

Department of Water Resources

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Bureau of Reclamation

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March 25, 2003

Ms. Celeste Cantú
Executive Director
State Water Resources Control Board
P.O. Box 2000
Sacramento, CA 95812-2000

Dear Ms. Cantú:

By this letter, the California Department of Water Resources and US Bureau of Reclamation (DWR/USBR) submit the attached “2001-2002 Review of the Environmental Monitoring Program (EMP) in compliance with Water Right Decision 1641, Condition 11” and request modification of the monitoring program pursuant to Water Right Decision 1641 (D-1641), Condition 11.

DWR/USBR fund and maintain, in cooperation with the California Department of Fish and Game (DFG) and the US Geological Survey (USGS), a water quality compliance and baseline monitoring program (henceforth referred to as the “Environmental Monitoring Program” or EMP) for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary (Bay-Delta). D-1641 specifies three goals for this monitoring program: (1) to ensure compliance with Bay-Delta water quality objectives; (2) to identify meaningful changes in any significant water quality parameters potentially related to operation of the State Water Project (SWP) or the Central Valley Project (CVP); and (3) to reveal trends in ecological changes potentially related to SWP/CVP operations. Condition 11 (e) requires DWR/USBR to evaluate the EMP and report their conclusions to the Executive Director of the State Water Resources Control Board every three years. This condition also provides DWR/USBR with the opportunity to propose appropriate modifications to the EMP for your concurrence.

DWR/USBR staff worked with DFG, USGS, and your staff to complete a comprehensive technical review of the EMP during 2001-2002 and prepared a detailed report of review findings and recommendations. Implementation of some of these recommendations will proceed under D-1641. Implementing other recommendations requires your agreement for several modifications to D-1641 Table 5 and Figure 4, and for the addition of a Table 6. The attached materials specify these modifications and briefly describe the reasons for them. The review report provides more detailed information regarding the rationale and recommended plans for the overall monitoring program revisions and associated special studies.

The modified program would be functionally equivalent to the existing program. However, it would improve monitoring efficiency and products.

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DWR/USBR will proceed to implement the following recommendations under the existing D-1641:

- Produce a more informative annual status and trends report augmented by improved web-based reporting of data and information;
- Shift program emphasis from discrete to continuous monitoring of several variables;
- Compare data from ten neighboring continuous and discrete station pairs to evaluate if these stations could be consolidated at the continuous station site. This will lead to recommendations about station consolidation in the next triennial review;
- Update methods for sample analysis.

Upon your concurrence with the modifications to Table 5 and Figure 4, we will:

- Add, reestablish, and/or better integrate stations and monitoring elements where needed for more comprehensive, integrative data analyses and modeling;
- Consolidate two neighboring continuous and discrete stations;
- Change discrete sampling frequency from monthly to near-monthly according to the tides.

DWR/USBR staff would be happy to present and discuss the review findings and recommendations at a staff workshop or informational meeting at your convenience. If you or your staff have any questions regarding this matter, please contact Erwin Van Nieuwenhuysse at USBR (916) 978-5213 or Anke Mueller-Solger at DWR (916) 227-2194.

Thank you for consideration of our request.

Sincerely,

Susan Ramos
Assistant Regional Director
Bureau of Reclamation

Stephen Verigin
Acting Chief Deputy Director
Department of Water Resources

Cc: Barbara McDonnell, DWR
Phil Wendt, DWR
Steve Ford, DWR
Anke Mueller-Solger, DWR
Zach Hymanson, CA Bay-Delta Authority

Ken Lentz, USBR
Erwin Van Nieuwenhuysse, USBR
Nick Wilcox, SWRCB
Gita Kapahi, SWRCB

2001-2002 Review of the Environmental Monitoring Program

In Compliance With Water Right Decision 1641, Condition 11.

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**APPENDIX A: WORKING TABLES FOR THE REQUEST FOR MODIFICATIONS TO
D-1641, TABLE 5, AND THE ADDITION OF A TABLE 6**

**APPENDIX B: MILESTONES AND PARTICIPANTS IN THE 2001-2002 REVIEW OF
THE ENVIRONMENTAL MONITORING PROGRAM**

**APPENDIX C: INTERAGENCY ECOLOGICAL PROGRAM ENVIRONMENTAL
MONITORING PROGRAM REVIEW AND RECOMMENDATIONS, FINAL
REPORT, MARCH 25, 2003**

I. Program Summary and Proposed Changes

The Environmental Monitoring Program (EMP) was initiated in 1971 and now monitors water quality and phytoplankton, zooplankton, and benthos abundance and distribution in the upper San Francisco Estuary. The Department of Water Resources (DWR) and the US Bureau of Reclamation (USBR) implement the EMP through the Interagency Ecological Program (IEP). DWR and USBR contract with the Department of Fish and Game (DFG) and the US Geological Survey (USGS) to perform some of the monitoring and data maintenance, storage, and analysis. The EMP is conducted in accordance with the requirements of State Water Resources Control Board (SWRCB) Water Right Decision 1641¹ (D-1641) for DWR and USBR operations of the State Water Project (SWP) and the Central Valley Project (CVP). The EMP is part of the monitoring program described in D-1641 Condition 11, Table 5, and Figure 4. The EMP includes environmental baseline monitoring of water quality, plankton and benthic organisms. It also includes compliance monitoring for several of the water quality objectives listed in D-1641 Tables 1-4. Monitoring elements specified in Table 5 are:

- "Continuous Recorder" monitoring of water temperature, electrical conductivity (EC), or dissolved oxygen,
- Continuous "Multiparameter" monitoring,
- Discrete (monthly) physical and chemical water quality monitoring,
- Discrete (monthly) phytoplankton monitoring,
- Discrete (monthly) zooplankton monitoring, and
- Discrete (monthly) benthos monitoring.

EMP monitoring is currently conducted at 22 of the 42 stations listed in D-1641, Table 5. These 22 EMP stations include 14 of the 18 designated "baseline" monitoring stations, seven of the eight "compliance and baseline" monitoring stations (stations C9, C10, D10, D12, D22, D24, and S42) and one of the 16 "compliance" monitoring stations (D29). Thus, while one of the EMP's three goals is to ensure compliance with SWRCB

¹ State Water Resources Control Board, California Environmental Protection Agency. Revised Water Right Decision D-1641, March 15, 2000.

water quality objectives, it is primarily tasked with comprehensive baseline monitoring in order to achieve the other two goals stated in D-1641, Condition 11 -- the identification of meaningful changes in any significant water quality parameters potentially related to operation of the SWP or the CVP; and the identification of trends in ecological changes potentially related to SWP/CVP operations.

In 2001-2002, the DWR and USBR conducted a programmatic review of the EMP in accordance with D-1641 Condition 11 (e) and IEP guidelines. The intent of this review was to determine how the EMP could better meet current information needs for water resource management and protection. This review also reexamined program aims and the relationship of the EMP to other compliance and baseline aquatic monitoring activities in the San Francisco Bay/Sacramento-San Joaquin Delta Estuary (Bay-Delta). The programmatic review was conducted in two phases. The first phase consisted of an in-depth technical review of the EMP. The second phase consisted of a review by program managers and legal staff from various IEP agencies.

The technical review involved four subject area teams (SAT) consisting of invited technical experts, the IEP Science Advisory Group (SAG), stakeholder representatives and other interested parties participating in public review meetings, and a core team of EMP scientists. Review highlights and participants are listed in Appendix B. The four-tiered technical review was designed to assure broad-based and scientifically sound recommendations. All recommendations for EMP monitoring and special studies met three criteria: 1) continued fulfillment of the program's legal mandate, 2) continuity of long-term data sets, and 3) implementability of proposed monitoring and special studies within a fixed program budget. The management and legal review further assured that the recommendations were consistent with these criteria. The programmatic review resulted in a final "Review and Recommendations" report² and identified several changes to D-1641 necessary to implement some of the report's recommendations.

² Interagency Ecological Program Environmental Monitoring Program Review And Recommendations, Final Report, March 25, 2003, s. Appendix C.

The review identified the need for more refined program objectives, more informative monitoring products, and for better characterization of the high temporal and spatial variability in system components monitored by the EMP to distinguish between the effects of project operations and other factors. Following the review recommendations for more informative monitoring products, DWR/USBR are working toward conducting and reporting more in-depth data analyses, developing routine web-based analysis and reporting tools, and replacing the annual data report to the SWRCB with an annual status and trends report. This report will summarize the results of data analyses, identify future study plans, and refer to data and information stored by the EMP on a dedicated server managed by EMP staff and available via the Internet through the IEP and EMP web sites. The new reporting format would be consistent with the intent of D-1641 Condition 11 (c). It is our understanding that this new reporting format would thus not require concurrence of the Executive Director of the State Water Resources Control Board for changes to D-1641. We are also examining and updating our sample analysis procedures to assure the highest data quality and intend to complement the annual status and trends report with technical reports, research articles, and articles published in the IEP newsletter as opportunities allow.

Implementation of many of the review recommendations for better characterization of the temporal and spatial variability in the system will be contingent upon the concurrence of the Board's Executive Director to modify Table 5 and Figure 4 of D-1641. The proposed changes to Table 5 are explained in detail in Appendix A. They consist of (1) establishment of a new multiparameter station and reestablishment of three historical baseline stations, (2) addition of 14 new, reinstallation of 14 previously discontinued, and integration of three existing (but not currently required by D-1641) individual monitoring elements, (3) more accurate description and consolidation of several nearby discrete and continuous stations, (4) change of discrete monitoring frequency from monthly to near-monthly according to the tides, and (5) a temporary (2003-2004) reduction in benthos monitoring frequency to conduct benthos studies. These modifications to Table 5 would allow implementation of a revised monitoring program based on current conceptual models of the relationships among physical, chemical, and biological processes of the

Bay-Delta and designed to meet specific program objectives identified during the review (see Appendix C for details).

The proposed design would increase monitoring element consistency among stations and would increase the use of continuous monitoring. Ultimately, this would enable DWR and USBR to better distinguish between the effects of project operations and other factors (e.g., establishment of introduced species or large-scale restoration projects). Where flow data are available, we would also be able to calculate and report constituent fluxes across regions of the Bay-Delta. We would use data from 14 existing continuous recorder and continuous multiparameter stations (C2, C3, C9, C7, C14, D6, D10, D12, D22, D24, D28A, D29, P8, and S42 in the current Table 5). In addition, we would establish a new continuous multiparameter station on the San Joaquin River near Vernalis (C10A, see below) and four new continuous recorder stations for electrical conductivity (EC) and water temperature over the next three years. Three of the new continuous recorder stations would be established at former shallow-water baseline monitoring stations discontinued in 1995 (D9, D11, and D19) and the fourth would be established at an existing discrete baseline monitoring station (D7). Continuous monitoring at these four sites is needed to better understand baseline conditions and processes in ecologically important shallow-water habitats. We intend to offset the cost of the additional monitoring through greater monitoring efficiency resulting from consolidating nearby continuous and discrete water quality stations.

To more clearly identify the locations of monitoring stations listed in D-1641, Table 5, we propose to modify station identification numbers and descriptions as explained below. We also propose the addition of a Table 6 to provide the geographical coordinates of each station and a modified Figure 4 to reflect station locations based on these coordinates. Upon request, we would provide this information to the Board and all other interested parties in a "shapefile" (.shp) spatial data format appropriate for Geographic Information System (GIS) applications. This information will facilitate integrative data analyses and station consolidations.

In the current D-1641, Table 5, discrete and continuous monitoring at 11 stations is carried out at nearby rather than identical locations (C3, C7, C9, D6, D10, D12, D22, D24, D28A, P8, and S42). In the proposed Tables 5 and 6, we would list these sites as separate stations within "station pairs." We would add "A" or "B" to the station identification number of one of the two stations in each station pair (generally to the more recently established station). Benthos monitoring has historically been conducted along cross-channel transects with stations identified by the addition of "-L" (for locations near the left channel bank) or "-R" (for right channel bank). We would use these historical station identifiers for two baseline stations where only benthos monitoring is conducted (D24-L, C9-R). The separated stations would be identified as compliance, baseline, or compliance and baseline monitoring stations depending on the type of monitoring performed. The modification of station designations would not affect compliance monitoring, but would clarify station identity.

Over the next three years, we would conduct studies at ten continuous-discrete station pairs to determine if their data are sufficiently comparable to allow consolidation of discrete and continuous monitoring stations. This would improve monitoring efficiency and information products. Final recommendations for these station consolidations would be included in the next triennial program review in 2005. At this time, we would consolidate two station pairs, C3/C3A and C10/C10A. Available data from the continuous baseline monitoring stations on the Sacramento River at Greens Landing (C3) and Hood (C3A), located two miles apart from each other, shows that data comparability between these two locations is sufficient³ to allow consolidation without compromising the long-term continuity of discrete data collected from C3. We would move discrete sampling from C3 to C3A and conduct comprehensive side-by-side sampling for one year to document discrete and continuous data comparability for all measured variables. The new continuous baseline monitoring station on the San Joaquin River near Vernalis (C10A) will be located immediately (0.2 miles) downstream of discrete baseline monitoring at the current station C10. Due to the very short distance between C10 and C10A, water quality is not expected to be different between these two locations. We

³ See EMP Water Quality Subject Area Team review reports for details. These reports are available upon request and over the Internet at <http://iep.water.ca.gov/emp/SAT%20reports.html>.

would thus conduct side-by-side baseline monitoring for a year followed by the consolidation of all baseline monitoring at the new baseline monitoring station C10A. Compliance "continuous recorder" monitoring at C10 would be continued at its current location.

We would also conduct discrete baseline sampling on a near-monthly instead of monthly schedule, alternating between spring and neap tides to reduce tidal biases. The exception would be the baseline benthos sampling, which would be reduced from monthly to quarterly during 2003 and 2004 to allow reallocation of staff and equipment to in-depth studies necessary to redesign this program element, as recommended during the technical review of the EMP. More frequent benthos sampling would resume in 2005. In agreement with all other discrete sampling, this sampling would also be conducted on a near-monthly schedule. Final recommendations about benthos monitoring would be included in the next triennial program review in 2005.

The details of the 2001-2002 programmatic review and the resulting recommendations and implementation plan are described in the attached Appendix C, "Interagency Ecological Program Environmental Monitoring Program Review And Recommendations, Final Report, March 25, 2003" and additional background and review documents. Please contact Anke Mueller-Solger at the address below to request any of the documents prepared during the 2001-2002 EMP review, or visit <http://iep.water.ca.gov/emp/>.

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II. Request for Approval of Modifications to D-1641, Table 5 and Figure 4, and the Addition of a Table 6

Please accept the following Table 5 and Figure 4 as replacements for those in D-1641, and add Table 6 to D-1641. Four working tables in Appendix A specify and explain the proposed modifications to D-1641, Table 5 and Figure 4. Additional information can be found in Appendix C (IEP-EMP 2001-2002 Review and Recommendations, Final Report" (CA DWR, March 2003)) and requested from

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A. Proposed revised Table 5 (D-1641, p.192 - 193)

Table 5. Water Quality Compliance and Baseline Monitoring

Station ID ¹	Station Type ²	Station Description ³	Cont. Rec. ⁴	Cont. Multi-parameter ⁵	Discrete Physical/Chemical ⁶	Discr. Phytoplankton ⁷	Discr. Zooplankton ⁸	Discrete Benthos ⁹
C2	C	Sacramento River @ Collinsville	*					
C3A	B	Sacramento River @ Hood		*	*	*	*	
C4	C	San Joaquin River @ San Andreas Landing	*					
C5	C	Contra Costa Canal @ Pumping Plant #1	*					
C6	C	San Joaquin River @ Brandt Bridge site	*					
C7A	B	San Joaquin River @ Mossdale Bridge		*				
C8	C	Middle River near Old River	*					
C9	C&B	Clifton Court Forebay @ Radial Gates		*	*	*	*	
C9-R	B	West Canal @ Mouth of CC Forebay Intake						*
C10	C	San Joaquin River near Vernalis	*					
C10A	C&B	San Joaquin River near Vernalis @ San Joaquin River Club		*	*	*	*	
C13	C	Mokelumne River @ Terminous	*					
C14	C	Sacramento River @ Port Chicago	*					
C19	C	Cache Slough @ City of Vallejo Intake	*					
D4	B	Sacramento River above Point Sacramento			*	*	*	*
D6	B	Suisun Bay @ Bull's Head Pt. near Martinez			*	*	*	*
D6A	B	Suisun Bay @ Martinez		*				
D7	B	Grizzly Bay @ Dolphin nr. Suisun Slough	*		*	*	*	*
D8	B	Suisun Bay off Middle Point nr. Nichols			*	*	*	
D9	B	Honker Bay near Wheeler Point	*		*	*		
D10	B	Sacramento River @ Chipps Island					*	
D10A	C&B	Sacramento River @ Mallard Island		*	*			
D11	B	Sherman Lake near Antioch	*		*	*		
D12	B	San Joaquin River @ Antioch Ship Channel					*	
D12A	C&B	San Joaquin River @ Antioch Water Works		*	*			
D15	C	San Joaquin River @ Jersey Point	*					
D16	B	San Joaquin River @ Twitchell Island					*	*
D19	B	Franks Tract near Russo's Landing	*		*	*	*	
D22A	C	Sacramento River NW of Emmaton	*					
D22	B	Sacramento River @ Emmaton					*	
D24A	C&B	Sacramento River below Rio Vista Bridge		*	*			
D24-L	B	Sacramento River at Rio Vista Bridge, left bank						*
D26	B	San Joaquin River @ Potato Point			*	*	*	
D28A	B	Old River near Rancho Del Rio			*	*	*	*
D28B	B	Old River @ Bacon Island	*					
D29	C&B	San Joaquin River @ Prisoners Point	*		*	*	*	
D41	B	San Pablo Bay near Pinole Point			*	*	*	*
D41A	B	San Pablo Bay near Mouth of Petaluma River			*	*	*	*
DMC1	C	Delta-Mendota Canal @ Tracy Pump. Plt.		*				
P8	B	San Joaquin River @ Buckley Cove			*	*	*	*
P8A	B	San Joaquin River @ Rough and Ready Island		*				
P12	C	Old River @ Tracy Road Bridge	*					

(continued)

Proposed revised Table 5, continued

Table 5. Water Quality Compliance and Baseline Monitoring (continued)

Station ID ¹	Station Type ²	Station Description ³	Cont. Rec. ⁴	Cont. Multi-parameter ⁵	Discrete Physical/Chemical ⁶	Discr. Phytoplankton ⁷	Discr. Zooplankton ⁸	Discrete Benthos ⁹
MD10	B	Disappointment Slough near Bishop Cut			*	*	*	
S21	C	Chadbourne Slough @ Sunrise Duck Club	*					
S35	B	Goodyear Sl. @ Morrow Is. Clubhouse	*					
S42	C&B	Suisun Slough 300' south of Volanti Slough	*		*	*		
S42A	B	Suisun Slough 300' south of Volanti Slough, center channel					*	
S49	C	Montezuma Slough near Beldon Landing	*					
S64	C	Montezuma Slough @ National Steel	*					
S97	B	Cordelia Slough @ Ibis Club	*					
NZ032	B	Montezuma Slough, 2nd bend from mouth					*	
SLBAR3	C	Barker Slough @ North Bay Aqueduct	*					
---	C	Sacramento R. (I St. Bridge to Freeport) (RSAC155)	*					
---	B	San Joaquin R. (Turner Cut to Stockton) (RSAN050-RSAN061)	*					
---	B	Water supply intakes for waterfowl management areas on Van Sickle Island and Chipps Island	*					

¹ Most stations use historical "interagency" station identification (ID) numbers as given in SWRCB D-1641 (2000) and D-1485 (1978). Modified station ID numbers (e.g. C3A) identify stations near historical stations. For geographical coordinates see Table 6.

² C: Compliance monitoring station; B: Baseline monitoring station, C&B: Compliance and baseline monitoring station.

³ Most stations use historical "interagency" station descriptions as given in SWRCB D-1641 (2000) and D-1485 (1978). Stations with modified station ID numbers (e.g. D24A) also have modified names to indicate stations near historical stations with similar numbers and names.

⁴ Continuous recording (every 15 minutes) of water temperature, electrical conductivity (EC), and/or dissolved oxygen. For municipal and industrial intake chloride objectives, EC can be monitored and converted to chloride concentration.

⁵ Continuous multi-parameter monitoring (recording every 1 to 15 minutes with telemetry capabilities) includes the following variables: water temperature, EC, pH, dissolved oxygen, turbidity, chlorophyll fluorescence, tidal elevation, and meteorological data (air temperature, wind speed and direction, solar radiation).

⁶ Discrete physical/chemical monitoring is conducted near-monthly on alternating spring and neap tides and includes the following variables: macronutrients (inorganic forms of nitrogen, phosphorus, and silicon), total suspended solids, total dissolved solids, total, particulate and dissolved organic nitrogen and carbon, chlorophyll *a*, pH, dissolved oxygen (DO), EC (specific conductance), turbidity, secchi depth, and water temperature. In addition, on-board continuous recording is conducted intermittently for the following variables: water temperature, dissolved oxygen, electrical conductivity, turbidity, and chlorophyll *a* fluorescence.

⁷ Near-monthly discrete sampling on alternating spring and neap tides for phytoplankton enumeration or algal pigment analysis.

⁸ Near-monthly tow or pump sampling for zooplankton, mysids, and amphipods.

⁹ In 2003 and 2004, replicated benthos and sediment grab samples are taken quarterly (every three months) and during special studies; more frequent monitoring sampling resumes in 2005.

B. Proposed new Table 6

Table 6. Water Quality Compliance and Baseline Monitoring Station Locations

Station ID ¹	Station Type ¹	Station Description ¹	Latitude ²	Longitude ²
C2	C	Sacramento River @ Collinsville	38.07395	-121.85010
C3A	B	Sacramento River @ Hood	38.36772	-121.52051
C4	C	San Joaquin River @ San Andreas Landing	38.10319	-121.59128
C5	C	Contra Costa Canal @ Pumping Plant #1	37.99520	-121.70244
C6	C	San Joaquin River @ Brandt Bridge site	37.86454	-121.32270
C7A	B	San Joaquin River @ Mossdale Bridge	37.78604	-121.30666
C8	C	Middle River near Old River	37.82208	-121.37517
C9	C&B	Clifton Court Forebay @ Radial Gates	37.83075	-121.55703
C9-R	B	West Canal @ Mouth of CC Forebay Intake	37.82818	-121.55275
C10	C	San Joaquin River near Vernalis	37.67575	-121.26500
C10A	B	San Joaquin River near Vernalis @ San Joaquin River Club	37.67934	-121.26472
C13	C	Mokelumne River @ Terminous	38.11691	-121.49888
C14	C	Sacramento River @ Port Chicago	38.05881	-122.02607
C19	C	Cache Slough @ City of Vallejo Intake	38.29687	-121.74784
D4	B	Sacramento River above Point Sacramento	38.06214	-121.81792
D6	B	Suisun Bay @ Bulls Head Pt. near Martinez	38.04427	-122.11764
D6A	B	Sacramento River @ Martinez	38.02762	-122.14052
D7	B	Grizzly Bay @ Dolphin nr. Suisun Slough	38.11708	-122.03972
D8	B	Suisun Bay off Middle Point nr. Nichols	38.05992	-121.98996
D9	B	Honker Bay	38.07245	-121.93923
D10	B	Sacramento River @ Chipps Island	38.04631	-121.91829
D10A	C&B	Sacramento River @ Mallard Island	38.04288	-121.92011
D11	B	Sherman Lake near Antioch	38.04228	-121.79951
D12	B	San Joaquin River @ Antioch Ship Channel	38.02162	-121.80638
D12A	C&B	San Joaquin River @ Antioch	38.01770	-121.80273
D15	C	San Joaquin River @ Jersey Point	38.05190	-121.68927
D16	B	San Joaquin River @ Twitchell Island	38.09690	-121.66912
D19	B	Frank's Tract near Russo's landing	38.04376	-121.61477
D22A	C	Sacramento River NW of Emmaton	38.08406	-121.73912
D22	B	Sacramento River @ Emmaton	38.08453	-121.73914
D24A	C&B	Sacramento River below Rio Vista Bridge	38.15891	-121.68721
D24-L	B	Sacramento River @ Rio Vista, left bank	38.15550	-121.68113
D26	B	San Joaquin River @ Potato Point	38.07667	-121.56696
D28A	B	Old River near Rancho Del Rio	37.97038	-121.57271
D28B	B	Old River @ Bacon Island	37.96980	-121.57210
D29	C&B	San Joaquin River @ Prisoners Point	38.05793	-121.55736
D41	B	San Pablo Bay near Pinole Point	38.03016	-122.37287
D41A	B	San Pablo Bay near Mouth of Petaluma R.	38.08472	-122.39067
DMC1	C	Delta Mendota Canal @ Tracy Pump Plt.	37.78165	-121.59050
P8	B	San Joaquin River @ Buckley Cove	37.97815	-121.38242
P8A	B	San Joaquin River @ Rough and Ready Island	37.96277	-121.36587
P12	C	Old River @ Tracy Road Bridge	37.80493	-121.44929

(continued)

Proposed new Table 6, continued

Table 6. Water Quality Compliance and Baseline Monitoring Station Locations (continued)

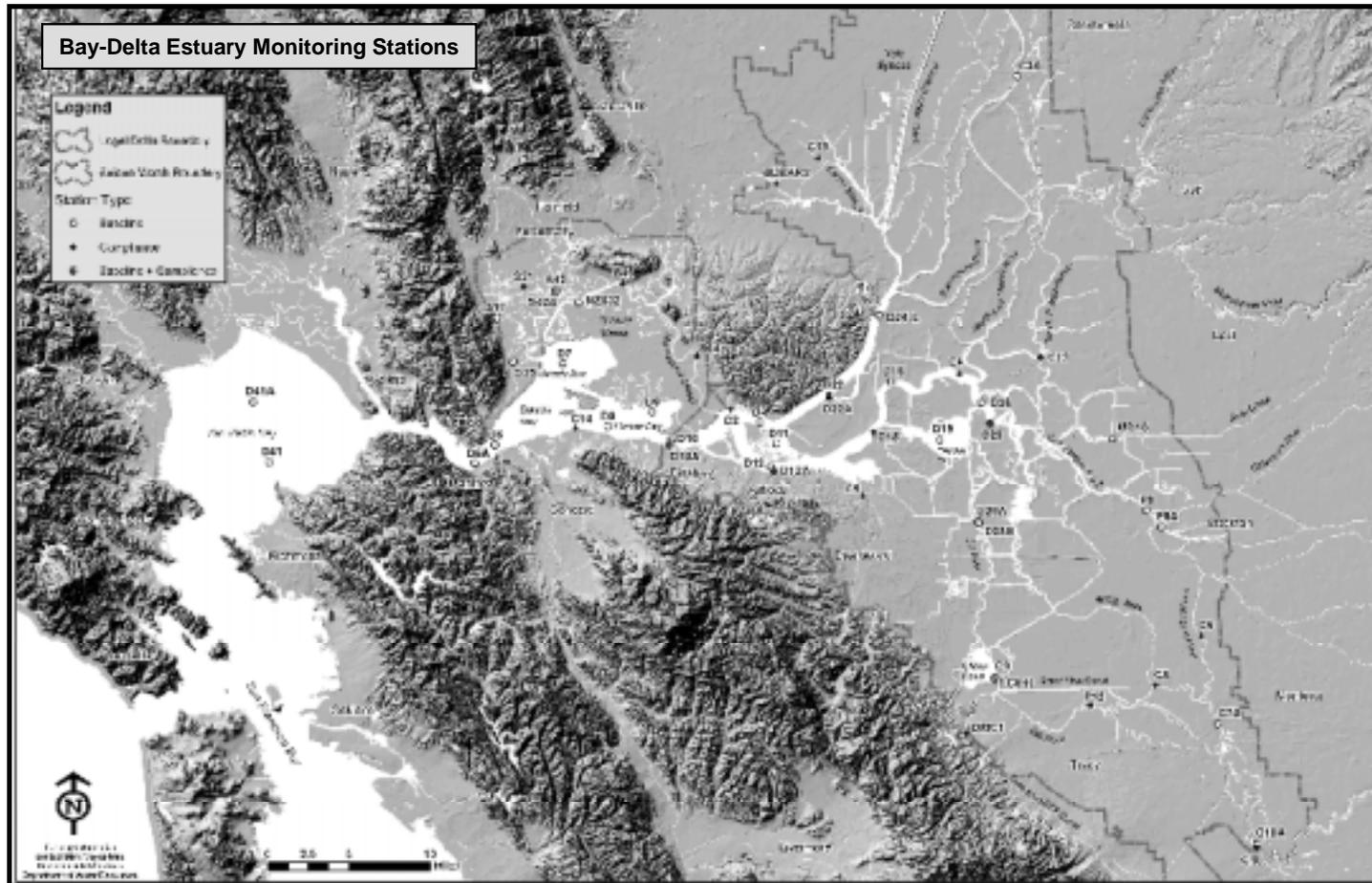
Station ID ¹	Station Type ¹	Station Description ¹	Latitude ²	Longitude ²
MD10	B	Disappointment Slough near Bishop Cut	38.04229	-121.41935
S21	C	Chadbourne Slough @ Sunrise Duck Club	38.18476	-122.08315
S35	B	Goodyear Slough @ Morrow Island Clubhouse	38.11881	-122.09580
S42	C&B	Suisun Slough 300' south of Volanti Slough	38.18053	-122.04696
S42A	B	Suisun Slough 300' south of Volanti Slough, center channel	38.18027	-122.04779
S49	C	Montezuma Slough near Beldon Landing	38.18686	-121.97080
S64	C	Montezuma Slough @ National Steel	38.12223	-121.88800
S97	B	Cordelia Slough @ Ibis Club	38.15703	-122.11378
NZ032	B	Montezuma Slough, 2nd bend from mouth	38.16990	-122.02112
SLBAR3	C	Barker Slough @ North Bay Aqueduct	38.27474	-121.79499
---	C	Sacramento R. (I St. Bridge to Freeport)		
---	B	San Joaquin R. (Turner Cut to Stockton)		
---	B	Water supply intakes for waterfowl management areas on Van Sickle Island and Chipps Island		

¹ See Table 5, Footnotes 1-3.

² Coordinates are geographic North American Datum 1983 and have been verified to be accurate for 1:24,000 scale mapping.

C. Proposed revised Figure 4 (D-1641, p.194)

Figure 4. Bay-Delta Estuary Monitoring Stations



Please note: This is a very low-resolution representation of the proposed Figure 4 prepared by EMP staff based on the geographical station coordinates in Table 6. A higher quality image is provided separately in JPEG and Adobe pdf formats.

Appendix A: Working Tables for the Request for Modifications to D-1641, Table 5, and the Addition of a Table 6

Working Table 1: Proposed modifications to D-1641, Table 5 (p. 192) with modification descriptions, justification, future goals, and revised footnotes.	2
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Working Table 1: Proposed modifications to D-1641, Table 5 (p. 192) with modification descriptions, justification, future goals, and revised footnotes.

Modified Table 5: (Symbols: *:no change; x: added, (-): moved to neighboring station)

Station ID ¹	Station Type ²	Station Description ³	Cont. Rec. ⁴ (CR)	Cont. Multi-parameter ⁵ (MP)	Discrete Physical/Chemical ⁶ (P/C)	Discr. Phytoplankton ⁷ (P)	Discr. Zooplankton ⁸ (Z)	Discrete Benthos ⁹ (B)
C2	C	Sacramento River @ Collinsville	*					
C3	B	Sacramento River @ Greens Landing			(-)	(-)		
C3A	B	Sacramento River @ Hood		*	*	*	X	
C4	C	San Joaquin River @ San Andreas Landing	*					
C5	C	Contra Costa Canal @ Pumping Plant #1	*					
C6	C	San Joaquin River @ Brandt Bridge site	*					

Explanations:

Modification description	Justification and outlook
No operational change, but analytical integration of this compliance station with baseline station D4. See also D 4. Obtain funding for multi-depth CR array by the end of the 2003-2005 review cycle	Better integration of existing continuous compliance and discrete baseline stations for improved monitoring products and efficiency. Multi-depth CR array for characterization of vertical temperature and salinity stratification at this deep station. This is important for understanding ecological and hydrodynamic transport processes and for meaningful numerical modeling.
See C3A.	See C3A.
Discrete P/C & P sampling moved from historical station C3 to the neighboring continuous MP station C3A at Hood. Data comparisons for several variables suggest close agreement between these two sites. However, to ensure data continuity for all variables, conduct side-by-side P/C & P sampling for one year, then discontinue discrete sampling at C3. New station ID and description to indicate different station location from historical station C3 (see proposed new Table 6 for coordinates). Reinstate historical C3 zooplankton sampling at C3A (pump).	Consolidation of existing discrete and continuous stations for improved monitoring products and efficiency. C3A is an important rim station for many monitoring programs. Important flux station (imports into the Delta from the Sacramento River watershed). C3A was established in 1998 near the historical station C3. Reinstated zooplankton sampling to monitor zooplankton entering the Delta from the north and for more comprehensive data analyses and interpretation. A separate special study may investigate cross-channel zooplankton variability to determine potential shore bias.
No operational change.	
No operational change.	
No operational change.	

(continued)

Appendix A: Working Tables

Working Table 1, continued

Station ID ¹	Station Type ²	Station Description ³	Cont. Rec. ⁴ (CR)	Cont. Multi-parameter ⁵ (MP)	Discrete Physical/Chemical ⁶ (P/C)	Discr. Phytoplankton ⁷ (P)	Discr. Zooplankton ⁸ (Z)	Discrete Benthos ⁹ (B)
C7A	B	San Joaquin River @ Mossdale Bridge		*				
C8	C	Middle River near Old River	*					
C9	C&B	Clifton Court Forebay @ Radial Gates		X	X	*	X	
C9-R	B	West Canal @ Mouth of CC Forebay Intake						*

Modification description	Justification and outlook
New station ID and description indicates different station location from historical station C7 (see proposed new Table 6 for coordinates). During the 2003-2005 review cycle, study data comparability with C10 and C10A (Vernalis) to assess if this station can be discontinued in favor of a new MP station at Vernalis (C10A).	C7A was established in 1984 near the historical van station C7. The proposed station ID has been used in annual data reports to the SWRCB and indicates a different location from the historical discrete baseline monitoring station C7. The multi-parameter station was established in 1984 near C7 and completely replaced discrete monitoring at C7 in 1995. Vernalis is more important to most data users as a "rim station" and has a longer, more comprehensive data record. The MP data record at Mossdale is limited and not extensively used. Mossdale equipment could be used at Vernalis. A recommendation about station discontinuation will be included in the next triennial program review due in 2005.
No operational change.	
Formally (re-) adopt continuous D-1485 compliance monitoring. Reinstatement of D-1485 discrete P/C sampling. Reinstatement of historical zooplankton (pump) monitoring. Separate station ID and description indicates different location from C9A, see proposed new Table 6 for coordinates.	CR monitoring was likely unintentionally excluded from C9 in D-1641, Table 5, since water quality objectives for Chloride and EC exist at the designated compliance and baseline station C9. Continuous multiparameter and phytoplankton monitoring is currently conducted by DWR O&M. Reinstatement of discrete P/C sampling for QA/QC of continuous measurements and to monitor exports of additional water quality variables. Reinstatement of zooplankton sampling to monitor exports through the water projects.
Analytical integration of existing, but not currently mandated, MP monitoring at C9 with D-1641 baseline benthos monitoring at C9-R, right channel bank. During the 2003-2005 review cycle, investigate if discrete benthos sampling at C9A can be moved to C9 without compromising long-term data continuity.	Better integration and potential consolidation of existing continuous and discrete baseline stations for improved monitoring products and efficiency. A recommendation about station consolidation will be included in the next triennial program review due in 2005. Important station near export pumps, flux station (exports).

(continued)

Working Table 1, continued

Station ID ¹	Station Type ²	Station Description ³	Cont. Rec. ⁴ (CR)	Cont. Multi-parameter ⁵ (MP)	Discrete Physical/Chemical ⁶ (P/C)	Discr. Phytoplankton ⁷ (P)	Discr. Zooplankton ⁸ (Z)	Discrete Benthos ⁹ (B)	Modification description	Justification and outlook
C10	C	San Joaquin River near Vernalis	X						Formally reinstate D-1485 CR compliance monitoring currently conducted by the USBR.	CR monitoring was likely unintentionally excluded from C10 in D-1641, Table 5, since water quality objectives for EC exist at the designated "compliance and baseline" station C10 and the USBR (CV Operations) has an active CR station at this site.
C10A	B	San Joaquin River near Vernalis @ San Joaquin River Club		X	*	*	X		After side-by-side P/C & P sampling for at least one year, discontinue discrete baseline sampling at historical station C10 and move it to the new Vernalis MP station C10A, slightly north of current C10 (see proposed new Table 6 for coordinates). Separate station ID and description indicates different location from C10. Add zooplankton sampling (pump).	C10 is a "rim station" with a long, comprehensive, highly utilized data record and an important flux station (imports) with high productivity. The new MP station at C10A is supported by CALFED and will be used and operated by multiple agency groups. It provides a much safer work environment than the increasingly unsafe historical bridge location. It will be the southern counterpart of the Hood station (C3A) on the Sacramento River. Added zooplankton sampling to monitor zooplankton entering the Delta from the south and for more comprehensive data analyses and interpretation. A separate special study may investigate cross-channel zooplankton variability to determine potential shore bias.
C13	C	Mokelumne River @ Terminus	*						No operational change.	
C14	C	Sacramento River @ Port Chicago	*						No operational change. Analytical integration of continuous data from this compliance station with discrete data from baseline station D8. See D8 for details. Obtain funding for multi-depth CR array by the end of the 2003-2005 review cycle.	Better integration and potential consolidation of existing continuous compliance and discrete baseline stations for improved monitoring products and efficiency. Multi-depth CR array to characterize vertical temperature and salinity stratification at this deep "gravitational circulation cell" station. This is important for understanding ecological and hydrodynamic transport processes and for meaningful numerical modeling.

(continued)

Appendix A: Working Tables

Working Table 1, continued

Station ID ¹	Station Type ²	Station Description ³	Cont. Rec. ⁴ (CR)	Cont. Multi-parameter ⁵ (MP)	Discrete Physical/Chemical ⁶ (P/C)	Discr. Phytoplankton ⁷ (P)	Discr. Zooplankton ⁸ (Z)	Discrete Benthos ⁹ (B)	Modification description	Justification and outlook
C19	C	Cache Slough @ City of Vallejo Intake	*						No operational change.	
D4	B	Sacramento River above Point Sacramento			*	*	*	*	Analytical integration of discrete data from this baseline station with continuous data from compliance station C2. See also C2. During the 2003-2005 review cycle, investigate if discrete sampling at D4 can be moved to C2 without compromising long-term data continuity.	Better integration and potential consolidation of existing continuous compliance station C2 and discrete baseline station D4 at the C2 location for greater monitoring utility and efficiency. A recommendation about station consolidation will be included in the next triennial program review report due in 2005.
D6	B	Suisun Bay @ Bull's Head Pt. near Martinez		(-)	*	*	*	*	Separation of continuous MP monitoring from discrete monitoring at D6 to indicate different station locations, see D6A. Analytical integration of discrete data from this baseline station with continuous data from the neighboring, shore-based MP station D6A. Investigate consolidation with MP station D6A and best location for consolidated station for consideration during the next triennial review. See also D6A.	Better integration and potential consolidation of existing continuous and discrete baseline stations for improved monitoring products and efficiency. Important flux station (exports to San Francisco Bay). A recommendation about station consolidation will be included in the next triennial program review report due in 2005.
D6A	B	Suisun Bay @ Martinez		*					Separate new station ID and description indicates different location from D6, see proposed new Table 6 for coordinates. During the 2003-2005 review cycle, investigate if this continuous baseline monitoring station should be moved to a center channel location through side-by-side sampling and data comparisons. In addition, obtain funding for and test a multi-depth CR array by the end of the 2003-2005 review cycle.	Potential move to new center channel location to avoid shore bias and permit more representative sampling and better integration with USGS and NOAA continuous monitoring of salinity, suspended solids, and flow on Pier 7 of the Benicia Bridge north of the main ship channel. A recommendation about this potential location change and the routine operation of a multi-depth CR will be included in the next triennial program review report due in 2005. Important flux and sill station (exports to Bay) in the western estuary. Multi-depth CR array to characterize vertical temperature and salinity stratification. This is important for understanding ecological and hydrodynamic transport processes and for meaningful numerical modeling, including SWP & CVP operations forecasts.

(continued)

Appendix A: Working Tables

Working Table 1, continued

Station ID ¹	Station Type ²	Station Description ³	Cont. Rec. ⁴ (CR)	Cont. Multi-parameter ⁵ (MP)	Discrete Physical/Chemical ⁶ (P/C)	Discr. Phytoplankton ⁷ (P)	Discr. Zooplankton ⁸ (Z)	Discrete Benthos ⁹ (B)	Modification description	Justification and outlook
D7	B	Grizzly Bay @ Dolphin near Suisun Slough	X		*	*	*	*	New: moored continuous recorder for EC & Temperature	Long-term benthos station, ambient station representing shallow, open estuarine embayment habitat. Important site for monitoring of the invasive clam <i>Potamocorbula</i>
D8	B	Suisun Bay off Middle Point near Nichols			*	*	*		Analytical integration of discrete data from this baseline station with continuous data from compliance station C14. See also C14. During the 2003-2005 review cycle, investigate if discrete P/C & P sampling at D8 can be moved to C14 and zooplankton sampling to a channel site close to C14 without compromising long-term data continuity.	Better integration and potential consolidation of existing continuous compliance and discrete baseline stations for improved monitoring products and efficiency. A recommendation about station consolidation will be included in the next triennial program review report due in 2005. A separate special study may investigate cross-channel water quality and zooplankton variability to assist interpretation of integrated data analysis results.
D9	B	Honker Bay near Wheeler Point	X		X	X			Reinstated D-1485 P/C and P monitoring. New: continuous recorder for EC & Temperature.	Ambient station representing ecologically important shallow estuarine embayment habitat
D10	B	Sacramento River @ Chipps Island		(-)			*		Separation of continuous MP monitoring from discrete monitoring at D10 to indicate different station locations, see D10A for details. Improved analytical integration of discrete zooplankton data from this baseline station with continuous data from shore-based MP station D10A.	Better integration of existing continuous and discrete baseline stations for improved monitoring products and efficiency. A separate special study may investigate cross-channel water quality and zooplankton variability to assist interpretation of integrated data analysis results.
D10A	C&B	Sacramento River @ Mallard Island		*	X				Separate new station ID and description indicates different location from D10, see proposed new Table 6 for coordinates. Reinstatement of discrete D-1485 P/C sampling conducted during sensor maintenance. Obtain funding for multi-depth CR array by the end of the 2003-2005 review cycle.	Reinstatement of discrete P/C sampling for QA/QC of continuous measurements. Multi-depth CR array to characterize vertical temperature and salinity stratification. This is important for understanding ecological and hydrodynamic transport processes and for meaningful numerical modeling.

(continued)

Appendix A: Working Tables

Working Table 1, continued

Station ID ¹	Station Type ²	Station Description ³	Cont. Rec. ⁴ (CR)	Cont. Multi-parameter ⁵ (MP)	Discrete Physical/Chemical ⁶ (P/C)	Discr. Phytoplankton ⁷ (P)	Discr. Zooplankton ⁸ (Z)	Discrete Benthos ⁹ (B)	Modification description	Justification and outlook
D11	B	Sherman Lake near Antioch	X		X	X			Reinstated D-1485 P/C monitoring. New: phytoplankton monitoring and continuous recorder for EC & Temperature.	Ambient monitoring in flooded island (shallow lake) habitat. Of proposed flooded island sites, D11 is the "leakiest" and closest to the confluence / estuarine transition zone.
D12	B	San Joaquin River @ Antioch Ship Channel		(-)			*		Separation of continuous MP monitoring from discrete monitoring at D12 to indicate different station locations, see D12A for details. Improved analytical integration of discrete zooplankton data from this baseline station with continuous data from shore-based MP station D12A-1983.	Better integration of existing continuous and discrete baseline stations for improved monitoring products and efficiency. A separate special study may investigate cross-channel water quality and zooplankton variability to assist interpretation of integrated data analysis results.
D12A	C&B	San Joaquin River @ Antioch Water Works		*	X				Separate new station ID and description indicates different location from D12, see proposed new Table 6 for coordinates. This station was listed as D12* in D-1485. Reinstatement of D-1485 station description and P/C sampling. P/C sampling will be conducted during sensor maintenance. Obtain funding for multi-depth CR array by the end of the 2003-2005 review cycle.	Reinstatement of discrete P/C sampling for QA/QC of continuous measurements. Multi-depth CR array to characterize vertical temperature and salinity stratification. This is important for understanding ecological and hydrodynamic transport processes and for meaningful numerical modeling.
D15	C	San Joaquin River @ Jersey Point	*						No operational change. New: analytical integration of data from this USBR-operated station into comprehensive EMP data analyses.	D-1641 compliance station for EC operated by USBR O&M. USGS measures flow here. Important for cross-Delta mass flux calculations. EMP will acquire data from USBR and USGS for flux analyses.
D16	B	San Joaquin River @ Twitchell Island					*	*	No operational change. New: analytical association of D16 discrete monitoring data with continuous and discrete monitoring data from stations D29 and D15.	Long-term zooplankton "index" station. Improved analytical integration of data from existing continuous and discrete monitoring stations for improved monitoring products. A separate special study may investigate water quality and zooplankton variability between stations near D16 to assist interpretation of integrated data analysis results.

(continued)

Working Table 1, continued

Station ID ¹	Station Type ²	Station Description ³	Cont. Rec. ⁴ (CR)	Cont. Multi-parameter ⁵ (MP)	Discrete Physical/Chemical ⁶ (P/C)	Discr. Phytoplankton ⁷ (P)	Discr. Zooplankton ⁸ (Z)	Discrete Benthos ⁹ (B)	Modification description	Justification and outlook
D19	B	Franks Tract near Russo's Landing	X		X	X	X		Reinstated D-1485 P/C and Z monitoring station. Reinstated historical (1975-1979, 1988-1995) P monitoring. New: CR monitoring.	Ambient monitoring in flooded island (shallow lake) habitat. "Leaky," shallow lake in the Western Delta with high SAV and <i>Corbicula</i> densities and low algal biomass.
D22A	C	Sacramento River NW of Emmaton	X						No operational change, but formally reinstate D-1485 CR compliance monitoring at existing shore station operated by DWR O&M (EC1120).	CR monitoring at D22A was likely unintentionally excluded from D-1641, Table 5, since water quality objectives for EC exist at the designated compliance and baseline station D22.
D22	B	Sacramento River @ Emmaton					*		Separate new station ID and description indicates (very slightly!) different location from D22A, see proposed new Table 6 for coordinates. Improved analytical association of D22 discrete zooplankton monitoring data with continuous and discrete monitoring data from continuous shore station D22A and D24. See also D22A and D24.	Long-term zooplankton "index" station. Improved analytical integration of data from existing continuous and discrete monitoring stations for improved monitoring products. As separate special study, investigate cross-channel zooplankton variability between D22A and D22 to assist interpretation of integrated data analysis results. Also investigate if D22 zooplankton monitoring can be replaced by reinstated D24 zooplankton monitoring without compromising long-term data continuity.
D24A	C&B	Sacramento River below Rio Vista Bridge		*	X				New: discrete P/C sampling. New station ID to distinguish continuous MP monitoring from discrete monitoring at historical D24.	Discrete P/C sampling for QA/QC of continuous measurements, to improve benthos data interpretations and to provide additional relevant data. Important flux and compliance station.
D24-L	B	Sacramento River below Rio Vista Bridge, left bank						*	Separate new station ID and description indicates different location from D24A, see proposed new Table 6 for coordinates. Improved analytical integration of benthos baseline monitoring data from discrete channel station D24 with data from near-by, shore-based MP station.	Benthos station on left channel bank. Better integration of existing continuous and discrete baseline stations for improved monitoring products. A separate special study may investigate cross-channel water quality and benthos variability to assist interpretation of integrated data analysis results. Investigate moving D22 zooplankton monitoring to this station.

(continued)

Working Table 1, continued

Station ID ¹	Station Type ²	Station Description ³	Cont. Rec. ⁴ (CR)	Cont. Multi-parameter ⁵ (MP)	Discrete Physical/Chemical ⁶ (P/C)	Discr. Phytoplankton ⁷ (P)	Discr. Zooplankton ⁸ (Z)	Discrete Benthos ⁹ (B)	Modification description	Justification and outlook
D26	B	San Joaquin River @ Potato Point			*	*	*		No operational change. New: analytical association of D26 discrete monitoring data with continuous and discrete monitoring data from stations D16 and D29. During the 2003-2005 review cycle, investigate if sampling at D26 can be moved to D29 without compromising long-term data continuity. See also D29.	Long-term zooplankton "index" station. Better integration and potential consolidation of existing discrete baseline and continuous compliance stations for improved monitoring products and efficiency. A recommendation about station consolidation will be included in the next triennial program review report due in 2005.
D28A	B	Old River near Rancho Del Rio	(-)		*	*	*	*	Separation of CR baseline monitoring from discrete monitoring at D28A to indicate different station locations, see D28B for details. New: analytical integration of discrete data from channel station D28A with data from near-by, shore-based continuous station D28B (=EC5250) operated by DWR (Central District). During the 2003-2005 review cycle, investigate if D28A and D28B monitoring can be consolidated at D28B location without compromising long-term data continuity.	Flux station, long-term benthos station. Better integration and potential consolidation of existing continuous and discrete baseline stations for improved monitoring products and efficiency. A recommendation about the consolidation of these stations will be included in the next triennial program review report due in 2005.
D28B	B	Old River at Bacon Island	*						New station ID and description for the shore-based continuous station near D28A operated by DWR, Central District (EC5250). In collaboration with DWR-CD, attempt to obtain funding for station expansion to include MP monitoring by the end of the 2003-2005 cycle.	Formally propose continuous MP monitoring at this station for adoption into the water right decision in the next triennial program review report due in 2005.

(continued)

Appendix A: Working Tables

Working Table 1, continued

Station ID ¹	Station Type ²	Station Description ³	Cont. Rec. ⁴ (CR)	Cont. Multi-parameter ⁵ (MP)	Discrete Physical/Chemical ⁶ (P/C)	Discr. Phytoplankton ⁷ (P)	Discr. Zooplankton ⁸ (Z)	Discrete Benthos ⁹ (B)	Modification description	Justification and outlook
D29	C&B	San Joaquin River @ Prisoners Point	*		X	X	X		Seasonal CR monitoring station expanded to year-around operation with new discrete sampling of P/C, P, and Z. Attempt to obtain funding for station expansion to include MP monitoring by the end of the 2003-2005 review cycle.	Important flux station, northern endpoint for Stockton Ship Channel D.O. monitoring. Analytical association of D29 continuous data with discrete data collected at D26 and D16. Discrete sampling at D29 may eventually replace discrete sampling at D26 (and possibly D16), see D26.
D41	B	San Pablo Bay near Pinole Point			*	*	X	*	No operational change, but formal addition of ongoing Z monitoring.	Though not required in D-1641, zooplankton has been monitored here since 1998. This site is not suitable for continuous monitoring. Hydrodynamically important sill station in the western estuary.
D41A	B	San Pablo Bay near Mouth of Petaluma River			X	X	X	*	Expand to include discrete sampling of PC, P, and Z. Analytical integration of discrete data from D41 A with continuous data from near-by USGS-operated CR station at Channel Marker 9 (turbidity, EC, temperature). Investigate data comparability between these sites to assist interpretation of integrated data analysis results.	Long-term benthos station. Ambient station representing shoal habitat with fluctuating salinity levels. Important site for monitoring of the invasive clam <i>Potamocorbula</i> . Better integration of existing continuous and discrete baseline stations for improved monitoring products. Include recommendation about formal adoption of the USGS CR station at channel marker 9 for adoption into the water right decision in the next triennial program review report due in 2005.
DMC1	C	Delta-Mendota Canal @ Tracy Pump. Plt.		*					No operational change.	
P8	B	San Joaquin River @ Buckley Cove		(-)	*	*	*	*	Separation of continuous MP monitoring from discrete monitoring at P8 to indicate different station locations, see P8A for details. Improved analytical integration of discrete baseline monitoring data from discrete channel station P8 with data from near-by, shore-based MP station. During the 2003-2005 review cycle, investigate if discrete sampling at P8 can be moved to P8A without compromising long-term data continuity.	Station integration and potential consolidation improves monitoring products and efficiency. A recommendation about the consolidation of stations P8 and P8A will be included in the next triennial program review report due in 2005. See also P8A .

(continued)

Appendix A: Working Tables

Working Table 1, continued

Station ID ¹	Station Type ²	Station Description ³	Cont. Rec. ⁴ (CR)	Cont. Multi-parameter ⁵ (MP)	Discrete Physical/Chemical ⁶ (P/C)	Discr. Phytoplankton ⁷ (P)	Discr. Zooplankton ⁸ (Z)	Discrete Benthos ⁹ (B)	Modification description	Justification and outlook
P8A	B	San Joaquin River @ Rough and Ready Island		*					No operational change. Separate new station ID and description indicates different location from P8, see proposed new Table 6 for coordinates.	Important San Joaquin River station near southern endpoint for Stockton Ship Channel D.O. monitoring. Frequently occurring D.O. sags, high productivity. Data extensively used by CVRWQCB.
P12	C	Old River @ Tracy Road Bridge	*						No operational change.	
MD10	B	Disappointment Slough near Bishop Cut			*	*	*		No operational change. Attempt to obtain funding for station expansion to include CR monitoring by the end of the 2003-2005 review cycle.	Ambient station, the only eastern Delta representative, smaller "backwater" tidal river channel
S21	C	Chadbourne Slough @ Sunrise Duck Club	*						No operational change.	
S35	B	Goodyear Sl. @ Morrow Island Clubhouse	*						No operational change.	
S42	C&B	Suisun Slough 300' south of Volanti Slough	*		X	X			New: discrete P/C & P sampling.	Discrete P/C and P sampling for QA/QC of continuous measurements, to improve interpretation zooplankton data collected at S42A, and to provide additional relevant data. Ecologically important tidal marsh slough habitat with long-term monitoring history. Planned in vicinity: NERR site.
S42A	B	Suisun Slough 300' south of Volanti Slough, center channel					*		Separate new station ID and description indicates different location from S42, see proposed new Table 6 for coordinates. Improved analytical integration of zooplankton baseline monitoring data from discrete channel station S42A with data from near-by, shore-based CR station S42.	Long-term zooplankton station. Improved analytical integration of data from existing continuous and discrete monitoring stations for improved monitoring products. A separate special study may investigate water quality and zooplankton variability between S42 and S42A to assist interpretation of integrated data analysis results.
S49	C	Montezuma Slough near Beldon Landing	*						No operational change.	
S64	C	Montezuma Slough @ National Steel	*						No operational change.	
S97	B	Cordelia Slough @ Ibis Club	*						No operational change.	

(continued)

Working Table 1, continued

Station ID ¹	Station Type ²	Station Description ³	Cont. Rec. ⁴ (CR)	Cont. Multi-parameter ⁵ (MP)	Discrete Physical/Chemical ⁶ (P/C)	Discr. Phytoplankton ⁷ (P)	Discr. Zooplankton ⁸ (Z)	Discrete Benthos ⁹ (B)	Modification description	Justification and outlook
NZ032	B	Montezuma Slough, 2 nd bend from mouth					*		No operational change. New: Improved analytical association of zooplankton data with data from continuous recorder stations S49 and S54 operated by DWR -Suisun Marsh program	Improved analytical integration of data from existing continuous and discrete monitoring stations for improved monitoring products. As separate special study, investigate zooplankton variability at and between the three Montezuma Slough sites to assist interpretation of integrated data analysis results and evaluate station consolidation potential. Ecologically important tidal marsh slough habitat.
SLBAR3	C	Barker Sl. at No. Bay Aqueduct	*						No operational change.	
---	C	Sacramento R. (I St. Bridge to Freeport) (RSAC155)	*						No operational change.	
---	B	San Joaquin R. (Turner Cut to Stockton) (RSAN050-RSAN061)	*						No operational change.	
---	B	Water supply intakes for waterfowl management areas on Van Sickle Island and Chipps Island	*						No operational change.	

Symbols:
 *: no change
 X: added
 (-): moved to neighboring station

Acronyms:
 ID: Station Identification (instead of "station number")
 CR: Continuous Recorder monitoring, s. footnote 4
 MP: Continuous Multi-Parameter monitoring, s. footnote 5
 P/C: Discrete physical/chemical monitoring, s. footnote 6
 P: Phytoplankton monitoring, s. footnote 7
 Z: Zooplankton monitoring, s. footnote 8
 B: Benthos monitoring, s. footnote 9
 DWR-CD: Monitoring by DWR-Central District
 DWR-O&M: Monitoring by DWR-Division of Operations and Maintenance
 DWR-SMP: Monitoring by DWR-Suisun Marsh Program
 DWR-MWQI: Monitoring by DWR-Municipal Water Quality Investigations Program
 USBR-CVO: Monitoring by US Bureau of Reclamation-Central Valley Operations
 USGS: Monitoring by US Geological Survey
 NERR: National Estuarine Research Reserve

Proposed revised footnotes for revised D-1641, Table 5:

Changes from D-1641, Table 5:

- Individual footnotes added for each table column.
- New column 2 to clarify symbols in D-1641 (2000), Table 5.
- All other changes: Updates and clarifications.

All footnote text modifications indicated by **bold print!**

- 1 **Most stations use historical "interagency" station identification (ID) numbers as given in SWRCB D-1641 (2000) and D-1485 (1978). Modified station ID numbers (e.g. C3A) identify stations near historical stations. For geographical coordinates see Table 6.**
- 2 **C: Compliance monitoring station; B: Baseline monitoring station , C&B: Compliance and baseline monitoring station.**
- 3 **Most stations use historical "interagency" station descriptions as given in SWRCB D-1641 (2000) and D-1485 (1978). Stations with modified station ID numbers (e.g. D24A) also have modified names to indicate stations near historical stations with similar numbers and names.**
- 4 **Continuous recording (every 15 minutes) of water temperature, EC, and/or dissolved oxygen. For municipal and industrial intake chloride objectives, electrical conductivity (EC) can be monitored and converted to chloride concentrations.**
- 5 **Continuous multi-parameter monitoring (recording every 1 to 15 minutes with telemetry capabilities) includes the following variables: water temperature, EC, pH, dissolved oxygen, turbidity, chlorophyll fluorescence, tidal elevation, and meteorological data (air temperature, wind speed and direction, solar radiation).**
- 6 **Discrete physical/chemical monitoring is conducted near-monthly on alternating spring and neap tides and includes the following variables: macronutrients (inorganic forms of nitrogen, phosphorus, and silicon), total suspended solids, total dissolved solids, total, particulate and dissolved organic nitrogen and carbon, chlorophyll *a*, pH, dissolved oxygen (DO), EC (specific conductance), turbidity, secchi depth, and water temperature. In addition, on-board continuous recording is conducted intermittently for the following variables: water temperature, dissolved oxygen, electrical conductivity, turbidity, and chlorophyll *a* fluorescence.**
- 7 **Near-monthly discrete sampling on alternating spring and neap tides for phytoplankton enumeration or algal pigment analysis.**
- 8 **Near-monthly tow or pump sampling for zooplankton, mysids, and amphipods.**
- 9 **In 2003 and 2004, replicated benthos and sediment grab samples are taken quarterly (every three months) and during special studies events; more frequent monitoring sampling resumes in 2005.**

Appendix A: Working Tables

Working Table 2: Proposed stations for revised D-1641, Table 5 (p. 192) with summary of some important information contained in Working Table 1.

Station ID ¹	Station Type ²	Station Description ³	Is this a shore or vessel-based station? ⁴	Is this a primary or secondary EMP station? ⁵	Primary EMP station: flux or ambient monitoring? ⁶	Does agency flow (F) and/or stage (S) monitoring exist? ⁷	Analytically link this station with ⁸	Move(d) from Station (year) ⁸	Study relocation to this primary station ⁸
C2	C	Sacramento River @ Collinsville	Shore	Primary	Ambient		D4		
C3A	B	Sacramento River @ Hood	Shore	Primary	Flux	USGS (F) At Freeport: USGS (F&S)		C3 (MP: 1998, all: 2004)	
C4	C	San Joaquin River @ San Andreas Landing	Shore						
C5	C	Contra Costa Canal @ Pumping Plant #1	Shore						
C6	C	San Joaquin River @ Brandt Bridge site	Shore			DWR-CD (S)			
C7A	B	San Joaquin River @ Mossdale Bridge	Shore	Secondary		(S)		C7 (1984)	C10A
C8	C	Middle River near Old River	Shore						
C9	C&B	Clifton Court Forebay @ Radial Gates	Shore	Primary	Flux	DWR-O&M (F&S)	C9		
C9-R	B	West Canal @ Mouth of CC Forebay Intake	Vessel	Secondary			C9A	C9	C9A
C10	C	San Joaquin River near Vernalis	Shore (Bridge)				C10A		
C10A	B	San Joaquin River near Vernalis @ San Joaquin River Club	Shore	Primary	Flux	USGS (F&S)		C10 (2003)	
C13	C	Mokelumne River @ Terminus	Shore						
C14	C	Sacramento River @ Port Chicago	Shore	Primary	Ambient		D8		
C19	C	Cache Slough @ City of Vallejo Intake	Shore						
D4	B	Sacramento River above Point Sacramento	Vessel	Secondary			C2		C2
D6	B	Suisun Bay @ Bulls Head Pt. near Martinez	Vessel	Secondary			D6A		New center channel location
D6A	B	Sacramento River @ Martinez	Shore	Primary	Flux	EMP (S)	D6	D6 (1983)	New center channel location
D7	B	Grizzly Bay @ Dolphin nr. Suisun Slough	Vessel	Primary	Ambient				
D8	B	Suisun Bay off Middle Point nr. Nichols	Vessel	Secondary			C14		C14

(continued)

Appendix A: Working Tables

Proposed stations for revised D-1641, Table 5 with summary information, cont.

Station ID ¹	Station Type ²	Station Description ³	Is this a shore or vessel-based station? ⁴	Is this a primary or secondary EMP station? ⁵	Primary EMP station: flux or ambient monitoring? ⁶	Does agency flow (F) and/or stage (S) monitoring exist? ⁷	Analytically link this station with ⁸	Move(d) from Station (year) ⁸	Study relocation to this primary station ⁸
D9	B	Honker Bay	Vessel	Primary	Ambient				
D10	B	Sacramento River @ Chipps Island	Vessel	Secondary			D10A		
D10A	C&B	Sacramento River @ Mallard Island	Shore	Primary	Flux		D10	D10 (1984)	
D11	B	Sherman Lake near Antioch	Vessel	Primary	Ambient				
D12	B	San Joaquin River @ Antioch Ship Channel	Vessel	Secondary			D12A		
D12A	C&B	San Joaquin River @ Antioch	Shore	Primary	Ambient	EMP (S)	D12	D12 (1984)	
D15	C	San Joaquin River @ Jersey Point	Shore	Primary	Flux	USGS (F&S)			
D16	B	San Joaquin River @ Twitchell Island	Vessel	Primary	Ambient		D15, D29		
D19	B	Frank's Tract near Russo's landing	Vessel	Primary	Ambient				
D22A	C	Sacramento River NW of Emmaton	Shore	Primary	Ambient		D22A		
D22	B	Sacramento River @ Emmaton	Vessel	Secondary			D22		D24
D24A	C&B	Sacramento River below Rio Vista Bridge	Shore	Primary	Flux	USGS (F&S)	D24A		
D24-L	B	Sacramento River @ Rio Vista, left bank	Vessel	Secondary			D24		
D26	B	San Joaquin River @ Potato Point	Vessel	Primary	Ambient		D16, D29		D29
D28A	B	Old River near Rancho Del Rio	Vessel	Secondary			D28B		
D28B	B	Old River @ Bacon Island	Shore	Primary	Flux	USGS (F&S)	D28A		
D29	C&B	San Joaquin River @ Prisoners Point	Shore	Primary	Flux		D16, D26		
D41	B	San Pablo Bay near Pinole Point	Vessel	Primary	Ambient				
D41A	B	San Pablo Bay near Mouth of Petaluma R.	Vessel	Primary	Ambient		(USGS CR at channel marker 9)		
DMC1	C	Delta Mendota Canal @ Tracy Pump Pt.	Shore						
P8	B	San Joaquin River @ Buckley Cove	Vessel	Secondary			P8A		P8A
P8A	B	San Joaquin River @ Rough and Ready Island	Shore	Primary	Ambient		P8	P8	
P12	C	Old River @ Tracy Road Bridge	Shore						
MD10	B	Disappointment Slough near Bishop Cut	Vessel	Primary	Ambient				

(continued)

Proposed stations for revised D-1641, Table 5 with summary information, cont.

Station ID ¹	Station Type ²	Station Description ³	Is this a shore or vessel-based station? ⁴	Is this a primary or secondary EMP station? ⁵	Primary EMP station: flux or ambient monitoring? ⁶	Does agency flow (F) and/or stage (S) monitoring exist? ⁷	Analytically link this station with ⁸	Move(d) from Station (year) ⁸	Study relocation to this primary station ⁸
S21	C	Chadbourne Slough @ Sunrise Duck Club	Shore						
S35	B	Goodyear Slough @ Morrow Island Clubhouse	Shore						
S42	C&B	Suisun Slough 300' south of Volanti Slough	Shore	Primary	Ambient	DWR-SM (S)	S42A		
S42A	B	Suisun Slough 300' south of Volanti Slough, center channel	Vessel	Secondary					
S49	C	Montezuma Slough near Beldon Landing	Shore						
S64	C	Montezuma Slough @ National Steel	Shore						
S97	B	Cordelia Slough @ Ibis Club	Shore						
NZ032	B	Montezuma Slough, 2nd bend from mouth	Shore & Vessel	Primary	Ambient	DWR-SM (S)	S42, S54		
SLBAR3	C	Barker Slough @ North Bay Aqueduct							
---	C	Sacramento R. (I St. Bridge to Freeport)							
---	B	San Joaquin R. (Turner Cut to Stockton)							
---	B	Water supply intakes for waterfowl management areas on Van Sickle Island and Chipps Island							

Footnotes for Working Table 2:

- ¹ Most stations use historical "interagency" station identification (ID) numbers as given in SWRCB D-1641 (2000) and D-1485 (1978). Modified station ID numbers (e.g. C3A) identify stations near historical stations.
- ² C: Compliance monitoring station; B: Baseline monitoring station, C&B: Compliance and baseline monitoring station
- ³ Most stations use historical "interagency" station descriptions as given in SWRCB D-1641 (2000) and D-1485 (1978). Stations with modified station ID numbers (e.g. D24A) also have modified names to indicate stations near historical stations with similar numbers and names.
- ⁴ This is important for monitoring logistics and costs. Continuous monitoring is more readily accomplished from shore and shore-based monitoring may be less costly. It may also indicate how well monitoring results represent local and regional environmental conditions. Vessel-based monitoring usually occurs at a greater distance from shore and may often yield more representative data than shore-based monitoring.

(continued)

Footnotes for Working Table 2, continued:

- ⁵ Primary EMP stations have continuous monitoring components (reflecting proposed new program emphasis on continuous monitoring) and/or the EMP is the only monitoring program conducting environmental baseline monitoring at these sites. Secondary EMP stations are discrete monitoring stations linked to primary (continuous) sister stations and many may eventually be consolidated with (*i.e.* moved to) the primary stations, if studies show that this will not compromise long-term data continuity.
- ⁶ Important station designation in proposed new conceptual models for EMP monitoring. For details about underlying conceptual models please see "IEP-EMP 2001-2002 Review and Recommendations, Final Report" (CA DWR, February 2003)
- ⁷ The EMP does not monitor flow. Flow monitoring is, however, very important for flux calculations, especially at the designated "flux stations," see footnote 6. We thus propose to more closely collaborate with agencies conducting flow (and stage) monitoring to obtain flow data and help fill gaps in the current flow monitoring network.
- ⁸ For improved monitoring efficiency and products, we propose to more closely link continuous and discrete stations and in some cases consolidate stations at the continuous site. These three columns show station integration (links) and proposed future station relocation (moves). We also indicate which continuous monitoring stations have been previously installed in a different location (*i.e.*, moved) than the historical discrete station whose station name they still bear in D-1641, Table 5.

Working Table 3: Proposed modifications to D-1641, Table 5 (p. 192) with highlighted changes and station operators (if not otherwise noted, operator is IEP EMP).

Station ID ¹	Station Type ²	Station Description ³	Cont.Rec. ⁴	Cont. Multi-parameter ⁵	Discrete Physical/Chemical ⁶	Discr. Phytoplankton ⁷	Discr. Zooplankton ⁸	Discrete Benthos ⁹
C2	C	Sacramento River @ Collinsville	USBR-CVO					
C3	B	Sacramento River @ Greens Landing	USBR-CVO		(-)	(-)		
C3A	B	Sacramento River @ Hood		*	X	X	X	
C4	C	San Joaquin River @ San Andreas Landing	USBR-CVO					
C5	C	Contra Costa Canal @ Pumping Plant #1	USBR-CVO					
C6	C	San Joaquin River @ Brandt Bridge site	DWR-CD					
C7A	B	San Joaquin River @ Mossdale Bridge (near C7)		*				
C8	C	Old River near Middle River	USBR-CVO					
C9	C&B	Clifton Court Forebay Radial Gates		DWR-O&M	X	DWR-O&M	X	
C9-R	B	West Canal @ Mouth of CC Forebay Intake						*
C10	C	San Joaquin River near Vernalis	USBR-CVO		(-)	(-)		
C10A	B	San Joaquin River near Vernalis @ San Joaquin River Club		X	X	X	X	
C13	C	Mokelumne River @ Terminous	USBR-CVO					
C14	C	Sacramento River @ Port Chicago	USBR-CVO					
C19	C	Cache Slough @ City of Vallejo Intake	USBR-CVO					
D4	B	Sacramento River above Point Sacramento			*	*	*	*
D6	B	Suisun Bay @ Bull's Head Pt. near Martinez			*	*	*	*
D6A	B	Suisun Bay @ Martinez		*				
D7	B	Grizzly Bay @ Dolphin near Suisun Slough	X		*	*	*	*
D8	B	Suisun Bay off Middle Point near Nichols			*	*	*	
D9	B	Honker Bay near Wheeler Point	X		X	X		
D10	B	Sacramento River @ Chipps Island					*	
D10A	C&B	Sacramento River @ Mallard Island		*	X			
D11	B	Sherman Lake near Antioch	X		X	X		
D12	B	San Joaquin River @ Antioch Ship Channel					*	
D12A	C&B	San Joaquin River @ Antioch Water Works		*	X			
D15	C	San Joaquin River @ Jersey Point	USBR-CVO					
D16	B	San Joaquin River @ Twitchell Island					*	*
D19	B	Franks Tract near Russo's Landing	X		X	X	X	
D22A	C&B	Sacramento River @ Emmaton	USBR-CVO & DWR-CD					
D22	B	Sacramento River @ Emmaton (near D22)					*	
D24A	C&B	Sacramento River below Rio Vista Bridge		*	X			
D24-L	B	Sacramento River below Rio Vista Bridge, left bank						*
D26	B	San Joaquin River @ Potato Point			*	*	*	
D28A	B	Old River opposite Rancho Del Rio			DWR-CD	*	*	*
D28B	B	Old River at Bacon Island	DWR-CD					
D29	C&B	San Joaquin River @ Prisoners Point	*		X	X	X	
D41	B	San Pablo Bay near Pinole point			*	*	X	*
D41A	B	San Pablo Bay near the Mouth of the Petaluma River			X	X	X	*
DMC1	C&B	Delta-Mendota Canal @ Tracy Pump. Plt.		USBR-CVO				
P8	B	San Joaquin River @ Buckley Cove			*	*	*	*
P8A	B	San Joaquin River @ Rough and Ready Island		*				
P12	C	Old River @ Tracy Road Bridge	DWR-CD					

(continued)

Working Table 3, continued

Station ID ¹	Station Type ²	Station Description ³	Cont.Rec. ⁴	Cont. Multi-parameter ⁵	Discrete Physical/Chemical ⁶	Discr. Phytoplankton ⁷	Discr. Zooplankton ⁸	Discrete Benthos ⁹
MD10	B	Disappointment Slough near Bishop Cut			*	*	*	
S21	C	Chadbourne Slough @ Sunrise Duck Club	DWR-SMP					
S35	B	Goodyear Sl. @ Morrow Is. Clubhouse	DWR-SMP					
S42	C&B	Suisun Slough 300' south of Volanti Slough	DWR-SMP		X	X		
S42A	B	Suisun Slough 300' south of Volanti Slough, center channel					*	
S49	C	Montezuma Slough near Beldon Landing	DWR-SMP					
S64	C	Montezuma Slough @ National Steel	DWR-SMP					
S97	B	Cordelia Slough @ Ibis Club	DWR-SMP					
NZ032	B	Montezuma Slough, 2nd bend from mouth					*	
SLBAR3	C	Barker Sl. at No. Bay Aqueduct	DWR-O&M					
---	C	Sacramento R. (I St. Bridge to Freeport) (RSAC155)	USGS					
---	B	San Joaquin R. (Turner Cut to Stockton) (RSAN050-RSAN061)	?					
---	B	Water supply intakes for waterfowl management areas on Van Sickle Island and Chipps Island	?					

Symbols (IEP EMP):

*	No change from D-1641
X	New
(-)	Moved to neighboring station
	No change
	Ongoing, but not currently mandated monitoring
	New monitoring
	Reinstated historical monitoring
	Moved to neighboring station
	C&B monitoring² split between neighboring stations

Footnotes for Working Table 3: same as footnotes for Working Table 1.

Working Table 4: Proposed new Table 6 with additional information.

Station ID ¹	Station Type ¹	Station Description ¹	Latitude ²	Longitude ²	RKI ³	Lead Operator ⁴	Alias ⁵	Comments ⁶
C2	C	Sacramento River @ Collinsville	38.07395	-121.85010	RSAC081	USBR-CVO	Collinsville	Collocated with DWR-SM "Collinsville" station since 2001.
C3A	B	Sacramento River @ Hood	38.36772	-121.52051	RSAC142	IEP-EMP	70	Collocated with DWR-MWQI "HOOD" station. Established in 1998 to replace historical C3 (Green's Landing)
C4	C	San Joaquin River @ San Andreas Landing	38.10319	-121.59128	RSAN032	USBR-CVO	San Andreas	Collocated with DWR-CD station "5100"
C5	C	Contra Costa Canal @ Pumping Plant #1	37.99520	-121.70244	CHCCC006	USBR-CVO	Contra Costa	
C6	C	San Joaquin River @ Brandt Bridge site	37.86454	-121.32270		DWR-CD	5740	
C7A	B	San Joaquin River @ Mossdale Bridge	37.78604	-121.30666	RSAN087	IEP-EMP	10	Replaced historic van station C7
C8	C	Middle River near Old River	37.82208	-121.37517	RMID041	USBR-CVO	Union Island	Historical C8 station description: "In Middle River 1.7 km north of junction with Old River." This station has been moved south and is now at the junction with Old River.
C9	C&B	Clifton Court Forebay @ Radial Gates	37.83075	-121.55703		DWR-O&M	KA000000	Historical C9 used to be just outside of the Forebay on the other side of the levee.
C9-R	B	West Canal @ Mouth of CC Forebay Intake	37.82818	-121.55275	CHWST0	IEP-EMP	C9	C9 - Right bank benthic monitoring
C10	C	San Joaquin River near Vernalis	37.67575	-121.26500	RSAN112	USBR-CVO	Vernalis	
C10A	B	San Joaquin River near Vernalis @ San Joaquin River Club	37.67934	-121.26472		IEP-EMP	Vernalis	New station to be shared by IEP-EMP and DWR-MWQI
C13	C	Mokelumne River @ Terminous	38.11691	-121.49888	RSMKL008	USBR-CVO	Staten Island	USBR description: "Mokelumne River (South Fork) @ Staten Island"
C14	C	Sacramento River @ Port Chicago	38.05881	-122.02607	RSAC064	USBR-CVO	Port Chicago	
C19	C	Cache Slough @ City of Vallejo Intake	38.29687	-121.74784	SLCCH016	USBR-CVO	Cache Slough	Also described as "Cache Slough near end of Hastings cut"
D4	B	Sacramento River above Point Sacramento	38.06214	-121.81792	RSAC084	IEP-EMP		Benthic sampling is done close to the left shore
D6	B	Suisun Bay @ Bulls Head Pt. near Martinez	38.04427	-122.11764	RSAC056	IEP-EMP		Benthic sampling is done at a slightly different location
D6A	B	Sacramento River @ Martinez	38.02762	-122.14052	RSAC054	IEP-EMP	40	

(continued)

Working Table 4, continued

Station ID ¹	Station Type ¹	Station Description ¹	Latitude ²	Longitude ²	RKI ³	Lead Operator ⁴	Alias ⁵	Comments ⁶
D7	B	Grizzly Bay @ Dolphin nr. Suisun Slough	38.11708	-122.03972	LSBB11	IEP-EMP		
D8	B	Suisun Bay off Middle Point nr. Nichols	38.05992	-121.98996	RSAC068	IEP-EMP		
D9	B	Honker Bay	38.07245	-121.93923		IEP-EMP		Reinstated D-1485 monitoring station
D10	B	Sacramento River @ Chipps Island	38.04631	-121.91829	RSAC075	IEP-EMP		
D10A	C&B	Sacramento River @ Mallard Island	38.04288	-121.92011	RSAC075	IEP-EMP	60	Collocated with DWR-MWQI "Mallardis"
D11	B	Sherman Lake near Antioch	38.04228	-121.79951		IEP-EMP		Reinstated D-1485 monitoring station
D12	B	San Joaquin River @ Antioch Ship Channel	38.02162	-121.80638	RSAN007	IEP-EMP		
D12A	C&B	San Joaquin River @ Antioch	38.01770	-121.80273	RSAN007	IEP-EMP	50	Collocated with USBR-CVO "Antioch", DWR-CD 5020
D15	C	San Joaquin River @ Jersey Point	38.05190	-121.68927	RSAN018	USBR-CVO	Jersey Point	Collocated with USGS-SAC 337190
D16	B	San Joaquin River @ Twitchell Island	38.09690	-121.66912	RSAN024	IEP-EMP		
D19	B	Frank's Tract near Russo's landing	38.04376	-121.61477		IEP-EMP		Reinstated D-1485 monitoring station
D22A	C	Sacramento River NW of Emmaton	38.08406	-121.73912	RSAC092	USBR-CVO	Emmaton	Collocated with DWR-CD 1120
D22	B	Sacramento River @ Emmaton	38.08453	-121.73914	RSAC092	IEP-EMP		
D24A	C&B	Sacramento River below Rio Vista Bridge	38.15891	-121.68721	RSAC101	IEP-EMP	30	Collocated with DWR-CD 1212 and USGS-SAC 455400
D24-L	B	Sacramento River @ Rio Vista, left bank	38.15550	-121.68113		IEP-EMP		D24 - Left bank benthic site
D26	B	San Joaquin River @ Potato Point	38.07667	-121.56696	RSAN035	IEP-EMP		
D28A	B	Old River near Rancho Del Rio	37.97038	-121.57271	ROLD21	IEP-EMP		
D28B	B	Old River @ Bacon Island	37.96980	-121.57210	ROLD024	DWR-CD	5250	Collocated with USGS-SAC 313405 and DWR-MWQI "OLDRIVBACISL"
D29	C&B	San Joaquin River @ Prisoners Point	38.05793	-121.55736	RSAN037	IEP-EMP	80	
D41	B	San Pablo Bay near Pinole Point	38.03016	-122.37287	RSAC032	IEP-EMP		
D41A	B	San Pablo Bay near Mouth of Petaluma R.	38.08472	-122.39067		IEP-EMP		
DMC1	C	Delta Mendota Canal @ Tracy Pump Plt.	37.78165	-121.59050	CHDMC006	USBR-CVO	DMC Headworks	
P8	B	San Joaquin River @ Buckley Cove	37.97815	-121.38242	RSAN056	IEP-EMP		
P8A	B	San Joaquin River @ Rough and Ready Island	37.96277	-121.36587	RSAN058	IEP-EMP	20	Collocated with DWR-CD 5660

(continued)

Working Table 4, continued

Station ID ¹	Station Type ¹	Station Description ¹	Latitude ²	Longitude ²	RKI ³	Lead Operator ⁴	Alias ⁵	Comments ⁶
P12	C	Old River @ Tracy Road Bridge	37.80493	-121.44929		DWR-CD	5380	
MD10	B	Disappointment Slough near Bishop Cut	38.04229	-121.41935	SLDPT07	IEP-EMP		
S21	C	Chadbourne Slough @ Sunrise Duck Club	38.18476	-122.08315	SLCBN002	DWR-SMP		
S35	B	Goodyear Slough @ Morrow Island Clubhouse	38.11881	-122.09580	SLGYR003	DWR-SMP		
S42	C&B	Suisun Slough 300' south of Volanti Slough	38.18053	-122.04696		DWR-SMP		
S42A	B	Suisun Slough 300' south of Volanti Slough, center channel	38.18027	-122.04779	SLSUS12	IEP-EMP		
S49	C	Montezuma Slough near Beldon Landing	38.18686	-121.97080	SLMZU011	DWR-SMP		
S64	C	Montezuma Slough @ National Steel	38.12223	-121.88800	SLMZU025	DWR-SMP		
S97	B	Cordelia Slough @ Ibis Club	38.15703	-122.11378	SLCRD006	DWR-SMP		
NZ032	B	Montezuma Slough, 2nd bend from mouth	38.16990	-122.02112		IEP-EMP	NZ032	
SLBAR3	C	Barker Slough @ North Bay Aqueduct	38.27474	-121.79499	SLBAR002	DWR-O&M	KG000000	
---	C	Sacramento R. (I St. Bridge to Freeport)			RSAC155			
---	B	San Joaquin R. (Turner Cut to Stockton)			RSAN050-RSAN061			
---	B	Water supply intakes for waterfowl management areas on Van Sickle Island and Chipps Island						

Footnotes for Working Table 4:

- ¹ See Working Table 1, Footnotes 1-3.
- ² Coordinates are geographic North American Datum 1983 and have been verified to be accurate for 1:24,000 scale mapping
- ³ River Kilometer Index
- ⁴ IEP-EMP: Interagency Ecological Program -Environmental Monitoring Program. Other lead station operator acronyms: see Working Table 1. The lead station operator is responsible for compliance monitoring at compliance stations and for most baseline monitoring and/or station maintenance.
- ⁵ Alternative station I.D. used by the lead agency.
- ⁶ Comments about additional monitoring by other agencies and station history.

Appendix B: Milestones and participants in the 2001-2002 review of the Environmental Monitoring Program

1. Milestones

Technical Review Phase:

- First public meeting: Orientation. Romberg-Tiburon Bay Conference Center. May 8, 2001.
- Subject Area Team (SAT) meetings. May-June 2001
- Second public meeting: Presentation and discussion of SAT review results. UC Davis. July 30, 2001
- SAT leader and EMP core team meeting to integrate results and prioritize recommendations. SFEI, Richmond. August 22, 2001
- Briefing and discussion meeting with IEP Water Quality Project Work Team. DWR-Sacramento. September 25, 2001
- Completion of EMP Review and Recommendations Report, Draft I, November 2001, posting on EMP web site for review by review participants
- Third public meeting to discuss draft plan. Romberg-Tiburon Bay Conference Center. November 14, 2001.
- Completion of EMP Review and Recommendations Report, Draft II, December 2001, posting on EMP web site for review by review participants and IEP Science Advisory Group (SAG)
- Briefing meeting for staff from other DWR water quality monitoring programs, DWR-Sacramento, January 22, 2002
- Presentations about the EMP and the 2001-2002 review at the annual IEP workshop in Asilomar, CA, February 2002
- Meeting of EMP review core team with IEP SAG to initiate SAG review of the EMP. Stanford University. April 4, 2002.
- Written SAG review completed and sent to IEP management and EMP May 22, 2002.
- Many core team meetings and discussions with SAT leaders to respond to SAG recommendations and revise the EMP Review and Recommendations Report

Appendix B: Review Milestones and Participants

- Presentation about the EMP and the state of the 2001-2002 review at the IEP monitoring forum at UC Davis on June 19, 2002.
- Completion of EMP Review and Recommendations Report, Draft III. This completes the technical review phase. Documents posted on EMP web site and sent to EMP review core team, and SAT leaders, IEP Water Quality PWT, agency program managers, IEP Management Team, IEP Coordinators, State Water Contractor Representatives, SWRCB staff, Central Valley Regional Water Quality Control Board staff for review/approval. October 2002

Management Review Phase:

- Briefing meeting for State Water Contractors, State Water Contractor's offices in Sacramento, October 8, 2002
- Briefing meeting for Regional Water Quality Control Board staff, Sacramento, October 29, 2002
- Briefing meetings for DWR Office and Division Chiefs and USBR management to discuss how EMP revisions will affect their programs, November 12 and 13, 2002
- Meeting of review core team members with SWRCB, DWR, and USBR legal staff regarding preparation of final documents, December 2, 2002
- Communications with IEP Management Team about the EMP review, December 2002-January 2003.
- Joint USBR-DWR request for 61-day extension to allow review completion sent to SWRCB December 20, 2002.
- Briefing of DWR Bay-Delta Hearing Coordination Committee, January 31, 2003.
- Revision of EMP Review and Recommendations Report, Draft III based on all new comments received after meetings, etc. Drafting of final report and documents for "EMP review package."
- IEP Asilomar meeting: update IEP SAG, MT, and others. February 28, 2003.
- Request approval of agency deputy directors to submit package to the SWRCB.
- Submittal of EMP Package to SWRCB for approval, March 30, 2003.
- Notification of "Water Rights Community" with workshop invitation and attached review documents expected April 2003.
- SWRCB Staff Workshop (2 hour presentation) expected May, 2003.

2. Participants in the technical review of the EMP

Name	Organization	Role in Review
Heather Peterson Jan Thompson Cindy Messer Bruce Thompson	USGS, Biologist USGS, Biologist DWR, Biologist SFEI, Biologist	Benthos SAT, Lead Benthos SAT Benthos SAT, EMP staff Benthos SAT
Zach Hymanson Jon Bureau Ken Lentz Larry Schemel David Briggs Mike Simpson Rainer Hoenicke Cary Burns Hank Gebhard Joe Dolmalgalski Tom Morstein-Marx Art Hinojosa	DWR/CALFED, Biologist USGS, Hydrologist USBR, Biologist USGS, Chemist CCWD, Engineer USGS, Engineer SFEI, Biologist USGS, Biologist DWR, Engineer USGS (NAWQA) USBR operations DWR O&M Operations Studies	Water Quality SAT, Lead; Core Team; EMP Program Manager Water Quality SAT, Lead; Core Team Water Quality SAT; Core Team; EMP Program Manager Water Quality SAT Water Quality SAT
Anke Mueller-Solger Peggy Lehman Sang-Kyu Park	DWR, Biologist DWR, Biologist UC Davis, Biologist	Phytoplankton SAT, Lead; Core Team, EMP staff Phytoplankton SAT, EMP staff Phytoplankton SAT
Wim Kimmerer Lee Mecum Jim Orsi	SFSU, Biologist DFG DFG (Retired), Biologist	Zooplankton SAT, Lead Zooplankton SAT, EMP staff Zooplankton, SAT
Erwin Van Nieuwenhuysse Carolyn Penny Nick Wilcox Gita Kapahi Kim Taylor Tina Swanson Rick Sitts John Andrew	USBR, Biologist Consultant SWRCB SWRCB CALFED Science Bay Institute MWD CALFED Drinking Water	All-Participant Meeting(s); Core Team, EMP staff All-Participant Meeting(s), Facilitator Public Meeting(s) only Public Meeting(s) only Public Meeting(s) only Public Meeting(s) only Public Meeting(s) only Public Meeting(s) only

Appendix B: Review Milestones and Participants

Review participants, continued

Name	Organization	Role in Review
Mike Chotkowski	USBR	Public Meeting(s) only
Sam Harader	CALFED Drinking Water	Public Meeting(s) only
Barbara Marcotte	CALFED ERP	Public Meeting(s) only
Elaine Archibold	Consultant	Public Meeting(s) only
Fred Lee	Consultant, Enviroqual	Public Meeting(s) only
Claus Suverkropp	SRWP / LWA	Public Meeting(s) only
Tom Grovhoug	SRWP / LWA	Public Meeting(s) only
Elizabeth Soderstrom	NHI	Public Meeting(s) only
Khalil Abu-Saba	RWQCB	Public Meeting(s) only
Bruce Herbold	EPA	Public Meeting(s) only
Lester McKee	SFEI, Biologist	Public Meeting(s) only
Marc Vayssieres	DWR, Ecologist	Public Meeting(s) only, EMP staff
Steve Hayes	DWR, Section Chief	Public Meeting(s) only, EMP staff
Karen Gehrts	DWR, Biologist	Public Meeting(s) only, EMP staff
Scott Waller	DWR, Staff	Public Meeting(s) only, EMP staff
Kitty Triboli	DWR, Staff	Public Meeting(s) only, EMP staff
Casey Ralston	DWR, Staff	Public Meeting(s) only, EMP staff
Shaun Phillipart	DWR, Staff	Public Meeting(s) only, EMP staff
Steve Ford	DWR, Program Manager	Core Team, EMP Program Manager
Stephen Monismith	Stanford U.	IEP SAG (chair)
Si Simensted	U. Washington	IEP SAG
Jim Cloern	USGS	IEP SAG
Edward Houde	U. Maryland	IEP SAG
Terry Short	USGS	IEP SAG (Temporary)
Jonathan H. Sharp	U. Delaware	IEP SAG (Temporary)
Alan Jassby	UC Davis	IEP SAG (Temporary)

(Acronyms see next page)

Appendix B: Review Milestones and Participants

Acronyms:

CALFED	Consortium of Bay-Delta State and Federal Agencies. Beginning 1-1-03: "Bay-Delta Authority"
CD	DWR Central District
DFG	California Department of Fish and Game
DWR	California Department of Water Resources
EPA	Environmental Protection Agency
EMP	Environmental Monitoring Program
IEP	Interagency Ecological Program, 1994-present
LWA	Larry Walker and Associates
MT	IEP Management Team
MWD	Metropolitan Water District of Southern California
NHI	Natural Heritage Institute
O&M	DWR Division of Operations and Maintenance
RWQCB	Regional Water Quality Control Board
SAG	IEP Science Advisory Group
SAT	IEP EMP Review Subject Area Team
SFEI	San Francisco Estuary Institute
SFSU	San Francisco State University
SRI	Stanford Research Institute
SRWP	Sacramento River Watershed Program
SWRCB	State Water Resources Control Board
USBR	United States Bureau of Reclamation
USGS	United States Geological Survey

Appendix C:

**INTERAGENCY ECOLOGICAL PROGRAM
ENVIRONMENTAL MONITORING PROGRAM
REVIEW AND RECOMMENDATIONS**

Final Report

March 25, 2003

(Separate file in MS Word or Adobe pdf format.)

Also available at:

<http://iep.water.ca.gov/emp/>

And upon request from:

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