,000	5	
17.2	Temporary River Realignment	JOB	LS										$3,968,419		$3,968,419		$13,889,466		$13,889,466	4	Length Proportion Adj
17.3	Dewatering	JOB	LS										$173,938		$173,938		$608,784		$608,784	4	Length Proportion Adj
17.4	Siphon - Concrete Including Rebar and Earthwork		CY								$423	36,532	$15,458,354	36,532	$15,458,354	127,862	$54,104,240	127,862	$54,104,240	3	Conc $409, Earth $14
17.5	Riprap		TON										$1,508,000		$1,508,000		$1,508,000		$1,508,000	4	
17.6	Access Road		MILE										$190,168		$190,168		$190,168		$190,168	4	
17.7	Inlet and Outlet Transitions - Concrete		CY								$328	23,600	$7,733,355	23,600	$7,733,355	23,600	$7,733,355	23,600	$7,733,355	3	Conc $328
17.8	Turnout Structure w/200 cfs Capacity	1	LS								$1,000,000	1	$1,000,000	1	$1,000,000	1	$1,000,000	1	$1,000,000		Suggested by D. Majors
17.9	Miscellaneous @ 20%									$0			$6,006,447		$6,006,447		$15,806,803		$15,806,803		
17.10	SUBTOTAL DISAPPOINTMENT SLOUGH SIPHON									$0			$37,840,682		$37,840,682		$99,582,816		$99,582,816		
18	CONTROL STRUCTURE on CANAL BRANCH "A" to CVP																				
18.1	Mob/Demob Allowance @ 5%												$307,000		$307,000		$307,000		$307,000	5	
18.2	Inlet and Outlet Transitions - Concrete	7,000	CY			$600	213	296	$834		$328	7,867	$2,577,785	7,867	$2,577,785	7,867	$2,577,785	7,867	$2,577,785	3	Conc $328, 1/3 size
18.3	Radial Control Gates, based on 1999 price of $284,000 ea for 20'w by 26'h, excal to 2006 and adjust for size 5,000 cfs										$1,267,000	2	$2,534,000	2	$2,534,000	2	$2,534,000	2	$2,534,000	6	C x(w2/w1)$^{1.5}$ x (h2/h1)^{2}
18.4	Miscellaneous @ 20%												$1,022,357		$1,022,357		$1,022,357		$1,022,357		
18.5	SUBTOTAL CONTROL STRUCTURE ON CANAL BRANCH "A"									$0			$6,441,142		$6,441,142		$6,441,142		$6,441,142		
19	CONTROL STRUCTURE on CANAL BRANCH "B" to SWP																				
19.1	Mob/Demob Allowance @ 5%												$1,534,000		$1,534,000		$1,534,000		$1,534,000	5	
19.2	#1 Inlet and Outlet Transitions - Concrete - 15,000 cfs	7,000	CY			$600	213	296	$834		$328	23,600	$7,733,355	23,600	$7,733,355	23,600	$7,733,355	23,600	$7,733,355	3	Conc $328
19.3	#1 Radial Control Gates, based on 1999 price of $284,000 ea for 20'w by 26'h, excal to 2006 and adjust for size 15,000 cfs										$1,267,000	6	$7,602,000	6	$7,602,000	6	$7,602,000	6	$7,602,000	6	C x(w2/w1)$^{1.5}$ x (h2/h1)^{2}
19.4	#2 Inlet and Outlet Transitions - Concrete - 15,000 cfs	7,000	CY			$600	213	296	$834		$328	15,733	$5,155,570	15,733	$5,155,570	15,733	$5,155,570	15,733	$5,155,570	3	Conc $328, 2/3 size
19.5	#2 Radial Control Gates, based on 1999 price of $284,000 ea for 20'w by 26'h, excal to 2006 and adjust for size 10,000 cfs										$1,267,000	4	$5,068,000	4	$5,068,000	4	$5,068,000	4	$5,068,000	6	C x(w2/w1)$^{1.5}$ x (h2/h1)^{2}
19.6	Miscellaneous @ 20%												$5,111,785		$5,111,785		$5,111,785		$5,111,785		
19.7	SUBTOTAL CONTROL STRUCTURE ON CANAL BRANCH "A"									$0			$32,204,709		$32,204,709		$32,204,709		$32,204,709		

Table B-3, ESTIMATED CAPITAL COSTS (Including Escalation by USBR Index to Apr 2006)

ISLOLATED DELTA CONVEYANCE FACILITY - 15,000 CFS ALTERNATIVE COST ESTIMATES

[1] Line Ref. No.	[2] Description	[3] Quantity	[4] Unit Meas	[5] Unit Cost Oct. 1964	[6] USBR Index Oct. 1964	[7] Unit Cost Oct. 1996	[8] USBR Index Oct. 1996	[9] USBR Index Apr 2006	[10] Unit Cost Apr 2006	[11] QTO from 1997 TOTAL COST APR. 2006	[12] 2006 QTO Unit Rate	[13] Route 1-1 2006 QTO Quantity	[14] Route 1-1 2006 QTO Total Cost 2006 $'s	[15] Route 1-2 2006 QTO Quantity	[16] Route 1-2 2006 QTO Total Cost 2006 $'s	[17] Route 2-1 2006 QTO Quantity	[18] Route 2-1 2006 QTO Total Cost 2006 $'s	[19] Route 2-2 2006 QTO Quantity	[20] Route 2-2 2006 QTO Total Cost 2006 $'s	[21] Cost Ref.	[22] Comments
20	FOREBAY STRUCTURE to SWP																				
20.1	Mob/Demob Allowance @ 5%												$2,496,000		$2,496,000		$2,496,000		$2,496,000	5	
20.2	FLOW IN/OUT OF FOREBAY - Inlet and Outlet Transitions - Concrete - 15,000 cfs										$328	23,600	$7,733,355	23,600	$7,733,355	23,600	$7,733,355	23,600	$7,733,355	3	Conc $328
20.3	Radial Control Gates, based on 1999 price of $284,000 ea for 20'w by 26'h, escal to 2006 and adjust for size to 15,000 cfs										$1,267,000	6	$7,602,000	6	$7,602,000	6	$7,602,000	6	$7,602,000	6	C s(w2/w1)$^{3.5}$ x (h2/h1)^{3}
20.4	Excavation (250 Acres @ 16' depth)	0	CY							$0		6,500,000		6,500,000		6,500,000		6,500,000		3	
20.4.1	Scraper Excavation (1 Mi Haul)										$5.36	1,210,000	$6,485,600	1,210,000	$6,485,600	1,210,000	$6,485,600	1,210,000	$6,485,600	5	U.P. = Direct x 1.30
20.4.2	Dragline Excavation (0 Mi Haul)										$1.98	5,290,000	$10,474,200	5,290,000	$10,474,200	5,290,000	$10,474,200	5,290,000	$10,474,200	5	U.P. = Direct x 1.35
20.4.3	Hyd Excavator below Embank in Organic Soils (0.5 Mi Haul)										$2.60	0	$0	0	$0	0	$0	0	$0	5	U.P. = Direct x 1.30
20.5	Dewatering in Organic Soils for Embankment Plc	0	LS										$0		$0		$0		$0	5	Ref: Dewater2.xls
20.6	Compacted Embankment											2,789,000		2,789,000		2,789,000		2,789,000			
20.6.1	Import Dry Soils - Borrow, Load, Haul, Dump in Temp Stockpile - 10 Mi Haul										$8.04	0	$0	0	$0	0	$0	0	$0	5	U.P. = Direct x 1.3+$1
20.6.2	Use Dragline Excav'd Soils to Build Embankment Total - 0.5 Mi Haul										$3.33	1,579,000	$5,258,070	1,579,000	$5,258,070	1,579,000	$5,258,070	1,579,000	$5,258,070	5	U.P. = Direct x 1.3
20.7	Riprap Slopes of Forebay	0	CY			$50.00	181	267	$74	$0		167,000	$12,358,000	167,000	$12,358,000	167,000	$12,358,000	167,000	$12,358,000	3	
20.8	SUBTOTAL FOREBAY STRUCTURE to CVA									$0			$52,407,225		$52,407,225		$52,407,225		$52,407,225		
21	SUBTOTAL COST ITEMS ISOLATED DELTA CONVEYANCE FACILITY - 15,000 CFS ALTERNATIVE									$1,221,650,273			$2,072,337,973		$2,239,887,029		$1,989,664,536		$2,130,756,543		
22							ROUNDOFF SUBTOTAL			$1,222,000,000			$2,072,000,000		$2,240,000,000		$1,990,000,000		$2,131,000,000		
23	CONTINGENCIES																				
23a	Contingency at 20%									$244,300,000			--		--		--		--		
23b	Contingency at 30%									--			$621,700,000		$672,000,000		$596,900,000		$639,200,000	7	
24	ESTIMATED CONSTRUCTION COST									$1,466,300,000			$2,693,700,000		$2,912,000,000		$2,586,900,000		$2,770,200,000		
25	ENG, LEGAL, AND ADM @ 35%									$513,000,000			N/A		N/A		N/A		N/A	1	
25.1	ENGINEERING @ 28% (Design @ 13% and Const Management @ 15%)									N/A			$754,000,000		$815,000,000		$724,000,000		$776,000,000		% by D Majors
26	ESTIMATED CAPITAL COST									$1,979,300,000			$3,447,700,000		$3,727,000,000		$3,310,900,000		$3,546,200,000		

Footnote:
LS=lump sum, HP=horsepower, CY=cubic yard, LF=linear foot, SF=square foot, EA=each

Cost References:
1. CALFED
2. U.S. Bureau of Reclamation, *Peripheral Canal - Reconnaissance Estimate*, October 1964
3. Cost developed by Bookman-Edmonston Engineering
4. California Department of Water Resources, Civil Design Branch, Division of Design and Construction, *Isolated Delta Conveyance*, September 1995
5. Washington Group International, Inc. Recomn Level Unit Prices
6. CALFED Bay-Delta Program, Water Management Planning Branch, *Isolated Facility, Conceptual Analysis of Incised Canal Configuration*, September 1999
7. Contingency percentage selected by Washington Group International, Inc. based on the level of unknowns in design, QTO's, and other factors that could increase construction costs

Table B-4, USBR CONSTRUCTION COST TRENDS 1960 to 2006

CONSTRUCTION INDEXES	1960 JAN	1960 APR	1960 JUL	1960 OCT	1961 JAN	1961 APR	1961 JUL	1961 OCT	1962 JAN	1962 APR	1962 JUL	1962 OCT	1963 JAN	1963 APR	1963 JUL	1963 OCT
Earth Dams	42	41	40	40	41	41	41	41	41	41	41	41	41	41	41	42
Dam Structure	47	45	43	43	44	44	44	45	45	45	45	45	45	45	45	45
Spillway	41	40	39	39	40	40	40	40	40	40	40	40	40	40	41	41
Outlet Works	37	37	37	37	37	37	37	38	38	38	38	38	38	38	38	39
Concrete Dams	43	42	42	42	42	42	42	42	42	42	42	42	42	42	42	43
Diversions Dams	41	41	41	41	41	41	41	42	42	42	42	42	42	42	42	43
Pumping Plants	40	39	40	39	39	39	39	39	40	40	40	40	40	40	40	41
Structures and Improvements	44	42	43	42	42	42	42	43	43	43	44	44	44	44	45	45
Equipment	37	37	37	36	36	36	36	36	36	36	36	36	36	36	36	37
Pumps and Prime Movers	36	36	36	36	35	35	35	35	35	35	35	35	35	35	35	35
Accessory Elect + Misc. Equip.	37	37	37	37	37	37	37	38	38	38	38	38	39	39	39	39
Powerplants	40	40	40	40	40	39	39	40	40	40	40	40	41	41	41	41
Structures and Improvements	44	42	43	42	42	42	42	43	43	44	44	44	44	44	45	45
Equipment	40	40	39	39	39	38	38	39	39	39	39	39	39	39	39	40
Turbines and Generators	40	40	39	39	39	39	39	39	39	40	40	40	40	40	40	40
Accessory Elect + Misc. Equip	41	41	41	41	40	39	39	40	40	40	40	40	40	40	40	40
Steel Pipelines	39	39	39	39	39	39	39	40	40	40	40	41	41	41	41	41
Concrete Pipelines	48	48	48	48	48	48	48	48	49	49	49	49	49	49	49	49
Canals	42	40	42	42	42	42	42	42	42	42	42	42	43	43	44	44
Canal Earthwork	43	41	43	43	43	42	42	42	42	42	42	42	43	43	44	44
Canal Structures	42	40	42	42	42	41	41	42	42	43	43	43	44	44	44	44
Tunnels	44	44	44	44	45	45	45	45	46	46	46	46	46	46	46	46
Laterals and Drains	45	43	45	46	46	46	46	46	47	48	48	47	48	48	48	48
Lateral Earthwork	46	43	46	46	46	46	46	46	46	46	46	46	47	47	47	47
Lateral Stuctures	45	43	45	45	46	46	46	46	47	48	48	48	48	48	48	48
Distribution Pipelines																
Switchyards and Substations	42	42	42	41	40	40	40	41	41	41	41	41	41	41	41	41
Wood Pole Transmission Lines	39	39	39	39	49	49	49	49	39	39	39	40	40	40	39	40
Poles and Fixtures	33	33	33	32	32	33	33	33	34	34	34	34	34	34	34	35
Overhead Conductors and Devices	45	46	46	46	47	47	47	47	46	46	46	46	46	46	45	45
Steel Tower Transmission Lines	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39
Primary Roads	42	42	42	41	42	42	42	42	42	42	42	42	42	42	42	42
Secondary Roads	41	40	40	39	41	41	41	41	41	41	41	41	42	42	42	42
Bridges	38	38	38	38	39	39	39	39	39	40	40	40	41	41	41	41
General Property - Buildings	37	37	37	37	37	37	37	37	38	38	38	38	38	38	38	39
OTHER INDICATORS																
Composite Trend	41	40	40	40	40	40	40	41	41	41	41	41	42	42	42	42
LAND INDEXES																
California	47	48	48	49	50	51	52	52	53	54	55	55	56	56	58	59

Table B-4, USBR CONSTRUCTION COST TRENDS 1960 to 2006

CONSTRUCTION INDEXES	1964 JAN	1964 APR	1964 JUL	1964 OCT	1965 JAN	1965 APR	1965 JUL	1965 OCT	1966 JAN	1966 APR	1966 JUL	1966 OCT	1967 JAN	1967 APR	1967 JUL	1967 OCT
Earth Dams	42	42	43	43	43	43	44	44	44	45	45	46	47	47	48	49
Dam Structure	45	45	45	45	45	45	46	46	46	47	47	47	49	49	50	50
Spillway	42	42	42	42	42	43	43	43	44	44	45	45	45	46	47	47
Outlet Works	39	39	40	40	40	40	41	41	41	42	43	43	44	44	45	45
Concrete Dams	43	44	44	44	44	44	45	45	45	45	46	46	46	47	48	48
Diversions Dams	43	44	44	44	44	45	45	45	45	45	46	46	46	47	47	47
Pumping Plants	42	42	42	42	42	42	43	43	43	44	44	44	45	45	46	47
Structures and Improvements	45	45	46	46	46	46	46	46	46	46	47	47	47	47	48	48
Equipment	37	37	38	38	38	39	39	39	40	40	42	42	42	43	44	45
Pumps and Prime Movers	36	36	36	37	37	37	38	38	39	39	40	40	41	41	42	43
Accessory Elect + Misc. Equip.	39	40	40	41	41	41	41	42	42	43	44	44	45	45	47	47
Powerplants	41	41	41	42	42	42	43	43	43	43	45	45	45	46	47	47
Structures and Improvements	45	45	45	46	46	46	46	46	46	46	47	47	47	47	47	47
Equipment	40	40	40	41	41	41	41	42	42	42	44	44	44	45	46	46
Turbines and Generators	40	40	40	40	40	41	41	41	41	42	43	43	43	45	46	46
Accessory Elect + Misc. Equip	40	40	41	41	41	42	42	43	43	43	45	45	46	46	48	48
Steel Pipelines	41	41	37	41	41	41	42	42	42	42	43	43	44	44	45	45
Concrete Pipelines	49	48	48	48	48	48	48	48	48	48	48	48	49	50	51	51
Canals	44	44	44	45	45	45	45	45	45	45	46	46	47	47	47	47
Canal Earthwork	44	44	44	44	44	44	44	44	45	45	45	45	46	46	47	48
Canal Structures	45	45	45	45	45	45	45	45	46	46	46	46	46	46	47	47
Tunnels	46	44	44	44	45	45	46	46	46	46	46	46	47	47	47	47
Laterals and Drains	48	48	48	48	48	48	48	48	48	48	48	48	49	49	49	50
Lateral Earthwork	47	47	47	47	47	47	47	47	48	48	48	48	49	49	49	50
Lateral Stuctures	48	47	47	47	47	47	47	47	48	48	48	48	48	48	49	49
Distribution Pipelines													49	49	50	51
Switchyards and Substations	41	41	41	42	42	43	43	44	44	45	46	46	47	48	49	49
Wood Pole Transmission Lines	40	40	41	41	41	41	42	42	42	42	44	43	43	44	44	45
Poles and Fixtures	35	35	36	36	36	37	37	37	37	37	40	39	39	39	40	40
Overhead Conductors and Devices	45	45	46	46	46	47	47	47	48	48	48	48	49	49	50	50
Steel Tower Transmission Lines	39	40	40	40	41	41	42	42	42	43	44	44	45	45	46	46
Primary Roads	42	43	43	43	43	43	44	44	44	44	45	45	46	46	46	47
Secondary Roads	42	43	43	43	44	44	44	45	45	45	46	47	48	48	48	48
Bridges	42	42	43	43	43	43	43	44	44	44	45	45	45	45	46	46
General Property - Buildings	39	39	40	40	41	41	41	42	42	42	44	44	44	44	46	46
OTHER INDICATORS																
Composite Trend	42	42	43	43	43	43	44	44	44	44	45	45	46	46	47	47
LAND INDEXES																
California	60	61	63	65	66	66	67	68	69	71	71	72	71	71	72	74

Table B-4, USBR CONSTRUCTION COST TRENDS 1960 to 2006

CONSTRUCTION INDEXES	1968 JAN	1968 APR	1968 JUL	1968 OCT	1969 JAN	1969 APR	1969 JUL	1969 OCT	1970 JAN	1970 APR	1970 JUL	1970 OCT	1971 JAN	1971 APR	1971 JUL	1971 OCT
Earth Dams	49	50	50	51	51	52	53	53	54	55	57	58	59	60	61	62
Dam Structure	51	51	52	52	52	53	54	54	54	55	56	57	58	59	60	61
Spillway	48	49	50	50	51	52	53	54	54	56	58	59	60	61	62	63
Outlet Works	46	47	48	48	49	50	51	53	54	55	57	59	60	61	63	64
Concrete Dams	49	49	50	51	51	52	53	54	54	55	57	57	59	60	60	61
Diversions Dams	48	48	49	50	50	51	52	53	53	54	56	56	58	59	60	61
Pumping Plants	47	47	48	49	49	50	51	52	53	53	55	56	57	58	59	60
Structures and Improvements	48	49	49	50	50	50	51	52	52	53	54	55	55	56	57	58
Equipment	45	45	47	48	48	49	51	52	53	53	56	57	58	60	61	63
Pumps and Prime Movers	43	44	45	46	46	47	49	50	51	51	54	55	56	57	59	60
Accessory Elect + Misc. Equip.	47	48	49	50	51	51	54	55	56	56	60	61	62	63	66	67
Powerplants	48	48	49	50	51	51	53	54	55	56	57	58	60	60	61	62
Structures and Improvements	48	48	49	49	50	50	51	52	52	53	54	55	56	56	57	58
Equipment	47	48	49	50	51	52	54	56	56	57	59	60	61	62	63	64
Turbines and Generators	47	48	49	50	51	52	55	56	57	57	60	61	62	63	64	64
Accessory Elect + Misc. Equip	48	49	50	51	51	52	53	55	55	56	59	60	62	63	64	65
Steel Pipelines	46	46	47	47	48	49	50	51	52	52	55	55	57	58	60	61
Concrete Pipelines	51	52	52	52	53	53	54	54	55	55	56	57	58	58	59	60
Canals	48	48	49	49	50	50	51	52	52	53	54	55	56	57	58	59
Canal Earthwork	48	49	49	49	50	51	52	53	53	54	55	57	59	59	60	61
Canal Structures	48	48	48	49	49	49	50	51	52	52	53	54	55	56	57	57
Tunnels	47	48	48	48	49	49	50	50	50	51	53	53	54	55	58	59
Laterals and Drains	50	51	51	51	52	52	53	53	54	55	56	57	58	58	59	60
Lateral Earthwork	51	52	52	52	53	54	55	56	57	58	59	60	61	61	62	63
Lateral Stuctures	50	50	50	51	51	51	52	52	52	53	54	55	56	57	58	59
Distribution Pipelines	51	51	52	53	53	54	55	55	56	57	58	59	60	61	62	64
Switchyards and Substations	49	50	50	51	52	52	53	54	55	56	58	59	60	61	62	63
Wood Pole Transmission Lines	45	46	47	48	49	51	54	54	54	55	56	56	57	58	59	59
Poles and Fixtures	41	42	43	45	47	49	54	53	53	53	54	54	55	55	57	57
Overhead Conductors and Devices	51	51	52	53	53	53	55	56	56	58	59	60	61	61	63	64
Steel Tower Transmission Lines	46	47	47	48	49	49	50	51	52	52	53	55	55	57	59	60
Primary Roads	47	48	48	49	49	50	51	51	52	53	54	54	56	57	58	58
Secondary Roads	49	50	50	51	52	53	53	54	55	56	57	57	59	60	61	61
Bridges	47	47	48	48	49	49	51	51	52	53	54	55	56	57	59	60
General Property - Buildings	46	47	48	49	50	50	53	53	54	55	57	58	58	59	61	62
OTHER INDICATORS																
Composite Trend	47	48	49	49	50	50	52	53	53	54	55	56	57	58	60	61
LAND INDEXES																
California	74	74	75	75	76	76	77	77	79	79	79	78	78	78	79	80

Table B-4, USBR CONSTRUCTION COST TRENDS 1960 to 2006

CONSTRUCTION INDEXES	1972 JAN	1972 APR	1972 JUL	1972 OCT	1973 JAN	1973 APR	1973 JUL	1973 OCT	1974 JAN	1974 APR	1974 JUL	1974 OCT	1975 JAN	1975 APR	1975 JUL	1975 OCT
Earth Dams	64	65	67	67	68	68	70	71	73	74	79	85	87	89	92	94
Dam Structure	63	64	66	67	67	68	70	71	73	74	79	83	86	88	91	94
Spillway	65	66	66	67	67	68	70	71	72	74	79	86	88	90	92	94
Outlet Works	65	66	67	68	68	69	70	72	73	74	80	86	88	89	92	93
Concrete Dams	62	63	64	65	65	67	68	69	70	72	76	82	85	86	90	92
Diversions Dams	62	63	64	65	65	66	67	68	69	71	76	83	85	88	90	91
Pumping Plants	61	62	63	64	65	65	67	68	69	70	76	81	84	86	90	91
Structures and Improvements	60	61	62	63	63	64	65	66	67	69	75	82	86	88	90	91
Equipment	63	64	66	67	67	68	69	70	71	72	76	81	83	85	89	90
Pumps and Prime Movers	61	62	63	64	64	65	66	67	68	69	72	78	80	83	88	89
Accessory Elect + Misc. Equip.	67	68	70	71	72	72	73	75	76	77	81	85	87	89	91	92
Powerplants	63	64	64	65	66	67	67	68	69	71	75	81	84	85	89	91
Structures and Improvements	59	61	62	62	63	64	66	66	67	69	75	83	86	88	90	92
Equipment	64	65	66	66	67	67	69	69	71	71	76	79	82	84	88	90
Turbines and Generators	65	65	66	67	67	68	69	69	70	72	75	79	81	84	88	90
Accessory Elect + Misc. Equip	66	66	67	68	69	70	71	72	73	74	78	83	86	87	90	92
Steel Pipelines	61	64	65	66	67	68	69	70	71	73	77	84	85	86	89	90
Concrete Pipelines	62	64	65	66	66	68	69	70	71	73	78	83	86	89	93	94
Canals	60	62	63	64	65	66	67	68	69	71	76	83	86	88	91	93
Canal Earthwork	63	65	66	66	67	68	69	69	71	73	77	82	86	88	92	94
Canal Structures	59	61	62	62	63	64	65	66	67	69	75	82	86	87	90	92
Tunnels	59	61	63	63	64	66	68	68	69	71	76	83	85	87	90	91
Laterals and Drains	61	63	64	65	66	67	68	69	70	72	78	84	88	89	92	94
Lateral Earthwork	64	66	67	68	69	70	71	71	73	75	78	83	88	90	93	95
Lateral Stuctures	60	61	62	63	64	65	67	68	69	71	77	85	87	88	91	93
Distribution Pipelines	65	66	68	68	69	70	71	71	72	74	79	84	86	90	93	94
Switchyards and Substations	64	64	65	66	67	67	68	69	70	72	76	84	86	88	91	92
Wood Pole Transmission Lines	60	61	61	62	62	64	66	68	70	73	79	83	85	84	85	86
Poles and Fixtures	58	58	59	60	60	62	66	68	73	76	82	84	85	81	84	85
Overhead Conductors and Devices	64	65	65	65	66	66	67	67	68	70	76	82	86	87	88	88
Steel Tower Transmission Lines	60	61	62	63	64	65	65	66	67	68	74	83	85	87	90	90
Primary Roads	59	60	61	62	62	63	64	65	67	69	75	82	86	88	91	92
Secondary Roads	62	64	64	64	65	66	67	68	69	71	75	83	85	89	92	94
Bridges	61	63	64	65	66	66	67	68	69	71	75	81	84	86	89	91
General Property - Buildings	63	64	65	67	67	68	71	72	74	76	80	85	87	87	89	90
OTHER INDICATORS																
Composite Trend	62	63	64	65	65	67	68	69	70	72	77	83	85	87	90	91
LAND INDEXES																
California	81	81	81	82	83	83	86	88	88	88	91	93	95	96	96	97

Table B-4, USBR CONSTRUCTION COST TRENDS 1960 to 2006

CONSTRUCTION INDEXES	1976 JAN	1976 APR	1976 JUL	1976 OCT	1977 JAN	1977 APR	1977 JUL	1977 OCT	1978 JAN	1978 APR	1978 JUL	1978 OCT	1979 JAN	1979 APR	1979 JUL	1979 OCT
Earth Dams	95	95	96	98	99	99	100	101	102	103	105	107	109	113	117	119
Dam Structure	95	95	95	97	99	100	100	101	102	103	105	107	108	111	113	116
Spillway	95	96	96	98	99	99	100	101	102	103	105	107	111	115	120	124
Outlet Works	94	95	96	97	98	99	101	102	103	105	107	109	112	115	121	124
Concrete Dams	93	94	94	96	98	99	101	102	103	104	107	110	112	116	120	124
Diversions Dams	93	94	95	97	98	99	101	102	104	105	108	109	112	115	119	121
Pumping Plants	92	93	95	96	98	99	101	103	104	106	108	110	113	115	119	121
Structures and Improvements	93	94	95	96	98	99	101	102	103	105	108	110	112	117	120	123
Equipment	91	93	95	96	98	99	101	103	104	106	110	111	113	113	118	120
Pumps and Prime Movers	90	92	94	95	98	99	101	103	105	107	110	112	113	115	118	120
Accessory Elect + Misc. Equip.	93	93	96	97	98	99	101	103	104	105	109	110	111	112	117	119
Powerplants	92	92	95	96	98	99	101	102	103	105	108	109	111	113	117	119
Structures and Improvements	93	94	95	96	98	99	101	102	103	105	108	110	112	116	120	123
Equipment	90	91	94	95	98	99	101	102	103	105	107	109	110	112	115	117
Turbines and Generators	91	91	94	95	98	99	101	102	103	105	107	108	110	112	115	117
Accessory Elect + Misc. Equip	92	93	95	97	98	99	101	102	104	105	109	110	112	113	118	119
Steel Pipelines	92	93	95	96	98	99	101	102	105	105	110	112	114	116	120	122
Concrete Pipelines	95	96	97	98	99	99	101	101	103	104	109	111	113	117	121	123
Canals	95	96	96	97	98	99	101	102	103	105	106	108	110	114	118	121
Canal Earthwork	95	96	97	97	98	99	101	102	102	105	106	108	109	112	115	120
Canal Structures	93	94	95	96	98	99	101	102	103	105	107	110	112	116	120	122
Tunnels	92	93	95	96	98	99	101	102	104	105	108	110	113	116	119	122
Laterals and Drains	95	95	96	98	99	100	101	101	102	103	105	107	109	113	116	119
Lateral Earthwork	96	96	97	98	99	100	100	101	101	103	104	105	107	110	114	117
Lateral Stuctures	94	94	95	98	99	100	100	101	102	103	106	107	110	114	118	120
Distribution Pipelines	95	96	97	98	99	100	100	101	103	103	108	111	113	116	120	122
Switchyards and Substations	93	94	96	97	98	99	101	102	104	105	108	109	112	115	119	121
Wood Pole Transmission Lines	88	88	92	92	96	100	102	103	106	107	110	111	116	119	123	126
Poles and Fixtures	85	86	91	91	95	100	104	102	105	107	109	111	119	121	126	128
Overhead Conductors and Devices	90	90	92	93	96	99	101	104	107	108	110	111	114	115	119	122
Steel Tower Transmission Lines	91	92	94	95	98	99	101	102	105	106	111	113	115	117	121	123
Primary Roads	93	94	94	96	98	99	101	102	104	105	108	110	115	119	123	127
Secondary Roads	95	96	96	97	98	99	100	102	104	108	109	112	117	123	126	130
Bridges	93	94	95	97	98	99	101	102	104	105	109	111	113	116	120	122
General Property - Buildings	90	91	94	95	97	99	102	102	105	106	110	112	115	117	122	124
OTHER INDICATORS																
Composite Trend	**93**	**93**	**95**	**96**	**98**	**99**	**101**	**102**	**103**	**105**	**108**	**109**	**112**	**115**	**119**	**121**
LAND INDEXES																
California	98	98	99	99	99	99	101	101	109	113	116	118	120	129	137	142

Table B-4, USBR CONSTRUCTION COST TRENDS 1960 to 2006

CONSTRUCTION INDEXES	1980 JAN	1980 APR	1980 JUL	1980 OCT	1981 JAN	1981 APR	1981 JUL	1981 OCT	1982 JAN	1982 APR	1982 JUL	1982 OCT	1983 JAN	1983 APR	1983 JUL	1983 OCT
Earth Dams	123	127	132	134	137	140	143	144	146	144	145	142	141	140	139	139
Dam Structure	119	122	124	127	132	135	137	138	141	139	140	135	135	134	132	131
Spillway	128	134	140	143	143	147	149	150	151	148	149	147	146	146	144	144
Outlet Works	128	132	139	141	141	145	148	150	151	150	151	151	151	151	152	152
Concrete Dams	128	133	139	142	142	146	150	151	153	153	154	153	153	153	153	153
Diversions Dams	125	128	133	136	137	140	144	147	149	150	152	152	151	151	152	153
Pumping Plants	124	127	131	134	136	139	143	146	148	150	151	152	151	151	152	153
Structures and Improvements	126	129	133	136	138	140	143	145	147	149	150	149	148	147	147	148
Equipment	122	124	129	133	135	138	143	147	150	151	154	156	156	157	158	160
Pumps and Prime Movers	123	125	131	133	137	141	145	149	152	154	156	157	157	157	158	160
Accessory Elect + Misc. Equip.	121	123	128	131	132	134	139	144	146	148	151	153	155	155	158	160
Powerplants	122	126	132	135	138	141	145	149	151	152	154	155	155	155	156	157
Structures and Improvements	125	129	133	135	138	140	143	145	147	149	150	149	148	147	148	148
Equipment	120	125	132	136	138	142	147	151	152	154	157	157	158	158	159	160
Turbines and Generators	120	125	133	137	139	144	148	152	154	156	158	159	160	160	161	162
Accessory Elect + Misc. Equip	121	123	127	130	132	134	139	143	145	146	149	150	151	151	153	155
Steel Pipelines	124	127	130	135	137	139	145	149	152	154	158	158	158	158	161	161
Concrete Pipelines	125	130	135	138	141	143	146	148	150	151	153	154	154	153	154	156
Canals	123	127	130	134	137	139	142	144	147	147	148	146	144	144	144	144
Canal Earthwork	122	125	128	133	138	141	143	146	147	146	147	144	143	143	143	143
Canal Structures	125	129	132	135	137	139	142	144	146	149	150	149	148	147	147	148
Tunnels	125	128	132	136	138	140	144	149	151	154	157	158	158	158	160	161
Laterals and Drains	122	126	129	133	135	137	140	142	145	146	146	144	143	142	141	142
Lateral Earthwork	120	123	126	130	133	135	139	142	144	143	144	142	141	139	139	140
Lateral Stuctures	123	127	130	134	136	138	140	142	145	147	148	146	145	144	143	144
Distribution Pipelines	124	129	133	136	139	141	144	147	148	149	152	152	152	152	153	154
Switchyards and Substations	123	127	132	134	135	138	141	145	146	148	151	152	152	152	153	154
Wood Pole Transmission Lines	129	132	133	134	136	138	141	142	142	141	142	141	141	141	144	146
Poles and Fixtures	132	132	132	132	130	131	132	133	132	130	130	130	129	129	133	136
Overhead Conductors and Devices	125	131	134	138	142	146	151	153	155	155	156	157	157	156	158	169
Steel Tower Transmission Lines	126	130	135	138	140	144	148	152	154	157	161	162	162	162	163	163
Primary Roads	131	137	142	144	146	148	150	151	152	153	154	154	153	152	153	154
Secondary Roads	137	145	152	154	160	160	160	159	162	164	162	162	160	160	161	160
Bridges	126	129	134	137	140	141	144	147	150	153	155	155	154	153	154	154
General Property - Buildings	127	127	131	133	133	136	139	143	144	144	147	148	149	149	152	155
OTHER INDICATORS																
Composite Trend	**124**	**128**	**132**	**135**	**137**	**140**	**144**	**146**	**148**	**149**	**152**	**152**	**151**	**151**	**152**	**153**
LAND INDEXES																
California	158	165	169	173	176	206	209	214	218	219	223	227	228	229	225	225

Table B-4, USBR CONSTRUCTION COST TRENDS 1960 to 2006

CONSTRUCTION INDEXES	1984 JAN	1984 APR	1984 JUL	1984 OCT	1985 JAN	1985 APR	1985 JUL	1985 OCT	1986 JAN	1986 APR	1986 JUL	1986 OCT	1987 JAN	1987 APR	1987 JUL	1987 OCT
Earth Dams	139	138	139	139	139	139	139	140	140	140	140	141	141	141	142	142
Dam Structure	131	131	130	129	129	129	128	128	128	128	128	128	127	128	129	130
Spillway	144	144	145	145	145	146	147	148	150	149	150	151	151	150	151	151
Outlet Works	153	153	155	155	155	155	157	158	159	159	160	161	161	161	162	162
Concrete Dams	154	154	155	156	155	156	157	158	159	159	160	160	160	160	161	161
Diversions Dams	153	153	155	155	156	156	157	157	158	158	158	159	159	159	160	161
Pumping Plants	154	154	156	157	157	157	158	159	160	160	160	161	161	161	162	163
Structures and Improvements	148	149	150	151	152	152	153	154	154	154	154	154	154	154	155	156
Equipment	160	161	163	163	164	164	166	166	166	167	168	170	169	169	170	171
Pumps and Prime Movers	161	162	163	163	164	164	166	166	167	168	169	170	169	169	169	170
Accessory Elect + Misc. Equip.	161	161	164	164	165	165	166	166	166	167	168	170	170	171	172	174
Powerplants	157	158	159	160	160	161	162	152	163	164	164	166	166	167	168	170
Structures and Improvements	149	149	150	151	152	152	153	154	154	154	154	155	155	154	155	156
Equipment	161	162	164	164	164	164	166	166	168	169	169	171	172	173	175	176
Turbines and Generators	163	163	165	165	166	166	167	168	169	170	171	173	174	175	178	179
Accessory Elect + Misc. Equip	156	156	158	158	159	159	160	160	160	161	161	163	163	163	164	166
Steel Pipelines	161	161	163	162	163	162	163	162	163	163	164	165	165	165	166	167
Concrete Pipelines	157	157	158	159	159	160	161	161	162	162	163	164	164	164	165	166
Canals	144	145	146	146	147	148	149	149	150	150	150	150	150	150	151	152
Canal Earthwork	143	144	144	145	146	146	147	147	148	148	149	149	149	150	151	152
Canal Structures	149	149	150	151	151	152	153	153	154	153	154	154	154	154	155	156
Tunnels	161	161	162	163	164	165	166	167	167	168	168	169	170	170	171	173
Laterals and Drains	143	143	144	145	146	146	147	148	148	148	148	148	148	149	149	150
Lateral Earthwork	141	142	143	143	144	145	145	146	147	147	148	148	148	149	149	150
Lateral Stuctures	145	145	146	147	147	148	149	150	150	150	149	150	149	150	150	151
Distribution Pipelines	155	155	156	157	157	158	158	159	160	160	160	162	162	162	163	164
Switchyards and Substations	154	154	156	156	156	156	157	157	158	158	158	159	160	160	161	163
Wood Pole Transmission Lines	146	146	148	149	148	147	148	150	148	146	145	146	147	145	146	148
Poles and Fixtures	136	136	137	137	136	134	136	138	136	134	132	134	136	134	134	135
Overhead Conductors and Devices	159	161	164	164	164	163	164	165	163	162	161	163	162	161	162	164
Steel Tower Transmission Lines	163	164	166	166	168	168	169	170	170	170	170	170	170	170	171	173
Primary Roads	155	154	156	156	157	157	159	160	161	161	162	163	163	163	164	166
Secondary Roads	160	160	161	161	162	164	165	168	171	174	175	178	181	182	186	189
Bridges	154	155	156	157	158	158	159	160	161	162	162	164	164	165	166	168
General Property - Buildings	155	155	158	158	158	159	159	159	159	159	160	161	162	161	162	164
OTHER INDICATORS																
Composite Trend	153	153	155	155	156	156	157	158	158	158	159	160	160	160	161	162
LAND INDEXES																
California	225	225	223	223	223	223	201	201	201	201	183	183	183	183	159	159

Table B-4, USBR CONSTRUCTION COST TRENDS 1960 to 2006

CONSTRUCTION INDEXES	1988 JAN	1988 APR	1988 JUL	1988 OCT	1989 JAN	1989 APR	1989 JUL	1989 OCT	1990 JAN	1990 APR	1990 JUL	1990 OCT	1991 JAN	1991 APR	1991 JUL	1991 OCT
Earth Dams	143	144	145	146	147	149	151	153	154	155	156	158	160	159	161	161
Dam Structure	130	131	132	132	133	134	135	137	137	138	140	142	143	143	145	145
Spillway	152	153	154	158	158	162	164	165	167	167	170	172	173	172	174	174
Outlet Works	164	165	167	171	171	173	177	179	181	181	183	185	186	186	188	188
Concrete Dams	162	163	164	167	167	169	173	174	176	177	179	181	183	183	185	185
Diversions Dams	162	163	164	166	167	169	171	173	174	175	176	178	180	180	182	182
Pumping Plants	163	165	166	168	169	171	173	175	176	178	179	181	182	183	184	185
Structures and Improvements	157	158	159	160	160	162	164	166	166	167	168	169	170	171	172	172
Equipment	172	173	175	178	179	181	184	187	188	190	192	194	196	197	199	200
Pumps and Prime Movers	171	172	175	177	179	182	186	189	191	193	194	197	200	200	203	204
Accessory Elect + Misc. Equip.	174	175	177	179	180	181	182	184	186	187	188	190	191	191	194	195
Powerplants	170	171	172	173	175	177	180	182	183	184	187	190	192	193	195	196
Structures and Improvements	157	158	159	160	161	163	164	166	166	167	168	167	171	171	172	172
Equipment	177	178	179	181	183	186	190	191	193	195	199	203	205	206	209	210
Turbines and Generators	179	180	181	183	185	188	192	193	195	197	202	205	208	210	212	214
Accessory Elect + Misc. Equip	167	168	170	171	173	174	177	179	181	182	183	185	187	187	189	190
Steel Pipelines	168	169	171	173	175	177	179	182	183	184	186	188	191	191	194	195
Concrete Pipelines	165	165	165	166	166	167	167	168	168	169	169	171	173	174	176	177
Canals	153	154	154	155	155	157	158	160	161	161	162	163	165	165	167	167
Canal Earthwork	152	153	153	154	155	157	157	160	161	161	162	163	165	166	168	167
Canal Structures	156	157	158	159	160	161	163	164	165	165	167	168	169	170	171	171
Tunnels	174	175	176	178	179	181	183	185	186	187	189	191	192	192	194	195
Laterals and Drains	151	152	153	154	155	156	158	159	160	160	161	163	165	165	166	166
Lateral Earthwork	151	152	153	154	155	156	157	159	159	160	161	163	166	166	167	166
Lateral Stuctures	151	153	154	155	156	157	159	160	161	161	162	164	165	166	167	167
Distribution Pipelines	164	164	164	165	165	166	166	167	168	168	169	171	172	173	175	177
Switchyards and Substations	165	168	169	170	171	173	177	180	181	181	183	185	187	187	188	189
Wood Pole Transmission Lines	151	154	157	165	169	172	175	178	178	174	176	176	177	175	173	173
Poles and Fixtures	139	139	141	144	146	147	152	158	161	158	162	160	159	155	153	157
Overhead Conductors and Devices	167	173	179	192	197	203	204	203	200	195	194	195	201	200	197	194
Steel Tower Transmission Lines	175	179	182	189	192	195	197	198	198	196	197	198	201	200	200	198
Primary Roads	167	168	169	172	171	174	177	179	180	181	183	185	186	185	186	185
Secondary Roads	191	194	195	201	197	204	207	208	206	210	214	217	219	215	214	212
Bridges	170	171	172	174	174	176	179	180	180	182	184	186	187	187	188	188
General Property - Buildings	165	167	169	171	173	174	176	178	179	179	180	181	182	182	183	184
OTHER INDICATORS																
Composite Trend	**163**	**165**	**166**	**168**	**169**	**171**	**174**	**176**	**177**	**177**	**179**	**181**	**183**	**183**	**184**	**185**
LAND INDEXES																
California	207	211	215	219	223	227	231	235	239	243	247	251	255	259	263	267

Table B-4, USBR CONSTRUCTION COST TRENDS 1960 to 2006

CONSTRUCTION INDEXES	1992 JAN	1992 APR	1992 JUL	1992 OCT	1993 JAN	1993 APR	1993 JUL	1993 OCT	1994 JAN	1994 APR	1994 JUL	1994 OCT	1995 JAN	1995 APR	1995 JUL	1995 OCT
Earth Dams	162	160	161	162	164	165	165	166	168	163	167	168	173	175	178	178
Dam Structure	147	145	146	148	150	151	152	152	154	145	155	156	162	163	165	163
Spillway	175	171	171	172	174	175	175	176	178	176	173	175	180	182	187	188
Outlet Works	189	185	186	188	189	190	191	192	194	194	191	193	196	198	202	204
Concrete Dams	186	184	184	186	188	189	189	190	193	192	188	190	193	196	199	201
Diversions Dams	183	182	183	185	186	187	188	189	191	191	191	193	195	198	201	202
Pumping Plants	185	185	187	188	189	190	191	192	193	195	195	197	200	202	204	206
Structures and Improvements	172	171	173	174	175	176	177	178	181	183	182	184	188	191	194	197
Equipment	201	201	203	204	205	206	207	208	208	209	211	213	213	215	217	218
Pumps and Prime Movers	204	205	206	208	209	210	211	211	210	213	214	215	217	219	220	221
Accessory Elect + Misc. Equip.	195	196	197	199	199	200	201	203	204	204	206	208	209	210	211	213
Powerplants	197	198	199	201	202	203	204	205	207	207	208	209	212	213	215	216
Structures and Improvements	173	172	173	175	176	176	178	179	182	183	183	185	189	191	194	197
Equipment	212	213	215	217	218	219	220	221	222	222	223	224	226	227	228	228
Turbines and Generators	216	217	218	220	221	222	223	224	226	225	225	227	228	229	230	231
Accessory Elect + Misc. Equip	191	191	192	194	195	195	197	198	199	200	202	204	205	206	207	208
Steel Pipelines	195	195	196	198	199	200	201	202	203	204	204	206	209	211	212	213
Concrete Pipelines	178	178	179	181	181	182	183	184	184	185	185	186	188	189	191	191
Canals	167	166	167	169	170	171	172	172	174	176	176	178	182	184	187	189
Canal Earthwork	167	166	168	170	172	172	173	173	174	175	176	177	181	182	185	181
Canal Structures	172	171	172	174	174	175	176	178	180	183	182	183	188	191	194	198
Tunnels	196	195	196	198	200	200	202	203	205	205	206	208	210	212	216	220
Laterals and Drains	167	165	166	169	170	171	175	176	178	180	180	182	188	190	192	190
Lateral Earthwork	167	166	167	170	171	172	173	173	174	175	176	177	181	181	185	182
Lateral Stuctures	168	166	168	170	171	172	178	179	181	184	184	186	192	196	197	196
Distribution Pipelines	178	178	179	181	181	182	183	184	184	185	185	187	188	190	192	193
Switchyards and Substations	189	188	188	190	190	191	192	194	194	196	195	197	198	202	203	204
Wood Pole Transmission Lines	172	171	173	175	177	180	185	198	195	201	208	210	209	217	214	214
Poles and Fixtures	157	158	163	166	171	176	186	208	208	220	229	230	221	218	209	208
Overhead Conductors and Devices	191	188	187	186	185	185	184	186	180	179	182	185	195	218	222	222
Steel Tower Transmission Lines	197	196	195	196	196	196	197	198	196	196	198	201	205	215	218	219
Primary Roads	188	185	185	186	188	188	191	196	196	200	197	199	201	204	206	208
Secondary Roads	216	211	209	210	212	209	214	215	217	211	216	217	224	229	230	231
Bridges	189	188	188	190	191	191	194	194	196	196	198	199	204	207	208	212
General Property - Buildings	185	185	187	189	190	191	194	198	201	203	205	208	208	209	209	210
OTHER INDICATORS																
Composite Trend	**186**	**185**	**186**	**188**	**189**	**190**	**190**	**190**	**195**	**196**	**197**	**199**	**201**	**204**	**206**	**207**
LAND INDEXES																
California	182	182	181	181	181	181	172	172	172	172	172	172	172	172	172	172

Table B-4, USBR CONSTRUCTION COST TRENDS 1960 to 2006

CONSTRUCTION INDEXES	1996 JAN	1996 APR	1996 JUL	1996 OCT	1997 JAN	1997 APR	1997 JUL	1997 OCT	1998 JAN	1998 APR	1998 JUL	1998 OCT	1999 JAN	1999 APR	1999 JUL	1999 OCT
Earth Dams	175	180	174	176	177	179	181	180	180	181	183	183	184	185	188	191
Dam Structure	160	167	157	159	162	164	165	164	164	163	163	162	162	162	168	172
Spillway	186	189	187	186	187	188	191	191	190	192	198	198	200	203	204	206
Outlet Works	203	205	205	206	206	207	211	211	211	212	218	219	221	224	224	226
Concrete Dams	200	202	202	203	200	205	208	208	209	210	216	217	219	222	223	225
Diversions Dams	202	205	205	207	204	209	211	212	213	214	216	217	218	219	221	222
Pumping Plants	207	211	213	215	214	216	217	219	219	220	221	222	222	223	225	226
Structures and Improvements	195	202	205	209	205	208	210	211	211	212	213	214	214	215	218	218
Equipment	221	222	222	223	224	226	227	228	229	230	232	233	233	234	235	236
Pumps and Prime Movers	225	227	227	228	230	231	232	233	234	235	237	237	237	239	240	241
Accessory Elect + Misc. Equip.	213	214	214	216	216	217	220	221	221	222	225	226	226	227	228	229
Powerplants	215	216	217	219	217	220	223	224	225	225	226	227	227	229	231	231
Structures and Improvements	196	202	205	209	205	208	210	211	211	212	213	214	214	215	218	219
Equipment	226	226	227	228	226	229	231	233	233	233	235	236	236	238	239	240
Turbines and Generators	228	229	230	231	228	230	233	235	235	236	238	239	239	241	241	242
Accessory Elect + Misc. Equip	210	207	207	209	209	215	216	218	218	219	221	222	222	223	225	226
Steel Pipelines	214	217	219	222	229	229	231	232	233	233	236	237	238	239	241	243
Concrete Pipelines	191	194	193	196	197	200	202	203	205	206	209	211	212	213	215	216
Canals	186	196	194	199	198	200	201	201	201	201	202	202	203	203	207	210
Canal Earthwork	178	189	177	181	185	187	188	187	186	186	185	185	184	184	190	195
Canal Structures	197	203	208	213	209	211	213	215	215	216	218	219	219	221	223	224
Tunnels	221	224	223	226	226	231	233	234	235	236	239	240	241	242	243	245
Laterals and Drains	186	195	197	202	214	216	218	219	219	219	220	220	220	220	224	226
Lateral Earthwork	177	174	174	178	182	183	185	184	183	183	183	182	182	182	188	192
Lateral Stuctures	193	203	209	215	231	234	237	238	238	239	241	240	240	240	243	245
Distribution Pipelines	193	195	195	198	198	201	203	204	206	207	210	211	212	213	215	216
Switchyards and Substations	204	186	188	190	189	211	212	213	213	215	216	218	218	220	223	226
Wood Pole Transmission Lines	216	213	220	234	234	233	230	226	218	211	198	205	191	196	208	210
Poles and Fixtures	217	217	231	255	262	254	245	238	224	212	192	209	186	198	216	217
Overhead Conductors and Devices	215	209	207	207	200	208	212	212	212	210	205	200	199	196	199	204
Steel Tower Transmission Lines	218	216	216	217	214	219	221	222	223	223	224	222	222	222	223	225
Primary Roads	208	209	214	219	217	222	224	224	223	219	221	225	224	226	229	231
Secondary Roads	227	230	230	237	240	247	256	258	257	237	243	247	254	253	252	262
Bridges	211	218	221	226	224	227	231	232	233	229	232	233	236	237	239	242
General Property - Buildings	211	210	212	217	219	220	221	222	220	219	219	222	219	221	225	226
OTHER INDICATORS																
Composite Trend	**207**	**208**	**209**	**212**	**213**	**217**	**219**	**219**	**219**	**219**	**220**	**221**	**220**	**222**	**225**	**227**
LAND INDEXES																
California	301	307	313	319	325	331	335	339	343	346	350	355	359	359	359	359

Table B-4, USBR CONSTRUCTION COST TRENDS 1960 to 2006

CONSTRUCTION INDEXES	2000 JAN	2000 APR	2000 JUL	2000 OCT	2001 JAN	2001 APR	2001 JUL	2001 OCT	2002 JAN	2002 APR	2002 JUL	2002 OCT	2003 JAN	2003 APR	2003 JUL	2003 OCT
Earth Dams	191	197	198	201	203	200	200	201	198	198	203	207	209	214	213	214
Dam Structure	174	179	180	183	185	183	184	184	180	180	185	188	190	198	194	195
Spillway	202	211	211	214	215	212	211	212	209	210	215	220	221	226	225	228
Outlet Works	223	229	230	232	233	232	232	233	232	233	238	242	242	246	247	250
Concrete Dams	222	227	228	230	231	229	229	229	228	228	232	236	237	240	241	243
Diversions Dams	223	225	226	228	229	229	229	231	231	231	234	236	237	241	242	243
Pumping Plants	227	229	230	231	232	233	234	235	236	237	239	241	242	244	246	247
Structures and Improvements	220	222	223	224	225	225	226	228	228	229	231	233	235	238	239	240
Equipment	237	238	240	242	243	244	245	247	249	250	253	253	254	256	257	258
Pumps and Prime Movers	242	243	245	247	248	249	250	252	254	255	257	257	258	259	261	261
Accessory Elect + Misc. Equip.	230	231	233	235	236	236	238	240	242	242	246	247	248	250	253	254
Powerplants	232	234	234	236	237	237	239	240	241	242	245	246	247	249	250	252
Structures and Improvements	220	222	223	224	225	225	226	228	228	229	231	233	235	238	239	240
Equipment	240	243	242	244	245	245	247	249	250	251	254	255	255	257	258	260
Turbines and Generators	242	245	245	247	248	248	250	252	253	254	257	258	258	260	261	263
Accessory Elect + Misc. Equip	227	229	230	232	233	233	235	236	238	239	242	243	243	245	247	248
Steel Pipelines	245	246	248	250	252	253	255	257	258	259	262	264	266	268	270	271
Concrete Pipelines	217	220	221	223	226	227	230	231	232	233	236	237	238	242	243	244
Canals	212	216	217	220	222	221	222	224	222	223	226	229	232	237	236	238
Canal Earthwork	197	204	205	208	211	209	209	209	205	205	210	213	216	225	220	222
Canal Structures	226	227	228	230	231	232	233	235	236	236	239	241	243	246	247	249
Tunnels	246	249	250	251	252	253	254	256	256	257	260	261	262	265	266	268
Laterals and Drains	229	234	236	238	241	240	241	243	242	243	246	251	255	261	260	262
Lateral Earthwork	194	200	201	204	207	205	205	206	203	203	207	211	213	221	217	219
Lateral Stuctures	249	253	256	258	260	260	261	263	264	265	268	274	278	284	285	287
Distribution Pipelines	217	220	221	224	226	227	230	232	232	234	237	238	239	242	244	245
Switchyards and Substations	228	230	229	232	232	231	233	235	235	236	239	240	241	241	243	244
Wood Pole Transmission Lines	214	213	204	203	200	200	203	203	201	205	205	205	205	204	206	210
Poles and Fixtures	218	211	197	194	189	190	196	197	194	201	200	201	199	197	201	206
Overhead Conductors and Devices	211	216	214	217	216	214	214	213	212	212	213	212	214	215	216	217
Steel Tower Transmission Lines	230	233	233	234	233	233	233	233	233	233	234	234	234	235	236	236
Primary Roads	231	231	228	230	229	228	232	233	231	230	233	235	237	240	241	241
Secondary Roads	262	263	254	258	258	260	273	273	264	255	262	264	269	279	280	278
Bridges	244	247	246	248	250	251	255	257	257	255	259	261	264	269	270	271
General Property - Buildings	227	228	227	228	228	228	230	231	233	234	237	238	238	240	243	246
OTHER INDICATORS																
Composite Trend	**228**	**231**	**231**	**233**	**234**	**234**	**235**	**236**	**236**	**237**	**240**	**242**	**244**	**247**	**248**	**250**
LAND INDEXES																
California	360	366	370	374	378	384	388	390	392	394	396	400	404	408	412	415

Table B-4, USBR CONSTRUCTION COST TRENDS to 2006

CONSTRUCTION INDEXES	2004 JAN	2004 APR	2004 JUL	2004 OCT	2005 JAN	2005 APR	2005 JUL	2005 OCT	2006 JAN	2006 APR	2006 JUL	2006 OCT
Earth Dams	217	222	226	233	237	239	243	249	256	261		
Dam Structure	196	200	204	210	215	216	223	229	233	234		
Spillway	231	238	242	250	254	256	257	262	275	285		
Outlet Works	253	259	264	271	274	276	277	281	292	300		
Concrete Dams	245	248	251	257	260	263	267	272	282	292		
Diversions Dams	244	250	254	261	264	267	271	277	280	286		
Pumping Plants	248	253	257	263	266	269	272	277	280	283		
Structures and Improvements	241	249	254	262	266	269	271	278	281	287		
Equipment	260	262	264	270	272	274	277	280	283	285		
Pumps and Prime Movers	262	265	267	272	274	278	281	283	287	289		
Accessory Elect + Misc. Equip.	256	259	261	267	269	269	271	276	277	279		
Powerplants	253	257	260	265	267	269	272	276	279	283		
Structures and Improvements	242	249	254	262	266	269	271	278	281	287		
Equipment	261	263	265	269	270	272	274	277	280	283		
Turbines and Generators	264	266	267	271	272	275	277	280	283	286		
Accessory Elect + Misc. Equip	250	254	257	262	263	265	268	272	275	277		
Steel Pipelines	273	275	277	287	290	291	291	293	295	297		
Concrete Pipelines	244	248	251	256	258	261	265	271	275	278		
Canals	239	246	251	259	264	266	271	278	282	285		
Canal Earthwork	223	228	233	240	245	247	255	262	266	267		
Canal Structures	250	257	261	270	274	276	280	287	290	296		
Tunnels	269	275	280	288	291	293	297	304	306	311		
Laterals and Drains	263	277	288	303	311	314	316	323	327	332		
Lateral Earthwork	220	225	229	235	239	241	248	255	258	260		
Lateral Stuctures	289	307	323	343	353	356	356	363	367	374		
Distribution Pipelines	246	250	253	258	260	263	266	271	276	278		
Switchyards and Substations	246	251	256	261	264	266	269	274	277	283		
Wood Pole Transmission Lines	211	222	231	233	234	241	240	243	250	262		
Poles and Fixtures	207	219	232	229	227	235	234	237	238	241		
Overhead Conductors and Devices	220	227	232	239	245	252	249	254	268	292		
Steel Tower Transmission Lines	238	247	254	261	264	268	268	274	280	292		
Primary Roads	242	248	252	261	263	267	271	278	282	293		
Secondary Roads	280	282	284	291	294	297	302	309	321	331		
Bridges	273	278	281	287	291	293	296	303	307	311		
General Property - Buildings	247	256	261	266	267	270	271	277	279	283		
OTHER INDICATORS												
Composite Trend	**252**	**259**	**265**	**274**	**277**	**280**	**283**	**288**	**293**	**298**		
LAND INDEXES												
California	418	421	424	443	462	481	500	510	520	530		

Table B-5, Labor, Equipment, and Materials Rates

SAN JOAQUIN/SACRAMENTO CO. AREA WAGE AND LABOR RATES (Jul 2006 $)

Estimated Based on July, 2006 Published Rates

LABOR CATEGORY	Base Hourly	Fring Benefit	Hourly w/Fringe	Worker's Comp	Avg Fixed Overhead	Hourly Employer Cost	Roundoff WRBPS Hourly RATES**	LABOR CODE
Laborer, Gen			33.46	1.45	7.03	41.94	53.30	LABG
Laborer, Skilled			34.31	1.45	7.21	42.97	54.60	LABS
Carpenter			40.31	1.45	8.46	50.22	63.80	CARP
Cement Finisher			39.36	1.45	8.27	49.08	62.30	CONCF
Electrician Jman			45.56	1.45	9.57	56.58	71.90	ELECJ
Ironworker			47.67	1.45	10.01	59.13	75.10	REBAR
Pile Driv (Car)			49.55	1.45	10.40	61.40	78.00	PLDR
Plumber/Pipefitter			46.52	1.45	9.77	57.74	73.30	PLBR
Equip Oper, Light			47.40	1.45	9.95	58.81	74.70	EOPL
Equip Oper, Med			50.26	1.45	10.55	62.27	79.10	EOPM
Equip Oper, Hvy			52.67	1.45	11.06	65.18	82.80	EOPH
Equip Oper,Oiler			42.53	1.45	8.93	52.91	67.20	OILR
Truck Driver, Dump			39.78	1.45	8.35	49.59	63.00	TKDR
10-30 cy Dmp								
Truck Driver, Other non-Dump			39.78	1.45	8.35	49.59	63.00	TKDRO
HD Mech, Grp4			52.67	1.45	11.06	65.18	82.80	MECH
Millwright (Carp)			44.21	1.45	9.28	54.94	69.80	MLRT
Painters, Jman			36.69	1.45	7.70	45.85	58.20	PAINT
Sheetmetal Worker, Jman			49.16	1.45	10.32	60.94	77.40	SHTM
Driller, Air Track			33.83	1.45	7.10	42.39	53.80	DRLR
Powderman			33.83	1.45	7.10	42.39	53.80	PDMN
Dredging Superintendent			60.00	1.45	12.60	74.05	94.00	DSUP
Dredge Leverman, Inland			52.44	1.45	11.01	64.91	82.40	DLEV
Deckhand, Inland			46.36	1.45	9.74	57.55	73.10	DKHD
Shorehand, Inland (Oiler)			43.06	1.45	9.04	53.56	68.00	SHHD
Diver			88.63	1.45	18.61	108.69	138.00	DIVR
Diver Tender			52.64	1.45	11.05	65.14	82.70	DIVT
Prof Engineer (Designer)	50.00						100.00	PENG
Contractor's Superintendent							120.00	SUPR
Assist Engineer							70.00	AENG
Bridge Builder			47.39	1.45	9.95	58.79	74.70	BRGB
Fence Erector			46.78	1.45	9.82	58.06	73.70	FENC
Flagger, Traffic			33.28	1.45	6.99	41.72	53.00	FLGR

Notes:

Coverage Date: Bids after Aug 31, 2005

Travel Pay: Included in Hourly Rate

Fringe Benefits include : Vacation

Health & Welfare

Pension

Training

Workers' Comp Insur: Based on Classification of Risk for Type of Work

Fixed Overhead Includes: Unemployment Ins

FICA

Blder's Risk Ins

Pub Lia Ins

Cost Factor not included: Contractors General Overhead

Contractors Profit

Adjustment for **60 Hr Work Week: 40 Hrs @ 1x, 8Hrs @ 1.5x, and 12Hrs @ 2x = Rate **1.27x** Hourly

Table B-5, Labor, Equipment, and Materials Rates

CONSTRUCTION EQUIPMENT & RATES LIST

(Oct 2005 $'s)

Ref No.	Equipment Name	Equiv Hourly Rate	Notes:	Updated	Source
1	Motor Grader, CAT 14H	72	220 HP, 14' Moldboard	3/2/05	CECG
	Excavators & Dozers				
2	Hydraulic Excavator, CAT 318BL	50	115 HP, 1 CY bucket, 18.4 mT Wt	3/2/05	CECG
3	Hydraulic Excavator, CAT 325	77	168 HP, 1.44 CY bucket, 26.0 mT Wt	3/2/05	CECG
4	Hydraulic Excavator, CAT 235D	117	250 HP, 2.13 CY bucket, 47mT Wt	3/2/05	CECG
5	Hydraulic Excavator, CAT 350	128	286HP, 3.5 CY Bucket, 49.6mT Wt	3/2/05	CEGG
6	Hydraulic Excavator, CAT 365BL	173	385 HP, 3.61 CY Bucket, 67.6 mT Wt	3/2/05	CECG
7	Hydraulic Excavator, CAT 375L	206	428 HP, 5.0 CY bucket, 81.6 mT Wt	3/2/05	CECG
8	Impact Breaker	9	KB-999H AIR-RAM, 1,000 flb, 600bpm	3/2/05	CECG
9	Dozer, CAT D6R	60	163 HP	3/2/05	CECG
10	Dozer, CAT D7R DS II	90	238 HP	3/2/05	CECG
11	Dozer, CAT D8N	101	285 HP, 70,730#, Semi-U Blade	3/2/05	CECG
12	Dozer, CAT D9R	128	410 HP	3/2/05	CECG
13	Dozer, CAT D10R Push	171	570 HP, 128,060#, Semi-U Blade	3/2/05	CECG
14	Scraper, CAT 637E Series2, 25cy	245	450 HP/250HP, 112,670#, Dual Engine Scra	7/13/06	CECG
15	Bucyrus 680W Dragline w/30 cy bkt	610	Elect kW, 225' Boom, 25 cy bucket	7/13/06	Worksheet
	Backhoes & Loaders				
16	RT Loader-Backhoe, Case 580 Super	28	90 HP 4wd, 1 CY bucket	3/2/05	CECG
17	Loader-Hoe, CAT 426C/Case 680	31	85 HP 4WD, 1.25 CY bucket	3/2/05	CECG
18	Loader-Hoe, CAT 436C	31	93 HP, 4WD, 1.38 CY bucket	3/2/05	CECG
19	Rubber Tired Loader, CAT 926E	29	110 HP, 2 CY bucket	3/8/04	CECG
20	Rubber Tired Loader, CAT 950G	48	180 HP, 4.0 CY bucket	3/2/05	CECG
21	Rubber Tired Loader, CAT 980G II	87	311 HP, 7.0 CY bucket	3/2/05	CECG
22	Rubber Tired Loader, CAT 988G	127	475 HP, 8.2 CY bucket	3/2/05	CECG
	Trucks & Haulers				
23	On Highway Rr Dmp, 10 CY	34	235HP, 40,000# GVW, 6X4	3/2/05	CECG
24	On Highway Belly Dump, 18 CY	11	Semi Trailer, needs Tractor	3/2/05	CECG
25	Art Rr Dmp Trk, Volvo A-25B	61	240HP, 17 CY, 4X4, 22.5 mT	3/2/05	CECG
26	Art Rr Dmp Trk, CAT D25D	77	260HP, 18 CY, 4X4, 22.7 mT	3/2/05	CECG
27	Art Rr Dmp Trk, Volvo A-25D	73	304HP, 18 CY, 6X6, 24.0 mT	3/2/05	CECG
28	Art Rr Dmp Trk, CAT D350E S2	108	355HP, 25 CY, 6X6, 31.8 mT	3/2/05	CECG
29	CAT 777D Off-Rd Rear Dump	214	938 HP, 90 mT, 60 cy	3/2/05	CECG
30	~~Scraper, CAT 631E~~	~~175~~	~~450 HP, 21-31 CY, 93,740#~~	~~3/2/05~~	~~CECG~~
31	Flat Bed Truck, 4X2	25	210 HP Diesel, 25,000#	3/2/05	CECG
32	Water Tank Truck, 5,000 gal	63	175 HP Diesel	3/2/05	CECG
33	Mechanic Fuel Lube Trk, 6X4	41	210 HP	3/2/05	CECG
34	Pickup Trk, 2X4, 3/4 T	11	130 HP	3/2/05	CECG
35	Pickup Trk, 4X4, 1 T Crew	16	180 HP	3/2/05	CECG
36	Equip Haul Trailers, 3 Axle	14	75 T Cap	3/2/05	CECG
37	Highway Truck Tractor, 6X4	41	400 HP, 75,000# GVW	3/2/05	CECG
	Compaction Equip				
38	Compactor, CAT 825C Sheepsfoot	135	310 HP, 71,430#, 51" wide?	7/31/06	CECG
39	Rub & Stl Vib Compact, BW212D-2	35	112 HP, 22,000#, 83"W	3/2/05	CECG
40	Vib Stl Roller Compact, BW90AD-2	12	15.9 HP, 3,050#, 35"W	3/2/05	CECG
41	Paving Roller Compacter, BW5AS	30	50 HP, 5 MT,	3/2/05	CECG
42	CAT CS-583C Rub & Stl Vib Compactor	48	137 Hp 84" smooth Vib Drum, 3	3/2/05	CECG
43	Wacker 18x24 Walking Compactor	17	W55T, 8HP, 1,690#, 21.6" W	3/2/05	CECG
44	Hand Held Vib Plt Compactor	3	4.5 HP Gas, 17" Plate	3/2/05	CECG

Table B-5, Labor, Equipment, and Materials Rates

CONSTRUCTION EQUIPMENT & RATES LIST

(Oct 2005 $'s)

Ref No.	Equipment Name	Equiv Hourly Rate	Notes:	Updated	Source
	Cranes & Lifting				
45	Rough Terrain Crane, RT528C	60	130 HP, 25 mT, 70' Boom	3/3/05	CECG
46	Crawler Crane, 45 Ton, LS-108D	68	110 HP, 45 mT,50' Boom	3/3/05	CECG
47	Rough Terrain Crane, RT9100	143	250 HP, 90.7 mT, 114' Boom	3/3/05	CECG
48	Crawler Crane, Manitowoc 3900 Vico	100	287 HP, 91 mT, 100' Boom w/Hook	3/3/05	CECG
49	Crawl Crane, Manitowoc 222HDB	102	350 HP, 91 mT, 40' Boom w/Hook	10/20/05	CECG
50	Crawl Crane, Manitowoc 555 S2	105	340 HP, 136 mT, 160' Boom w/Hook	10/27/05	CECG
51	Crawl Crane, Manitowoc 888 S1	149	330 HP, 197 mT, 200' Boom w/Hook	10/20/05	CECG
52	Pile Hammer, 15K FtLbs, Vulcan 1	59	Needs 565 cfm Air Compressor	3/3/05	CECG
53	60 LF Pile Hammer Leads, 15K FtLbs	13	Allowance	3/16/04	KiewitPac
54	5 CY Clam Shell Bucket (add to Cran	15	Round Nose, Heavy 5cy Bucket	3/3/05	CECG
	Compressors & Drilling				
55	Air Compressor, 600 cfm	35	250 HP Reciprocating	3/3/05	CECG
56	Air Compressor Hoses, 100 LF (3" dia	7	Allowance	3/16/04	CECG
57	Concrete/Asphalt Demo Accessories	22	Air Compressor, air tools & hoses	3/17/04	Washington
58	Air Track, LM100WD90	26	3" max, Drifter, 7,000#, needs 400cfm	3/17/04	Superior Bla
59	Air Compressor, 450 cfm	20		3/3/05	Superior Bla
60	Gardner- Denver Air Track Drill Rig	34	3.5" ATD3800S/PR55 needs air compressor	3/3/05	CECG
61	Air Track Drill, ECM350/VL140	38	4" max, Drifter, 13,000#, needs 900cfm	3/3/05	CECG
62	Air Compressor, 900 cfm	42	260 HP Reciprocating, 990#	3/3/05	CECG
63	Jack Leg Drill, Retractable	7	Max 54" Depth, 3" Dia Hole	3/3/05	CECG
64	Hand Held Jackhammer	1	55# Wet or Dry	3/3/05	CECG
65	Drill Steel Allowance for Air Track	0.40	$0.40 per LF	$.40 per LF	
	Misc Support				
66	Morgan Conc Pump Boom & Chassis	99	Mod 100-115SV, 115cy/hr, 100' Reach	3/3/05	CECG
67	PowerCreter 40	45	Shotcrete Pump; 40 cy/hr, 72 HP		
67	Brush Chipper,	13	35 Hp, 6" Cap	3/16/04	Means
68	Brush Chipper, HD	21	130 HP, 12" Cutter Head	3/16/04	Means
68	HydroSeeder	25	3,000 gal Cap	3/16/04	Means
69	Dewatering Pump		use MH 021 404 0650		
70	Generator, 5kW, gas	2	11 HP	3/3/05	CECG
71	Generator, 15kW, gas	8	30 HP	3/3/05	CECG
72	Generator, 30kW, diesel	18	43 HP	3/3/05	CECG
73	Generator, 100kW, diesel	27	143 HP	3/3/05	CECG
74	Welder, Diesel, 400 Amp	8	48 HP Trailer Mount	3/3/05	CECG
75	Oxy-Acetylene Cutting Equipment	10	Allowance for Torch, Equip & Gases	3/17/04	
76	Gas Engine Power Tool	10	Allowance	3/17/04	CECG
77	Small Tools Allowance	4	Hand Tools, etc	3/17/04	Washington
78	Field Office Trailer w/Furnishings	5	12' x 60'	3/3/05	Means
79	Field Office Trailer	10	24' x 60'	3/3/05	Means
80	Lite Plants, 13.5 Hp, 4 lights	8	Diesel, 4 lites, 13.5 HP	3/3/05	CECG
	Water Work & Dredging				
81	Work Barge, Self Propelled	22		3/17/04	WDI
82	Outboard Skiff, 12' Boston Whaler	6	25 Hp motor, life jackets, etc.	3/17/04	WDI
83	4-inch HD Centrif Pump, 40,000gph	14	45 Hp Diesel Pump w/Elect Start	3/3/05	CECG
84	4-inch Suction & Discharge Hoses	4	Allowance	3/17/04	CECG
85	Segmented Barge, 80' x 40'	22	Sections 10'x40', 5'draw	3/17/04	Kiewit Pac
86	Shallow Draft Tug, 40' Long	88	380 Hp, 10,000 #	3/3/05	CECG

Table B-5, Labor, Equipment, and Materials Rates						
CONSTRUCTION EQUIPMENT & RATES LIST						
(Oct 2005 $'s)						
Ref No.	Equipment Name	Equiv Hourly Rate	Notes:		Updated	Source
	Other Miscellaneous					
87	300 Ho-Ram Pneumatic Hammer	9	1,200 flb; 500bpm		3/3/05	CECG
88	4" Hydraulic Submersible pump	14	hrly rate based on monthly rate quote		4/29/04	Baker Tank
89	10,000 gal Baker Mud Tanks	5	hrly rate based on monthly rate quote		4/29/04	Baker Tank
90	4 pod Baker Sand Filter	20	hrly rate based on monthly rate quote		4/29/04	Baker Tank
91	Pumps for Baker Sand Filters	14	hrly rate based on monthly rate quote		4/29/04	Baker Tank
92	Instrumentation for Sand Filters	9	hrly rate based on monthly rate quote		4/29/04	Baker Tank
93	Metering Pumps for Sand Filters	2	hrly rate based on monthly rate quote		4/29/04	Baker Tank
94	Misc Hoses & Piping for Baker Eqp	6	hrly rate based on monthly rate quote		4/29/04	Baker Tank
95	Chitosan Contactors for Sand Filter	1	hrly rate based on monthly rate quote		4/29/04	Baker Tank
96	21,000 gal Baker Tanks	6	hrly rate based on monthly rate quote		4/29/04	Baker Tank
97	CO2 System for pH stability	6	hrly rate based on monthly rate quote		4/29/04	Baker Tank
98	Self Propelled Teles Boom Aerial Lift	45	Genie S-60, 60' Ht, 600#, 4x2, 82 H		3/3/05	Means
99	5,000 Gal Water Truck	68	175 HP, 30,000# Diesel Off-highway		7/13/06	CECG
100	On Highway Rr Dmp, 18 CY	57	325HP, 70,000# GVW, 6X4		7/27/06	CECG
101	CAT 769D Off-Rd Rear Dump	127	487 HP, 36 mT, 30 cy		7/31/06	CECG
102	Rubber Tired Loader, CAT 962	87	311 HP, 7.0 CY bucket		3/2/05	CECG
103						

Table B-5, Labor, Equipment, and Materials Rates

PERMANENT MATERIALS UNIT PRICING

(Jul 2006 $'s)

Ref No.	Equipment Name	Unit Rate	Unit of Meas	Notes:	Updated	Source
1	Concrete, 2,500 psi	87	CY		7/27/2006	Internet Adj.
2	Concrete, 3,000 psi	90	CY		7/27/2006	Internet
3	Concrete, 4,000 psi	95	CY		7/27/2006	Internet Adj.
4	Concrete, 5,000 psi	98	CY		7/27/2006	Internet Adj.
5	Structural Steel (Small Quant's)	0.90	LB	Ready for welding	10/26/2005	The Guide
6	Pit Run & Ballast, Delv to Site	26	CY	equiv $13/ton	10/26/2005	The Guide
7	Washed Crushed Stone	35	CY	Delivered to Site	5/6/2003	
8	Riprap	30	CY	Delivered to Site	5/30/2003	
9	Coarse Aggregate, Delv to Site		TON			
10	Conc Agg C-57, Delv to Site		TON			
11	Fine Agg, Sand, Delv to Site		TON			
12	Bulk Cement, Delv to Site		TON			
13	Shotcrete, Batched @ Site		CY			
14	Reinforcing Steel	0.60	LB	Supply Only	10/20/2005	The Guide
15	Concrete Pumping	2.50	CY	To 140' Boom	10/20/2005	The Guide
16	Woven & Non-Woven GeoFabrics	0.60	SY		5/4/2006	The Guide
17	Silt Fence w/Stakes	1.00	LF		5/4/2006	The Guide
18	Visqueen, Clear or Blk, 10 mil	0.05	SF		5/4/2006	The Guide
19	HDPE Pipe,, 4' Dia	100	LF		Quote	W Shaffer
20	Royalty for Fill Material	5.00	CY		7/27/2006	MWD Input

Table B-6 Concrete Unit Prices for Inverted Siphon Structures and Transitions

Inverted Siphon Concrete Structure, 800 Ft Long Box Culvert

Conceptual Level Construction Cost Estimate (2006 $'s)

Based on 6 Openings, each 30' x 30'; with Walls & Slabs at 3' Thick

Ref No.	Description	Est Quant	Unit Rate	Amount	
1	Concrete Slab for Inverted Siphon Barrel	17,867	$298	5,324,366	See Conc$$01
2	Concrete Walls for Inverted Siphon Barrel	37,333	$438	16,351,854	See Conc$$02
3	Concrete Elevated Slab for Siphon Barrel	17,867	$460	8,218,820	See Conc$$03
4	Subtotal	73,067		$29,895,040	
5	Average Unit Rate per CY			409	$/cy
6	Average Volume for 100 Ft Long Inverted Siphon = Vol for 800 Ft / 8 =	9,133	CY per 100 Ft Length		
7	Cost per 100 Ft Long Inverted Siphon =	9,133	times	409	$/cy
		$3,736,880		per 100' Length	

Note: this does not include Excavation, Dewatering, Compacted Backfill, and Approach Structures

Table B-6 Concrete Unit Prices for Inverted Siphon Structures and Transitions

INVERTED SIPHON - BOTTOM SLAB

Concrete Unit Price Calculations

IFIC

ITEM	UNIT	QUANT	UNIT COST	BARE TOTAL	Quantity Notes	Pricing Notes
Fine Grade	SF	0	Not Incl'd		QTO	
Foundation Cleanup	SF	0	Not Incl'd		QTO	
Place Concrete, 3,000 psi	CY	17,867	13.82	$246,922	Pumped	MH 03310 700 4650
Purchase Ready Mix	CY	18,760	90.00	1,688,400	=Plc x 1.05	The Guide
Special Transportation Cost	CY		0.00	0		N/A
FORMS	SF	6,006			=WallF+CurvF	
Wall Forms - Set & Strip	SF	6,006	4.17	25,045	4 Uses	MH 03110 445 2150
Purchase, Fab, Assemble	SF	6,006	0.00	0	x .25 All Form S.A	Incl'd Above
Supported	SF	0	9.00	0		N/A
Curved, Complex and Other	SF	0	9.00	0	QTO	N/A
Rebar Materials	LB	1,429,360	0.60	857,616	Ratio	Use 80 #/CY
Rebar Installation	LB	1,429,360	0.30	428,808	=Rebar Mtl	
C. J. Prep	SF	0	1.00	0	=Plc Conc*27/5	
Screeds	SF	160,800	0.78	125,424	Top Surf Area	
Wet Finish	SF	160,800	0.80	128,640	= Screeds	
Waterstop	LF	0	10.00	0	None Required	
Waterproofing	SF	0	1.00	0	None Required	
Expansion Joints	LF	1,000	10.17	10,170		
Joint Sealant	LF	1,000	1.00	1,000	= Exp Jnts	
Curing	SF	166,806	0.20	33,361	=Forms+CJPrep+Screeds	
Cleanup	SF	166,806	Included		=Curing	
Point & Patch	SF	1,502	0.44	661	=Forms*.25	
Access	LS			0	LS Amt	See Separate Cost

		TOTAL		3,546,047		
				=========		
NEAT LINE CONC VOL =		17,867.00	CY		=Plc Conc	

UNIT COST =		$198.47	/CY			
Contractor's Ovrhd & Profit Adjst		1.50			Assume 50%	
UNIT PRICE =		**$298**	/CY			
		=========				
FORM RATIO =	0.3	SF/CY				

Table B-6 Concrete Unit Prices for Inverted Siphon Structures and Transitions

INVERTED SIPHON - WALLS

Concrete Unit Price Calculations

IFIC

ITEM	UNIT	QUANT	UNIT COST	BARE TOTAL	Quantity Notes	Pricing Notes
Fine Grade	SF	0	Not Incl'd		QTO	
Foundation Cleanup	SF	0	Not Incl'd		QTO	
Place Concrete, 3,000 psi	CY	37,333	21.35	$797,060	Pumped	MH 03310 700 5350
Purchase Ready Mix	CY	39,200	90.00	3,528,000	=Plc x 1.05	The Guide
Special Transportation Cost	CY		0.00	0		N/A
FORMS	SF	337,260			=WallF+CurvF	
Wall Forms - Set & Strip	SF	337,260	4.19	1,413,119	4 Uses	MH 03110 455 9460
Purchase, Fab, Assemble	SF	337,260	0.00	0	x .25 All Form S.A	Incl'd Above
Supported	SF	0	9.00	0		N/A
Curved, Complex and Other	SF	0	9.00	0	QTO	N/A
Rebar Materials	LB	5,599,950	0.60	3,359,970	Ratio	Use 150 #/CY
Rebar Installation	LB	5,599,950	0.30	1,679,985	=Rebar Mtl	
C. J. Prep	SF	0	1.00	0	=Plc Conc*27/5	
Screeds	SF	16,800	0.78	13,104	Top Surf Area	
Wet Finish	SF	16,800	0.80	13,440	= Screeds	
Waterstop	LF	0	10.00	0	None Required	
Waterproofing	SF	0	1.00	0	None Required	
Expansion Joints	LF	0	10.17	0	None Required	
Joint Sealant	LF	0	1.00	0	= Exp Jnts	
Curing	SF	354,060	0.20	70,812	=Forms+CJPrep+Screeds	
Cleanup	SF	354,060	Included		=Curing	
Point & Patch	SF	84,315	0.44	37,099	=Forms*.25	
Access	LS			0	LS Amt	See Separate Cost
		TOTAL		10,912,589		
NEAT LINE CONC VOL =		37,333.00	CY		=Plc Conc	
UNIT COST =		$292.30	/CY			
Contractor's Ovrhd & Profit Adjst		1.50			Assume 50%	
UNIT PRICE =		**$438**	/CY			
FORM RATIO =	9	SF/CY				

Table B-6 Concrete Unit Prices for Inverted Siphon Structures and Transitions

INVERTED SIPHON - ELEVATED SLAB

Concrete Unit Price Calculations

IFIC

ITEM	UNIT	QUANT	UNIT COST	BARE TOTAL	Quantity Notes	Pricing Notes
Fine Grade	SF	0	Not Incl'd		QTO	
Foundation Cleanup	SF	0	Not Incl'd		QTO	
Place Concrete, 3,000 psi	CY	17,867	13.82	$246,922	Pumped	MH 03310 700 4650
Purchase Ready Mix	CY	18,760	90.00	1,688,400	=Plc x 1.05	The Guide
Special Transportation Cost	CY		0.00	0		N/A
FORMS	SF	6,006			=WallF+CurvF	
Wall Forms - Set & Strip	SF	6,006	4.17	25,045	4 Uses	MH 03110 445 2150
Purchase, Fab, Assemble	SF	150,006	0.00	0	x .25 All Form S.A	Incl'd Above
Supported	SF	144,000	9.00	1,296,000		N/A
Curved, Complex and Other	SF	0	9.00	0	QTO	N/A
Rebar Materials	LB	2,144,040	0.60	1,286,424	Ratio	Use 120 #/CY
Rebar Installation	LB	2,144,040	0.30	643,212	=Rebar Mtl	
C. J. Prep	SF	0	1.00	0	=Plc Conc*27/5	
Screeds	SF	160,800	0.78	125,424	Top Surf Area	
Wet Finish	SF	160,800	0.80	128,640	= Screeds	
Waterstop	LF	0	10.00	0	None Required	
Waterproofing	SF	0	1.00	0	None Required	
Expansion Joints	LF	0	10.17	0	None Required	
Joint Sealant	LF	0	1.00	0	= Exp Jnts	
Curing	SF	166,806	0.20	33,361	=Forms+CJPrep+Screeds	
Cleanup	SF	166,806	Included		=Curing	
Point & Patch	SF	1,502	0.44	661	=Forms*.25	
Access	LS			0	LS Amt	See Separate Cost

		TOTAL		5,474,089		
				=========		
NEAT LINE CONC VOL =		17,867.00	CY		=Plc Conc	

UNIT COST =		$306.38	/CY			
Contractor's Ovrhd & Profit Adjst		1.50			Assume 50%	
UNIT PRICE =		**$460**	/CY			
		=========				
FORM RATIO =	0.3	SF/CY				

Table B-7 Concrete Unit Prices for Inverted Siphon Transitions

Inverted Siphon Concrete Structure, Approach Transition

Conceptual Level Construction Cost Estimate (2006 $'s)

Based on 6 Openings, each 30' x 30'; Approach Struct Walls & Slabs at 3' Thick

Ref No.	Description	Est Quant	Unit Rate	Amount	
1	Retaining Wall Footing (Slab)	1,192	$319	380,248	See Conc$$01
2	Retaining Wall w/o Buttress	1,015	$502	509,530	See Conc$$02
3	Buttresses for Retaining Walls	356	$499	177,644	See Conc$$03
4	Concrete Approach Bottom Slab.	9,219	$303	2,793,357	See Conc$$04
5	Subtotal	11,782		$3,860,779	
6	Average Unit Rate per CY			328	$/cy
7	Cost per Transition	$3,860,779		per Each Transition	

Note: this does not include Excavation, Dewatering, Compacted Backfill, and Box Culvert Structures

Table B-7 Concrete Unit Prices for Inverted Siphon Transitions						
APPROACH TRANSITION STRUCTURE - RETAINING WALL FOOTING (SLAB)						
Concrete Unit Price Calculations						
IFIC						
			UNIT	BARE	Quantity	Pricing
ITEM	UNIT	QUANT	COST	TOTAL	Notes	Notes
Fine Grade	SF	0	Not Incl'd		QTO	
Foundation Cleanup	SF	0	Not Incl'd		QTO	
Place Concrete, 3,000 psi	CY	1,192	13.82	$16,473	Pumped	MH 03310 700 4650
Purchase Ready Mix	CY	1,252	90.00	112,680	=Plc x 1.05	The Guide
Special Transportation Cost	CY		0.00	0		N/A
FORMS	SF	4,862			=WallF+CurvF	
Wall Forms - Set & Strip	SF	4,862	4.17	20,275	4 Uses	MH 03110 445 2150
Purchase, Fab, Assemble	SF	4,862	0.00	0	x .25 All Form S.A	Incl'd Above
Supported	SF	0	9.00	0		N/A
Curved, Complex and Other	SF	0	9.00	0	QTO	N/A
Rebar Materials	LB	95,360	0.60	57,216	Ratio	Use 80 #/CY
Rebar Installation	LB	95,360	0.30	28,608	=Rebar Mtl	
C. J. Prep	SF	0	1.00	0	=Plc Conc*27/5	
Screeds	SF	6,308	0.78	4,920	Top Surf Area	
Wet Finish	SF	6,308	0.80	5,046	= Screeds	
Waterstop	LF	0	10.00	0	None Required	
Waterproofing	SF	0	1.00	0	None Required	
Expansion Joints	LF	500	10.17	5,085	Assume QTO	
Joint Sealant	LF	500	1.00	500	= Exp Jnts	
Curing	SF	11,170	0.20	2,234	=Forms+CJPrep+Screeds	
Cleanup	SF	11,170	Included		=Curing	
Point & Patch	SF	1,216	0.44	535	=Forms*.25	
Access	LS			0	LS Amt	See Separate Cost

		TOTAL		253,572		
				=========		
NEAT LINE CONC VOL =		1,192.00	CY		=Plc Conc	

UNIT COST =		$212.73	/CY			
Contractor's Ovrhd & Profit Adjst		1.50			Assume 50%	
UNIT PRICE =		**$319**	/CY			
		=========				
FORM RATIO =	4.1	SF/CY				

Table B-7 Concrete Unit Prices for Inverted Siphon Transitions						
APPROACH TRANSITION STRUCTURE - RETAINING WALL W/O BUTTRESS						
Concrete Unit Price Calculations						
IFIC						
			UNIT	BARE	Quantity	Pricing
ITEM	UNIT	QUANT	COST	TOTAL	Notes	Notes
Fine Grade	SF	0	Not Incl'd		QTO	
Foundation Cleanup	SF	0	Not Incl'd		QTO	
Place Concrete, 3,000 psi	CY	1,015	21.35	$21,670	Pumped	MH 03310 700 5350
Purchase Ready Mix	CY	1,066	90.00	95,940	=Plc x 1.05	The Guide
Special Transportation Cost	CY		0.00	0		N/A
FORMS	SF	18,270			=WallF+CurvF	
Wall Forms - Set & Strip	SF	18,270	4.19	76,551	4 Uses	MH 03110 455 9460
Purchase, Fab, Assemble	SF	18,270	0.00	0	x .25 All Form S.A	Incl'd Above
Supported	SF	0	9.00	0		N/A
Curved, Complex and Other	SF	0	9.00	0	QTO	N/A
Rebar Materials	LB	152,250	0.60	91,350	Ratio	Use 150 #/CY
Rebar Installation	LB	152,250	0.30	45,675	=Rebar Mtl	
C. J. Prep	SF	0	1.00	0	=Plc Conc*27/5	
Screeds	SF	1,740	0.78	1,357	Top Surf Area	
Wet Finish	SF	1,740	0.80	1,392	= Screeds	
Waterstop	LF	0	10.00	0	None Required	
Waterproofing	SF	0	1.00	0	None Required	
Expansion Joints	LF	0	10.17	0	None Required	
Joint Sealant	LF	0	1.00	0	= Exp Jnts	
Curing	SF	20,010	0.20	4,002	=Forms+CJPrep+Screeds	
Cleanup	SF	20,010	Included		=Curing	
Point & Patch	SF	4,568	0.44	2,010	=Forms*.25	
Access	LS			0	LS Amt	See Separate Cost

		TOTAL		339,947		
				=========		
NEAT LINE CONC VOL =		1,015.00	CY		=Plc Conc	

UNIT COST =		$334.92	/CY			
Contractor's Ovrhd & Profit Adjst		1.50			Assume 50%	
UNIT PRICE =		**$502**	/CY			
		=========				
FORM RATIO =	18	SF/CY				

Table B-7 Concrete Unit Prices for Inverted Siphon Transitions						
APPROACH TRANSITION STRUCTURE - BUTTRESSES for RETAINING WALLS						
Concrete Unit Price Calculations						
IFIC						
			UNIT	BARE	Quantity	Pricing
ITEM	UNIT	QUANT	COST	TOTAL	Notes	Notes
Fine Grade	SF	0	Not Incl'd		QTO	
Foundation Cleanup	SF	0	Not Incl'd		QTO	
Place Concrete, 3,000 psi	CY	356	21.35	$7,601	Pumped	MH 03310 700 5350
Purchase Ready Mix	CY	374	90.00	33,660	=Plc x 1.05	The Guide
Special Transportation Cost	CY		0.00	0		N/A
FORMS	SF	6,358			=WallF+CurvF	
Wall Forms - Set & Strip	SF	6,358	4.19	26,640	4 Uses	MH 03110 455 9460
Purchase, Fab, Assemble	SF	6,358	0.00	0	x .25 All Form S.A	Incl'd Above
Supported	SF	0	9.00	0		N/A
Curved, Complex and Other	SF	0	9.00	0	QTO	N/A
Rebar Materials	LB	53,400	0.60	32,040	Ratio	Use 150 #/CY
Rebar Installation	LB	53,400	0.30	16,020	=Rebar Mtl	
C. J. Prep	SF	0	1.00	0	=Plc Conc*27/5	
Screeds	SF	264	0.78	206	Top Surf Area	
Wet Finish	SF	264	0.80	211	= Screeds	
Waterstop	LF	0	10.00	0	None Required	
Waterproofing	SF	0	1.00	0	None Required	
Expansion Joints	LF	0	10.17	0	None Required	
Joint Sealant	LF	0	1.00	0	= Exp Jnts	
Curing	SF	6,622	0.20	1,324	=Forms+CJPrep+Screeds	
Cleanup	SF	6,622	Included		=Curing	
Point & Patch	SF	1,590	0.44	699	=Forms*.25	
Access	LS			0	LS Amt	See Separate Cost

		TOTAL		118,402		
				=========		
NEAT LINE CONC VOL =		356.00	CY		=Plc Conc	

UNIT COST =		$332.59	/CY			
Contractor's Ovrhd & Profit Adjst		1.50			Assume 50%	
UNIT PRICE =		**$499**	/CY			
		=========				
FORM RATIO =	18	SF/CY				

Table B-7 Concrete Unit Prices for Inverted Siphon Transitions

APPROACH TRANSITION STRUCTURE - BOTTOM SLAB

Concrete Unit Price Calculations

IFIC

ITEM	UNIT	QUANT	UNIT COST	BARE TOTAL	Quantity Notes	Pricing Notes
Fine Grade	SF	0	Not Incl'd		QTO	
Foundation Cleanup	SF	0	Not Incl'd		QTO	
Place Concrete, 3,000 psi	CY	9,219	13.82	$127,407	Pumped	MH 03310 700 4650
Purchase Ready Mix	CY	9,680	90.00	871,200	=Plc x 1.05	The Guide
Special Transportation Cost	CY		0.00	0		N/A
FORMS	SF	3,480			=WallF+CurvF	
Wall Forms - Set & Strip	SF	3,480	4.17	14,512	4 Uses	MH 03110 445 2150
Purchase, Fab, Assemble	SF	3,480	0.00	0	x .25 All Form S.A	Incl'd Above
Supported	SF	0	9.00	0		N/A
Curved, Complex and Other	SF	0	9.00	0	QTO	N/A
Rebar Materials	LB	737,520	0.60	442,512	Ratio	Use 150 #/CY
Rebar Installation	LB	737,520	0.30	221,256	=Rebar Mtl	
C. J. Prep	SF	0	1.00	0	=Plc Conc*27/5	
Screeds	SF	103,717	0.78	80,899	Top Surf Area	
Wet Finish	SF	103,717	0.80	82,974	= Screeds	
Waterstop	LF	0	10.00	0	None Required	
Waterproofing	SF	0	1.00	0	None Required	
Expansion Joints	LF	0	10.17	0	None Required	
Joint Sealant	LF	0	1.00	0	= Exp Jnts	
Curing	SF	107,197	0.20	21,439	=Forms+CJPrep+Screeds	
Cleanup	SF	107,197	Included		=Curing	
Point & Patch	SF	870	0.44	383	=Forms*.25	
Access	LS			0	LS Amt	See Separate Cost
		TOTAL		1,862,581		
NEAT LINE CONC VOL =		9,219.00	CY		=Plc Conc	
UNIT COST =		$202.04	/CY			
Contractor's Ovrhd & Profit Adjst		1.50			Assume 50%	
UNIT PRICE =		**$303**	/CY			
FORM RATIO =	0.4	SF/CY				

Table B-8 - UNIT PRICES FOR CANAL EMBANKMENT - LOAD, PLACE, & COMPACT w/0.5 MILE HAUL

Direct Cost (July 2006 Level $'s)

Line Ref No	Item	Product Rate (cy /hr)	No Units (Ea)	Work Hours (Hrs)	Equipment Hourly Rate ($/Hr)	Equipment Subtotal Cost ($)	Labor Hourly Rate ($)	Labor Subtotal Cost ($)	Lab & Equip Hourly Rate ($)	Lab & Equip Subtotal Cost ($)	Avg Unit Cost ($/cy)	Comments
1.0	PRIME EXCAVATOR											
1.1	CAT 988F Loader	660	1	8,712	127	1,106,439	79.10	689,129	206	1,795,568	0.36	*Avg max pace*
1.2		*Production based on8 cy bucket @100% full, 50 min work hour, better than average sand & gravel working conditions										
1.3	Reduced pace	495	1	11,616	127	1,475,253	79.10	918,838	206	2,394,091	0.48	Reduced pace
2.0	HAULING UNITS											
2.1	Art Dmp Cat D350E	660	2.70	23,523	108	2,540,455	74.70	1,757,148	183	4,297,602	0.86	Normal Pace
2.2	Reduced pace	495	2.00	23,232	108	2,509,091	74.70	1,735,455	183	4,244,545	0.85	Reduced pace
3.0	SUPPORT LOADING, HAULING & PLACEMENT (w/Compaction)											
3.1	Dozer, D-9N	8,712	1.7	14,811	128.00	1,895,758	79.10	1,171,519	207	3,067,277	0.61	2 @ Dump Site
3.2	Compactor, Cat 825	8,712	0.4	3,485	135.00	470,455	74.70	260,318	210	730,773	0.15	1 @ Dump Site
3.3	Grader, 14-H	8,712	0.25	2,178	72.00	156,818	79.10	172,282	151	329,100	0.07	Haul Road Maint
3.4	Water Truck,	8,712	0.25	2,178	68.00	148,106	63.00	137,216	131	285,322	0.06	Haul Road Maint
3.5	Pickup Trk	8,712	1	8,712	16.00	139,394	0.00	0	16	139,394	0.03	Crew Movement
3.6	Foreman, Operator	8,712	0.5	4,356	0	0	82.80	360,682	83	360,682	0.07	Supervision
3.7	Foreman, Teamster	8,712	0.25	2,178	0	0	63.00	137,216	63	137,216	0.03	Supervision
3.8	Gradechecker	8,712	0.25	2,178	0	0	53.30	116,089	53	116,089	0.02	Survey Misc
3.9	Survey P Chief	8,712	0.25	2,178	0	0	54.60	118,920	55	118,920	0.02	Survey Misc
3.10	Flagmen & Gen Lab	8,712	3	26,136	2	52,273	53.00	1,385,227	55	1,437,500	0.29	Traffic Control & Misc
3.11					Subtotal Support Equipment & Labor						1.34	Normal Pace
									Reduced Pace =		1.79	Reduced pace
4.0	HAULING WORKSHEET											

	Haul Equipment	1Way Haul (Mi)	Avg Speed (mph)	Travel Time (min)	Wait Time (min)	No. Loader Passes	Load Time (min)	Turn & Dump (min)	Total Cycle (min)	Load Volume (cy)	Cycle Rate (cy/hr)	No of Units (ea)
4.1	Art Dmp Cat D350E	0.5	26	2.31	1.00	3	1.80	0.70	5.81	24	247.95	2.70
		**Production based on 30 cy average loose volume measure per truck load										

Table B-8 - UNIT PRICES FOR CANAL EMBANKMENT - LOAD, PLACE, & COMPACT w/0.5 MILE HAUL

Direct Cost (July 2006 Level $'s)

Line Ref No	Item	Product Rate (cy /hr)	No Units (Ea)	Work Hours (Hrs)	Equipment Hourly Rate ($/Hr)	Equipment Subtotal Cost ($)	Labor Hourly Rate ($)	Labor Subtotal Cost ($)	Lab & Equip Hourly Rate ($)	Lab & Equip Subtotal Cost ($)	Avg Unit Cost ($/cy)	Comments
5.0	GENERAL PROJECT RESULTS											

	Material Volume (cy)	Duration (Days)	Production Rate (cy/hr)	Hrs per Shift	No. Shifts	Hrs per Day		Avg Unit Cost	
Inplace	5,000,000								
Loose	5,750,000	435.61	660	10.00	2.00	20	1 Set-up Normal Pace	2.56	$/cy
		580.81	495	10.00	2.00	20	1 Set-up Reduced Pace	3.12	$/cy

Volume Reference:Caterpillar Handbook

Space requirements for (HAULER) Turnaround: Turn Circle = XXX' ==>**Use 100'**

Space for 2 Set-ups working, approx 2x 1 Unit = 2 x 100' = 200' ===>**Use 200'**

Note: Loose measure volume assumed = 1.15 times In Place Measure Volume

Table B-9 - UNIT PRICES FOR CANAL EXCAVATION - SCRAPER w/1 MILE HAUL

Direct Cost (July 2006 Level $'s)

Line Ref No	Item	Product Rate (cy /hr)	No Units (Ea)	Work Hours (Hrs)	Equipment Hourly Rate ($/Hr)	Equipment Subtotal Cost ($)	Labor Hourly Rate ($)	Labor Subtotal Cost ($)	Lab & Equip Hourly Rate ($)	Lab & Equip Subtotal Cost ($)	Avg Unit Cost ($/cy)	Comments
1.0	PRIME EXCAVATOR											
1.1	CAT 637E Scraper	250	1	46,000	245	11,270,000	79.10	3,638,600	324	14,908,600	1.49	*Avg max pace*
1.2		*Production based on31 cy bucket @100% full, 50 min work hour, average sand & gravel working conditions										
1.3	Reduced pace	188	1	61,333	245	15,026,667	79.10	4,851,467	324	19,878,133	1.99	Reduced pace
2.0	HAULING UNITS											
2.1	Incl'd in Excav			#DIV/0!	245	#DIV/0!	79.10	#DIV/0!	324	#DIV/0!	0.00	Normal Pace
2.2	Reduced pace		0.00	#DIV/0!	245	#DIV/0!	79.10	#DIV/0!	324	#DIV/0!	0.00	Reduced pace
3.0	SUPPORT LOADING, HAULING & PLACEMENT (w/Compaction)											
3.1	Dozer, D-9N	46,000	1.2	55,200	128.00	7,065,600	79.10	4,366,320	207	11,431,920	1.14	1 @ Dump Site; 1 Pushing
3.2	Compactor, Cat 825	46,000	0.14	6,440	135.00	869,400	74.70	481,068	210	1,350,468	0.14	1 @ Dump Site
3.3	Grader, 14-H	46,000	0.25	11,500	72.00	828,000	79.10	909,650	151	1,737,650	0.17	Haul Road Maint
3.4	Water Truck,	46,000	0	0	68.00	0	63.00	0	131	0	0.00	Haul Road Maint
3.5	Pickup Trk	46,000	3	138,000	16.00	2,208,000	0.00	0	16	2,208,000	0.22	Crew Movement
3.6	Foreman, Operator	46,000	0.5	23,000	0	0	82.80	1,904,400	83	1,904,400	0.19	Supervision
3.7	Foreman, Teamster	46,000	0.25	11,500	0	0	63.00	724,500	63	724,500	0.07	Supervision
3.8	Gradechecker	46,000	0.5	23,000	0	0	53.30	1,225,900	53	1,225,900	0.12	Survey Misc
3.9	Survey P Chief	46,000	0.25	11,500	0	0	54.60	627,900	55	627,900	0.06	Survey Misc
3.10	Flagmen & Gen Lab	46,000	2	92,000	2	184,000	53.00	4,876,000	55	5,060,000	0.51	Traffic Control & Misc
3.11					Subtotal Support Equipment & Labor						2.63	Normal Pace
									Reduced Pace =		3.50	Reduced pace

	Haul Equipment	1Way Haul (Mi)	Avg Speed (mph)	Travel Time (min)	Wait Time (min)	No. Loader Passes	Load Time (min)	Turn & Dump (min)	Total Cycle (min)	Load Volume (cy)	Cycle Rate (cy/hr)	No of Units (ea)
4.0	HAULING WORKSHEET											
4.1	Incl'd in Excav	1		3.70	0.00	1	0.50	0.60	4.80	25	312.5	1.00
		**Production based onTT cy average loose volume measure per truck load										

Table B-9 - UNIT PRICES FOR CANAL EXCAVATION - SCRAPER w/1 MILE HAUL

Direct Cost (July 2006 Level $'s)

Line Ref No	Item	Product Rate (cy /hr)	No Units (Ea)	Work Hours (Hrs)	Equipment Hourly Rate ($/Hr)	Equipment Subtotal Cost ($)	Labor Hourly Rate ($)	Labor Subtotal Cost ($)	Lab & Equip Hourly Rate ($)	Lab & Equip Subtotal Cost ($)	Avg Unit Cost ($/cy)	Comments
5.0	GENERAL PROJECT RESULTS											
	Material Volume (cy)	Duration (Days)		Production Rate (cy/hr)		Hrs per Shift	No. Shifts	Hrs per Day				Avg Unit Cost
Inplace	10,000,000											
Loose	11,500,000	2,300.00		250		10.00	2.00	20		1 Set-up Normal Pace	4.12	$/cy
		3,066.67		188		10.00	2.00	20		1 Set-up Reduced Pace	5.49	$/cy
	Volume Reference:Caterpillar Handbook											
	Space requirements for (HAULER) Turnaround: Turn Circle = XXX' ==>Use 100'											
	Space for 2 Set-ups working, approx 2x 1 Unit = 2 x 100' = 200' ===>Use 200'											
	Note: Loose measure volume assumed = 1.15 times In Place Measure Volume											

Table B-10 - UNIT PRICES FOR CANAL EXCAVATION - WALKING DRAGLINE w/NO HAUL

Direct Cost (July 2006 Level $'s)

Line Ref No	Item	Product Rate (cy /hr)	No Units (Ea)	Work Hours (Hrs)	Equipment Hourly Rate ($/Hr)	Equipment Subtotal Cost ($)	Labor Hourly Rate ($)	Labor Subtotal Cost ($)	Lab & Equip Hourly Rate ($)	Lab & Equip Subtotal Cost ($)	Avg Unit Cost ($/cy)	Comments
1.0	PRIME EXCAVATOR											
1.1	Bucyrus 680W	1,282	1	76,053	610	46,392,356	150.00	11,407,956	760	57,800,312	0.74	*Avg max pace*
1.2		*Production based on30 cy bucket @100% full, 50 min work hour, average wet soil working conditions										
1.3	Reduced pace	962	1	101,404	610	61,856,474	150.00	15,210,608	760	77,067,083	0.99	Reduced pace
2.0	HAULING UNITS											
2.1	None			#DIV/0!	0	#DIV/0!	79.10	#DIV/0!	79	#DIV/0!	0.00	Normal Pace
2.2	Reduced pace		#####	#DIV/0!	0	#DIV/0!	79.10	#DIV/0!	79	#DIV/0!	0.00	Reduced pace
3.0	SUPPORT LOADING, HAULING & PLACEMENT (w/Compaction)											
3.1	Dozer, D-9N	76,053	3	228,159	128.00	29,204,368	79.10	18,047,387	207	47,251,755	0.61	2 @ Dump Site
3.2	Compactor, Cat 825	76,053	0	0	135.00	0	74.70	0	210	0	0.00	1 @ Dump Site
3.3	Grader, 14-H	76,053	0	0	72.00	0	79.10	0	151	0	0.00	Haul Road Maint
3.4	Water Truck,	76,053	0	0	68.00	0	63.00	0	131	0	0.00	Haul Road Maint
3.5	Pickup Trk	76,053	2	152,106	16.00	2,433,697	0.00	0	16	2,433,697	0.03	Crew Movement
3.6	Foreman, Operator	76,053	0.5	38,027	0	0	82.80	3,148,596	83	3,148,596	0.04	Supervision
3.7	Foreman, Teamster	76,053	0.25	19,013	0	0	63.00	1,197,835	63	1,197,835	0.02	Supervision
3.8	Gradechecker	76,053	0.5	38,027	0	0	53.30	2,026,814	53	2,026,814	0.03	Survey Misc
3.9	Survey P Chief	76,053	0.25	19,013	0	0	54.60	1,038,124	55	1,038,124	0.01	Survey Misc
3.10	Flagmen & Gen Lab	76,053	0	0	2	0	53.00	0	55	0	0.00	Traffic Control & Misc
3.11				Subtotal Support Equipment & Labor							0.73	Normal Pace
									Reduced Pace =		0.98	Reduced pace

		1Way Haul	Avg Speed	Travel Time	Wait Time	No. Loader	Load Time	Turn & Dump	Total Cycle	Load Volume	Cycle Rate	No of Units
	Haul Equipment	(Mi)	(mph)	(min)	(min)	Passes	(min)	(min)	(min)	(cy)	(cy/hr)	(ea)
4.0	HAULING WORKSHEET											
4.1	None (D-9 Dozer push)	0	0	#DIV/0!	0.00	0	0.00	0.00	#DIV/0!		0	0.00
		**Production based onTT cy average loose volume measure per truck load										

Table B-10 - UNIT PRICES FOR CANAL EXCAVATION - WALKING DRAGLINE w/NO HAUL

Direct Cost (July 2006 Level $'s)

Line Ref No	Item	Product Rate (cy /hr)	No Units (Ea)	Work Hours (Hrs)	Equipment Hourly Rate ($/Hr)	Equipment Subtotal Cost ($)	Labor Hourly Rate ($)	Labor Subtotal Cost ($)	Lab & Equip Hourly Rate ($)	Lab & Equip Subtotal Cost ($)	Avg Unit Cost ($/cy)	Comments
5.0	GENERAL PROJECT RESULTS											
	Material Volume (cy)	Duration (Days)		Production Rate (cy/hr)		Hrs per Shift	No. Shifts	Hrs per Day			Avg Unit Cost	
Inplace	78,000,000											
Loose	97,500,000	3,802.65		1,282		10.00	2.00	20		1 Set-up Normal Pace	1.47	$/cy
		5,070.20		962		10.00	2.00	20		1 Set-up Reduced Pace	1.97	$/cy
	Volume Reference:Caterpillar Handbook & Contact with Buycrus International, Inc.											
	Space requirements for (HAULER) Turnaround: Turn Circle = XXX' ==> N/A											
	Space for 2 Set-ups working, approx 2x 1 Unit = 2 x 100' = 200' ===> N/A											
	Note: Loose measure volume assumed = 1.25 times In Place Measure Volume											

Table B-11 - UNIT PRICES FOR CANAL EXCAVATION - HYDRAULIC EXCAVATOR w/0.5 MILE HAUL

Direct Cost (July 2006 Level $'s)

Line Ref No	Item	Product Rate (cy /hr)	No Units (Ea)	Work Hours (Hrs)	Equipment Hourly Rate ($/Hr)	Equipment Subtotal Cost ($)	Labor Hourly Rate ($)	Labor Subtotal Cost ($)	Lab & Equip Hourly Rate ($)	Lab & Equip Subtotal Cost ($)	Avg Unit Cost ($/cy)	Comments
1.0	PRIME EXCAVATOR											
1.1	CAT 350 B L	660	1	8,712	128	1,115,152	79.10	689,129	207	1,804,280	0.36	"Avg max pace"
1.2		*Production based on4 cy bucket @100% full, 50 min work hour, better than average sand & gravel working conditions										
1.3	Reduced pace	495	1	11,616	128	1,486,869	79.10	918,838	207	2,405,707	0.48	Reduced pace
2.0	HAULING UNITS											
2.1	CAT 769D	660	2.30	20,038	127	2,544,811	74.70	1,496,830	202	4,041,640	0.81	Normal Pace
2.2	Reduced pace	495	2.00	23,232	127	2,950,505	74.70	1,735,455	202	4,685,960	0.94	Reduced pace
3.0	SUPPORT LOADING, HAULING & PLACEMENT (w/Compaction)											
3.1	Dozer, D-9N	8,712	1	8,712	128.00	1,115,152	79.10	689,129	207	1,804,280	0.36	1 @ Dump Site
3.2	Compactor, CS563	8,712	0	0	135.00	0	74.70	0	210	0	0.00	
3.3	Grader, 14-H	8,712	0.25	2,178	72.00	156,818	79.10	172,282	151	329,100	0.07	Haul Road Maint
3.4	Water Truck,	8,712	0	0	68.00	0	63.00	0	131	0	0.00	Haul Road Maint
3.5	Pickup Trk	8,712	1	8,712	16.00	139,394	0.00	0	16	139,394	0.03	Crew Movement
3.6	Foreman, Operator	8,712	0.5	4,356	0	0	82.80	360,682	83	360,682	0.07	Supervision
3.7	Foreman, Teamster	8,712	0.25	2,178	0	0	63.00	137,216	63	137,216	0.03	Supervision
3.8	Gradechecker	8,712	0.25	2,178	0	0	53.30	116,089	53	116,089	0.02	Survey Misc
3.9	Survey P Chief	8,712	0.25	2,178	0	0	54.60	118,920	55	118,920	0.02	Survey Misc
3.10	Flagmen & Gen Lab	8,712	3	26,136	2	52,273	53.00	1,385,227	55	1,437,500	0.29	Traffic Control & Misc
3.11	Subtotal Support Equipment & Labor										0.89	Normal Pace
									Reduced Pace =		1.18	Reduced pace
4.0	HAULING WORKSHEET											

	Haul Equipment	1Way Haul (Mi)	Avg Speed (mph)	Travel Time (min)	Wait Time (min)	No. Loader Passes	Load Time (min)	Turn & Dump (min)	Total Cycle (min)	Load Volume (cy)	Cycle Rate (cy/hr)	No of Units (ea)
4.1	CAT 769D	0.5	34	1.76	0.79	7	2.10	0.70	5.35	26	291.33	2.30
		**Production based on 30 cy average loose volume measure per truck load										

Table B-11 - UNIT PRICES FOR CANAL EXCAVATION - HYDRAULIC EXCAVATOR w/0.5 MILE HAUL

Direct Cost (July 2006 Level $'s)

Line Ref No	Item	Product Rate (cy /hr)	No Units (Ea)	Work Hours (Hrs)	Equipment Hourly Rate ($/Hr)	Equipment Subtotal Cost ($)	Labor Hourly Rate ($)	Labor Subtotal Cost ($)	Lab & Equip Hourly Rate ($)	Lab & Equip Subtotal Cost ($)	Avg Unit Cost ($/cy)	Comments
5.0	GENERAL PROJECT RESULTS											

	Material Volume (cy)	Duration (Days)	Production Rate (cy/hr)	Hrs per Shift	No. Shifts	Hrs per Day			Avg Unit Cost	
Inplace	5,000,000									
Loose	5,750,000	435.61	660	10.00	2.00	20	1 Set-up Normal Pace		2.06	$/cy
		580.81	495	10.00	2.00	20	1 Set-up Reduced Pace		2.60	$/cy

Volume Reference:Caterpillar Handbook

Space requirements for (HAULER) Turnaround: Turn Circle = XXX' ==>**Use 100'**

Space for 2 Set-ups working, approx 2x 1 Unit = 2 x 100' = 200' ===>**Use 200'**

Note: Loose measure volume assumed = 1.15 times In Place Measure Volume

Table B-12 - UNIT PRICES FOR BORROW LOAD & HAUL - HYDRAULIC EXCAVATOR w/10 MILE HAUL

Direct Cost (July 2006 Level $'s)

Line Ref No	Item	Product Rate (cy /hr)	No Units (Ea)	Work Hours (Hrs)	Equipment Hourly Rate ($/Hr)	Equipment Subtotal Cost ($)	Labor Hourly Rate ($)	Labor Subtotal Cost ($)	Lab & Equip Hourly Rate ($)	Lab & Equip Subtotal Cost ($)	Avg Unit Cost ($/cy)	Comments
1.0	PRIME EXCAVATOR											
1.1	CAT 350 B L	660	1	8,712	128	1,115,152	79.10	689,129	207	1,804,280	0.36	*Avg max pace*
1.2		*Production based on4 cy bucket @100% full, 50 min work hour, better than average sand & gravel working conditions										
1.3	Reduced pace	495	1	11,616	128	1,486,869	79.10	918,838	207	2,405,707	0.48	Reduced pace
2.0	HAULING UNITS											
2.1	18 CY Hiway Dump	660	20.20	175,985	57	10,031,136	74.70	13,146,068	132	23,177,205	4.64	Normal Pace
2.2	Reduced pace	495	16.00	185,859	57	10,593,939	74.70	13,883,636	132	24,477,576	4.90	Reduced pace
3.0	SUPPORT LOADING, HAULING & PLACEMENT (w/Compaction)											
3.1	Dozer, D-9N	8,712	1	8,712	128.00	1,115,152	79.10	689,129	207	1,804,280	0.36	1 @ Dump Site
3.2	Compactor, CS563	8,712	0	0	135.00	0	74.70	0	210	0	0.00	
3.3	Grader, 14-H	8,712	0.25	2,178	72.00	156,818	79.10	172,282	151	329,100	0.07	Haul Road Maint
3.4	Water Truck,	8,712	0	0	68.00	0	63.00	0	131	0	0.00	Haul Road Maint
3.5	Pickup Trk	8,712	1	8,712	16.00	139,394	0.00	0	16	139,394	0.03	Crew Movement
3.6	Foreman, Operator	8,712	0.5	4,356	0	0	82.80	360,682	83	360,682	0.07	Supervision
3.7	Foreman, Teamster	8,712	0.25	2,178	0	0	63.00	137,216	63	137,216	0.03	Supervision
3.8	Gradechecker	8,712	0.25	2,178	0	0	53.30	116,089	53	116,089	0.02	Survey Misc
3.9	Survey P Chief	8,712	0.25	2,178	0	0	54.60	118,920	55	118,920	0.02	Survey Misc
3.10	Flagmen & Gen Lab	8,712	3	26,136	2	52,273	53.00	1,385,227	55	1,437,500	0.29	Traffic Control & Misc
3.11					Subtotal Support Equipment & Labor						0.89	Normal Pace
									Reduced Pace =		1.18	Reduced pace
4.0	HAULING WORKSHEET											

	Haul Equipment	1Way Haul (Mi)	Avg Speed (mph)	Travel Time (min)	Wait Time (min)	No. Loader Passes	Load Time (min)	Turn & Dump (min)	Total Cycle (min)	Load Volume (cy)	Cycle Rate (cy/hr)	No of Units (ea)
4.1	18 CY Hiway Dumps	10	40	30.00	0.79	5	1.50	0.70	32.99	18	32.737	20.20
		**Production based on 30 cy average loose volume measure per truck load										

Table B-12 - UNIT PRICES FOR BORROW LOAD & HAUL - HYDRAULIC EXCAVATOR w/10 MILE HAUL

Direct Cost (July 2006 Level $'s)

Line Ref No	Item	Product Rate (cy /hr)	No Units (Ea)	Work Hours (Hrs)	Equipment Hourly Rate ($/Hr)	Equipment Subtotal Cost ($)	Labor Hourly Rate ($)	Labor Subtotal Cost ($)	Lab & Equip Hourly Rate ($)	Lab & Equip Subtotal Cost ($)	Avg Unit Cost ($/cy)	Comments
5.0	GENERAL PROJECT RESULTS											
	Material Volume (cy)	Duration (Days)		Production Rate (cy/hr)		Hrs per Shift	No. Shifts	Hrs per Day				Avg Unit Cost
Inplace	5,000,000											
Loose	5,750,000	435.61		660		10.00	2.00	20		1 Set-up Normal Pace		5.88 $/cy
		580.81		495		10.00	2.00	20		1 Set-up Reduced Pace		6.56 $/cy
	Volume Reference:Caterpillar Handbook											
	Space requirements for (HAULER) Turnaround: Turn Circle = XXX' ==>**Use 50'**											
	Space for 2 Set-ups working, approx 2x 1 Unit = 2 x 100' = 200' ===>**Use 100'**											
	Note: Loose measure volume assumed = 1.15 times In Place Measure Volume											

Table B-13 - DEWATERING COSTS FOR CANAL EMBANKMENT CONSTRUCTION

Direct Cost (August 2006 Level $'s)

Ref Code	DESCRIPTION	SUMMARY PRICING QUANT	UNIT	UNIT PRICE	AMOUNT	CREW LABOR CrewHr/ Unit	Total Hrs	Hrly Rate	TOTAL Amt	PERM MAT'L per Unit	TOTAL Amt	EQUIPMENT per Hour	TOTAL Amt	CONTRTR'S OVRHEAD & PROFIT Amt	per Unit	TOTAL Amount
1	Wells for Dewatering, 25' Deep	308,000	VLF	22.70	6,991,600	0.083	25667	181	4,653,367		0	28	718,667	1,611,610	22.67	6,983,643
	Spaced @50' c-c, 35' Deep		No Wells =		8,800											
2	Well Point System w/1,000 ft Long Headers, Including Installation, Pumping, & Removal															
	First Month	440	EA	350	154,000											
	Additional 3 Years	15,840	MO	116	1,837,440											
3	Subtotal			$8,991,840												

Table B-13 - DEWATERING COSTS FOR CANAL EMBANKMENT CONSTRUCTION

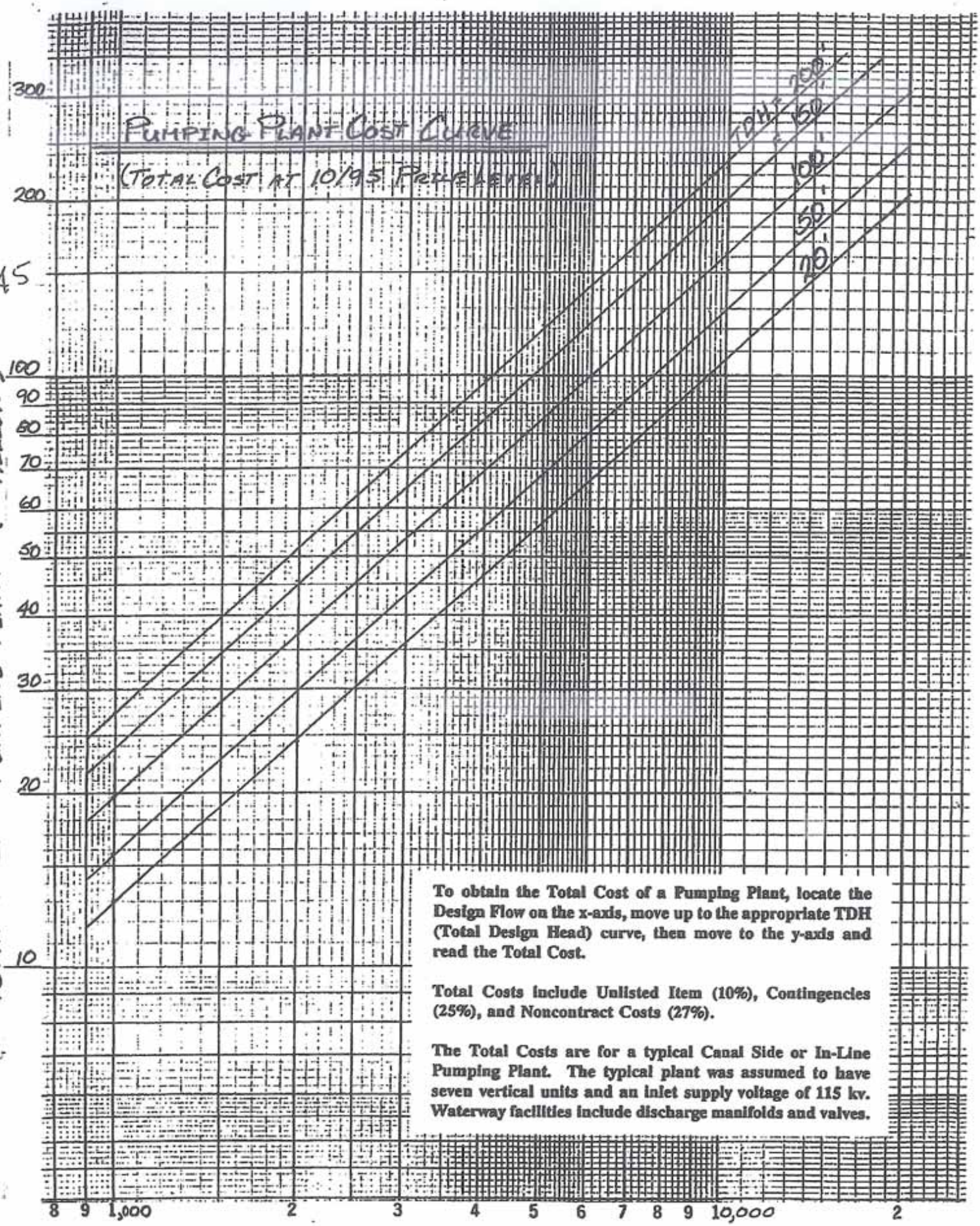
Direct Cost (August 2006 Level $'s)

Prdct Rate	Wrk Hrs	No. Crews	No. Shifts	No. Days	Reference	Other Notes	No. Mobs
12	25,667	10	256.7	256.7	2 Labr, 1OprM; 1 RT Backhoe		1

Table B-14 Isolated Facility, Incised Canal, Pumping Plant Estimated Cost

References	Q CFS	Total Head - Ft	Estimated HP	$ - Cost Estimate	Year of Estimate	Adjustment Factors To: Apr '06	15-kCFM	16-Ft	TOTAL	New $ Estimate
2006 WGI Draft Rpt	15,000	10	25,080	$ 79,380,904	Apr '06	1.000	1.000	1.326	1.326	105,241,742
1997 Report	5,000	10	8,360	$ 29,902,000	Oct '96	1.316	1.933	1.326	3.373	100,855,798
" "	10,000	10	16,720	$ 45,324,000	Oct '96	1.316	1.275	1.326	2.225	100,858,119
" "	15,000	10	25,080	$ 57,807,000	Oct '96	1.316	1.000	1.326	1.745	100,857,526
Stroppini USBR Cht	15,000	20	n/a	$ 155,000,000	Oct '95	1.375	1.000	0.875	1.203	186,418,234
w/7 Units									Say >>>	186,500,000
" " W/ 2 VFDs	Add $ 75,000 direct cost per VFD unit and associated electrical, space and facilities									187,228,234
									Say >>>	187,250,000
w/10units & 2VFDs	Add 10% for 10 units in lieu of 7									196,589,645
									Say >>>	196,600,000
Calculate HP	15,000	16	31,000	Based on 10 pumps operating						
Installed HP	16,500	16	34,100	Based on 11 pumps operating						

Price Per Additional VFD				$ 85,000						
Price Allowance for all appurtanences				$ 50,000	(includes allowance for additional: electrical capacity, switching, wiring, space inside and out, and ventilation					
Installation Cost for VFD & appurtances.				$ 115,000						
	Total Direct Costs - each			$ 250,000						
Contingencies & Indirects +10%, +25%, +27%				$ 155,000						
			Total (ea).	$ 405,000	2	810,000	< Total for 2			



To obtain the Total Cost of a Pumping Plant, locate the Design Flow on the x-axis, move up to the appropriate TDH (Total Design Head) curve, then move to the y-axis and read the Total Cost.

Total Costs include Unlisted Item (10%), Contingencies (25%), and Noncontract Costs (27%).

The Total Costs are for a typical Canal Side or In-Line Pumping Plant. The typical plant was assumed to have seven vertical units and an inlet supply voltage of 115 kv. Waterway facilities include discharge manifolds and valves.

REVISED 3/28/96

February, 1996
March 28, 1996 (Corrected)

Design Flow (cfs)	Total Design Head (Ft)	No. of Units	Pumps and Prime Movers: Curve Value	Pumps and Prime Movers: Contract Cost 1/68	Structures and Improvements: Contract Cost 1/68	Accessory Electrical: Q x H	Accessory Electrical: Contract Cost 1/68	Miscellaneous Installed Equipment: Contract Cost 1/68	Substations: Ix	Substations: Kva	Substations: Contract Cost 1/68	Sum Contract Cost (1/68)	Indexed Contract Cost (10/95)	Field Cost (10/95)	Denver Field Cost Waterways 10/95	Total Field Cost (10/95)	TOTAL COST (10/95)
1000	20	7	680	680,000	630,000	20,000	125,000	48,000	2,600	3,250	64,000	1,547,000	6,700,000	8,400,000	1,850,000	10,250,000	13,000,000
1000	50	7	780	780,000	700,000	50,000	220,000	54,000	6,500	8,125	90,000	1,844,000	8,000,000	10,100,000	2,400,000	12,500,000	15,900,000
1000	100	7	940	940,000	800,000	100,000	340,000	67,000	13,000	16,250	115,000	2,262,000	9,900,000	12,300,000	3,200,000	15,500,000	19,700,000
1000	150	7	1,100	1,100,000	900,000	150,000	440,000	72,000	19,500	24,375	180,000	2,692,000	11,700,000	14,700,000	4,000,000	18,700,000	23,700,000
1000	200	7	1,250	1,250,000	1,000,000	200,000	530,000	81,000	26,000	32,500	240,000	3,101,000	13,500,000	16,900,000	4,700,000	21,600,000	27,400,000
1000	250	7	1,400	1,400,000	1,100,000	250,000	620,000	90,000	32,500	40,625	300,000	3,510,000	15,300,000	19,200,000	5,300,000	24,500,000	31,100,000
2000	20	7	680	1,360,000	1,100,000	40,000	200,000	86,000	5,200	6,500	81,000	2,827,000	12,300,000	15,400,000	3,700,000	19,100,000	24,300,000
2000	50	7	780	1,560,000	1,250,000	100,000	340,000	98,000	13,000	16,250	135,000	3,383,000	14,800,000	18,500,000	4,800,000	23,300,000	29,600,000
2000	100	7	940	1,880,000	1,500,000	200,000	530,000	115,000	26,000	32,500	240,000	4,265,000	18,600,000	23,300,000	6,400,000	29,700,000	37,700,000
2000	150	7	1,100	2,200,000	1,700,000	300,000	700,000	130,000	39,000	48,750	360,000	5,090,000	22,300,000	27,800,000	7,900,000	35,700,000	45,300,000
2000	200	7	1,250	2,500,000	1,900,000	400,000	840,000	150,000	52,000	65,000	480,000	5,870,000	25,700,000	32,100,000	9,300,000	41,400,000	52,600,000
2000	250	7	1,400	2,800,000	2,100,000	500,000	970,000	170,000	65,000	81,250	600,000	6,640,000	29,100,000	36,300,000	10,500,000	46,800,000	59,400,000
3000	20	7	680	2,040,000	1,600,000	60,000	240,000	120,000	7,800	9,750	98,000	4,098,000	17,900,000	22,400,000	5,500,000	27,900,000	35,400,000
3000	50	7	780	2,340,000	1,800,000	150,000	440,000	140,000	19,500	24,375	185,000	4,905,000	21,400,000	26,800,000	7,100,000	33,900,000	43,100,000
3000	100	7	940	2,820,000	2,000,000	300,000	700,000	160,000	39,000	48,750	350,000	6,030,000	26,400,000	33,000,000	9,600,000	42,600,000	54,100,000
3000	150	7	1,100	3,300,000	2,400,000	450,000	900,000	190,000	58,500	73,125	540,000	7,330,000	32,100,000	40,100,000	12,000,000	52,100,000	66,200,000
3000	200	7	1,250	3,750,000	2,600,000	600,000	1,100,000	210,000	78,000	97,500	730,000	8,390,000	36,700,000	45,900,000	14,000,000	59,900,000	76,100,000
3000	250	7	1,400	4,200,000	3,000,000	750,000	1,250,000	230,000	97,500	121,875	940,000	9,620,000	42,100,000	52,700,000	16,000,000	68,700,000	87,200,000
4000	20	7	680	2,720,000	2,000,000	80,000	300,000	160,000	10,400	13,000	115,000	5,295,000	23,200,000	29,000,000	7,400,000	38,400,000	46,200,000
4000	50	7	780	3,120,000	2,300,000	200,000	530,000	180,000	26,000	32,500	250,000	6,380,000	27,900,000	34,900,000	9,500,000	44,400,000	56,400,000
4000	100	7	940	3,760,000	2,600,000	400,000	840,000	210,000	52,000	65,000	480,000	7,880,000	34,500,000	43,200,000	13,000,000	56,200,000	71,400,000
4000	150	7	1,100	4,400,000	3,000,000	600,000	1,100,000	240,000	78,000	97,500	730,000	9,470,000	41,500,000	51,800,000	16,000,000	67,800,000	86,100,000
4000	200	7	1,250	5,000,000	3,400,000	800,000	1,300,000	270,000	104,000	130,000	1,000,000	10,970,000	48,000,000	60,100,000	18,500,000	78,600,000	99,800,000
4000	250	7	1,400	5,600,000	3,700,000	1,000,000	1,550,000	290,000	130,000	162,500	1,250,000	12,390,000	54,300,000	67,800,000	21,000,000	88,800,000	112,800,000
5000	20	7	680	3,400,000	2,400,000	100,000	340,000	190,000	13,000	16,250	135,000	6,485,000	28,300,000	35,400,000	8,900,000	44,300,000	56,200,000
5000	50	7	780	3,900,000	2,800,000	250,000	620,000	215,000	32,500	40,625	300,000	7,835,000	34,300,000	42,900,000	11,200,000	54,100,000	68,700,000
5000	100	7	940	4,700,000	3,200,000	500,000	970,000	255,000	65,000	81,250	600,000	9,725,000	42,600,000	53,200,000	14,400,000	67,600,000	85,800,000
5000	150	7	1,100	5,500,000	3,600,000	750,000	1,250,000	290,000	97,500	121,875	900,000	11,540,000	50,500,000	63,200,000	17,700,000	80,900,000	102,700,000
5000	200	7	1,250	6,250,000	4,100,000	1,000,000	1,550,000	330,000	130,000	162,500	1,250,000	13,480,000	59,000,000	73,800,000	21,400,000	95,200,000	120,900,000
5000	250	7	1,400	7,000,000	4,500,000	1,250,000	1,750,000	360,000	162,500	203,125	1,800,000	15,410,000	67,500,000	84,400,000	25,300,000	109,700,000	139,300,000
10000	20	7	680	6,800,000	4,400,000	200,000	530,000	350,000	26,000	32,500	240,000	12,320,000	53,900,000	67,400,000	16,900,000	84,300,000	107,100,000
10000	50	7	780	7,800,000	4,900,000	500,000	970,000	380,000	65,000	81,250	600,000	14,650,000	64,200,000	80,200,000	20,900,000	101,100,000	128,400,000
10000	100	7	940	9,400,000	5,600,000	1,000,000	1,550,000	450,000	130,000	162,500	1,250,000	18,250,000	79,900,000	99,800,000	27,000,000	126,900,000	161,200,000
10000	150	7	1,100	11,000,000	8,500,000	1,500,000	2,000,000	520,000	195,000	243,750	1,800,000	21,820,000	95,600,000	119,500,000	33,500,000	153,000,000	194,300,000
10000	200	7	1,250	12,500,000	7,200,000	2,000,000	2,400,000	580,000	260,000	325,000	2,700,000	25,380,000	111,200,000	139,000,000	40,300,000	179,300,000	227,700,000
10000	250	7	1,400	14,000,000	8,000,000	2,500,000	2,800,000	650,000	325,000	406,250	3,500,000	28,950,000	126,800,000	158,600,000	47,800,000	206,200,000	261,800,000
15000	20	7	680	10,200,000	6,100,000	300,000	700,000	500,000	39,000	48,750	360,000	17,860,000	78,200,000	97,800,000	25,400,000	123,200,000	156,500,000
15000	50	7	780	11,700,000	7,800,000	750,000	1,250,000	560,000	97,500	121,875	900,000	22,210,000	97,300,000	121,600,000	32,800,000	154,400,000	196,100,000
15000	100	7	940	14,100,000	8,000,000	1,500,000	2,000,000	650,000	195,000	243,750	1,800,000	26,550,000	116,300,000	145,400,000	40,700,000	186,100,000	236,300,000
15000	150	7	1,100	16,500,000	9,000,000	2,250,000	2,900,000	750,000	292,500	365,625	3,100,000	31,950,000	140,000,000	175,000,000	50,800,000	225,800,000	286,800,000
15000	200	7	1,250	18,750,000	10,000,000	3,000,000	3,100,000	840,000	390,000	487,500	4,300,000	36,990,000	162,100,000	202,600,000	60,600,000	263,400,000	334,500,000
15000	250	7	1,400	21,000,000	11,000,000	3,750,000	3,600,000	900,000	487,500	609,375	5,800,000	42,100,000	184,500,000	230,600,000	71,500,000	302,100,000	383,700,000
20000	20	7	680	13,600,000	7,700,000	400,000	840,000	630,000	52,000	65,000	480,000	23,250,000	101,900,000	127,300,000	33,100,000	160,400,000	203,700,000
20000	50	7	780	15,600,000	8,800,000	1,000,000	1,550,000	710,000	130,000	162,500	1,250,000	27,910,000	122,300,000	152,900,000	41,300,000	194,200,000	246,800,000
20000	100	7	940	18,800,000	10,000,000	2,000,000	2,400,000	840,000	260,000	325,000	2,700,000	34,740,000	152,200,000	190,300,000	53,300,000	243,600,000	309,400,000
20000	150	7	1,100	22,000,000	12,000,000	3,000,000	3,100,000	950,000	390,000	487,500	4,300,000	42,350,000	185,600,000	232,000,000	67,300,000	299,300,000	380,100,000
20000	200	7	1,250	25,000,000	13,000,000	4,000,000	3,800,000	1,100,000	520,000	650,000	6,140,000	49,040,000	214,900,000	268,600,000	80,600,000	348,200,000	443,500,000
20000	250	7	1,400	28,000,000	14,000,000	5,000,000	4,400,000	1,200,000	650,000	812,500	8,000,000	55,600,000	243,600,000	304,600,000	94,400,000	399,000,000	506,700,000

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CH2M HILL
Sacramento
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RECEIVED

March 29, 1996

Mr. Ron Ott
CH2M Hill
2485 Natomas Park Drive, Suite 600
Sacramento, California 95833

Subject: **Addendum to Cost Estimates for CALFED Bay Delta Alternatives (Reference my Letter of March 15, 1996)**

Dear Mr. Ott:

On March 25, 1996, I was reviewing the materials transmitted to you by the subject letter and discovered a significant error in the pumping plant cost curve. The error is caused by two factors:

1. The pumping plant cost curve was developed from a set of general cost curves developed by USBR in the last 1960's. Per discussions with USBR Mechanical Engineer's, these old curves were suppose to generate Field Cost prices. This would include contingencies. I was informed that the old curves provide contract costs and that contingencies must be added. This procedure increases a pumping plants Total Cost by approximately 30- to 35-percent.

2. I was also informed that the old curves do not provide any form of waterway components. These costs can be obtained through USBR's pumping plant cost estimating program. This program provides estimates for discharge manifolds and valves. Inclusion of these costs increases a pumping plants Total Cost by approximately 35- to 45- percent.

Attached is an Addendum to the workbook transmitted by the subject letter. The Addendum contains a revised Pumping Plant Cost Curve dated March 28, 1996. Application of this revised cost curve impacts the Total Costs of Action Items 35.4, 35.5, and 35.6. The affected work papers for these Action Items have been copied and marked in red to delineate necessary corrections. The corrected workbook pages have been included in the Addendum. Lastly, Table 1, which summarized the required cost estimates, has been revised to reflect the above discussed corrections and is included in the Addendum.

My apologies for the error. I sincerely hope this does not produce significant problems with your project. The time spent correcting these materials has not been charged to your project. If you have any further questions regarding this matter, please contact me.

Sincerely,

Alan Stroppini, P.E.

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