FIGURE A-2
REACH 1 PROPOSED RESTORATION ACTIONS

CH2MHILL

Maximum Flow Capacity
1,300 cfs
Restoration Flow
4,500 cfs
Water Right Flows
2,300 cfs
Total Capacity Needed
6,800 cfs

2B

2A

GRAVELLY FORD CANAL

Maximum Flow Capacity
8,000 cfs
Restoration Flow
4,500 cfs

CHOWCHILLA BIFURCATION STRUCTURE
MODIFY FOR FISH PASSAGE

DREDGE LOW FLOW CHANNEL REACH 2A

LEGEND
- ROAD CROSSINGS AND CULVERTS
- BARRIERS TO MIGRATION
- EVALUATE FOR LEVEE AND CHANNEL IMPROVEMENTS
- SAN JOAQUIN RIVER
- REACH DIVISION
- CITY
- INTERSTATE HIGHWAY
- STATE-HIGHWAY
- US-HIGHWAY
- RAILROAD
- CANALS
- COUNTY BOUNDARY

0 0.75 Miles

N

FIGURE A-3
REACH 2A PROPOSED RESTORATION ACTIONS

CH2MHILL

\\GLACIER\PROJ\159813_SANJOAQUIN_RIVER\MAPFILES\FIGURES\FIGUREA_3.MXD FIGUREA-3.PDF 7/23/2007 15:25:57

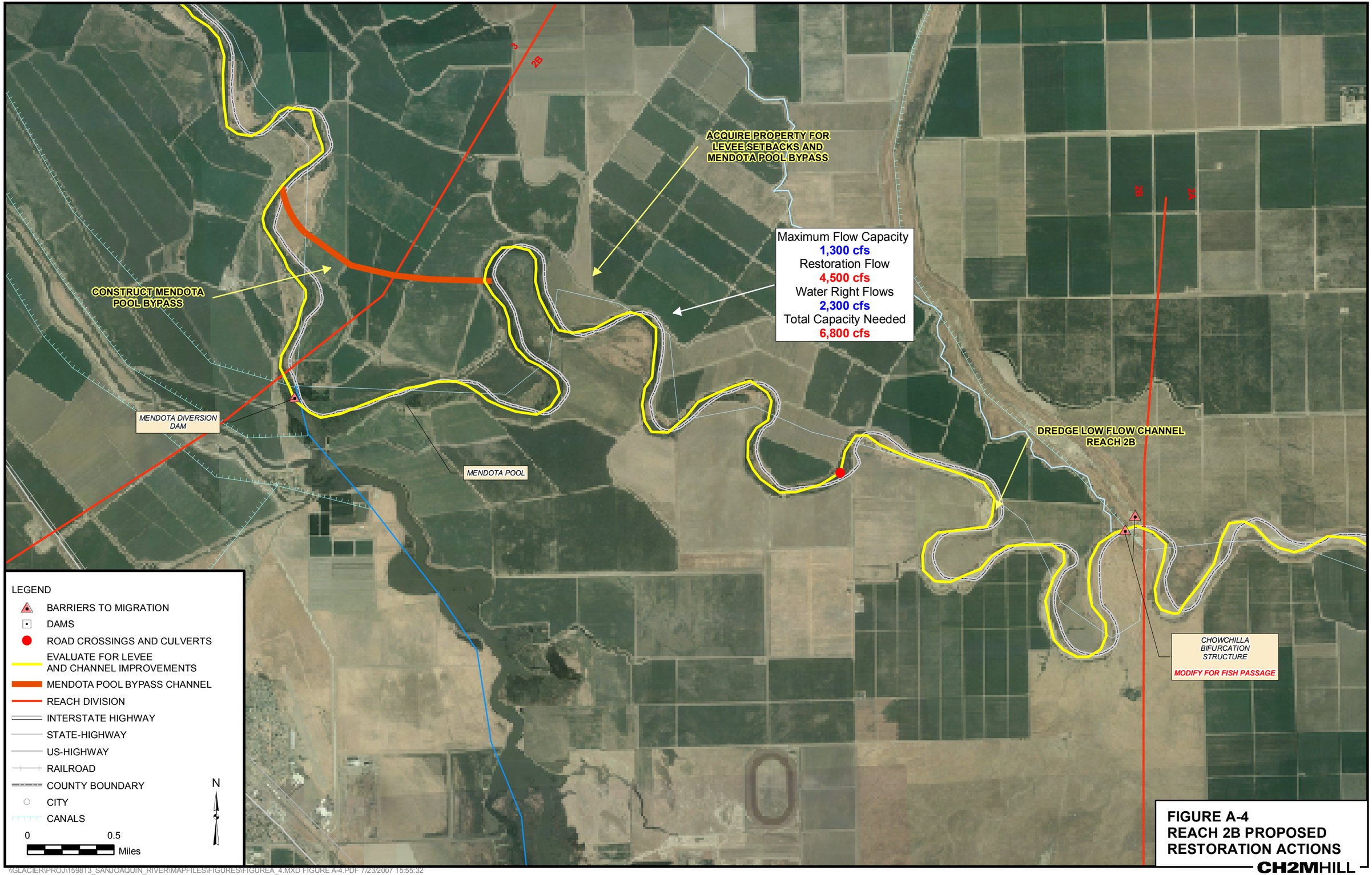

FIGURE A-4
REACH 2B PROPOSED RESTORATION ACTIONS

CH2MHILL

\\GLACIER\PROJ\159813_SANJOAQUIN_RIVER\MAPFILES\FIGURES\FIGUREA_4.MXD FIGURE A-4.PDF 7/23/2007 15:55:32

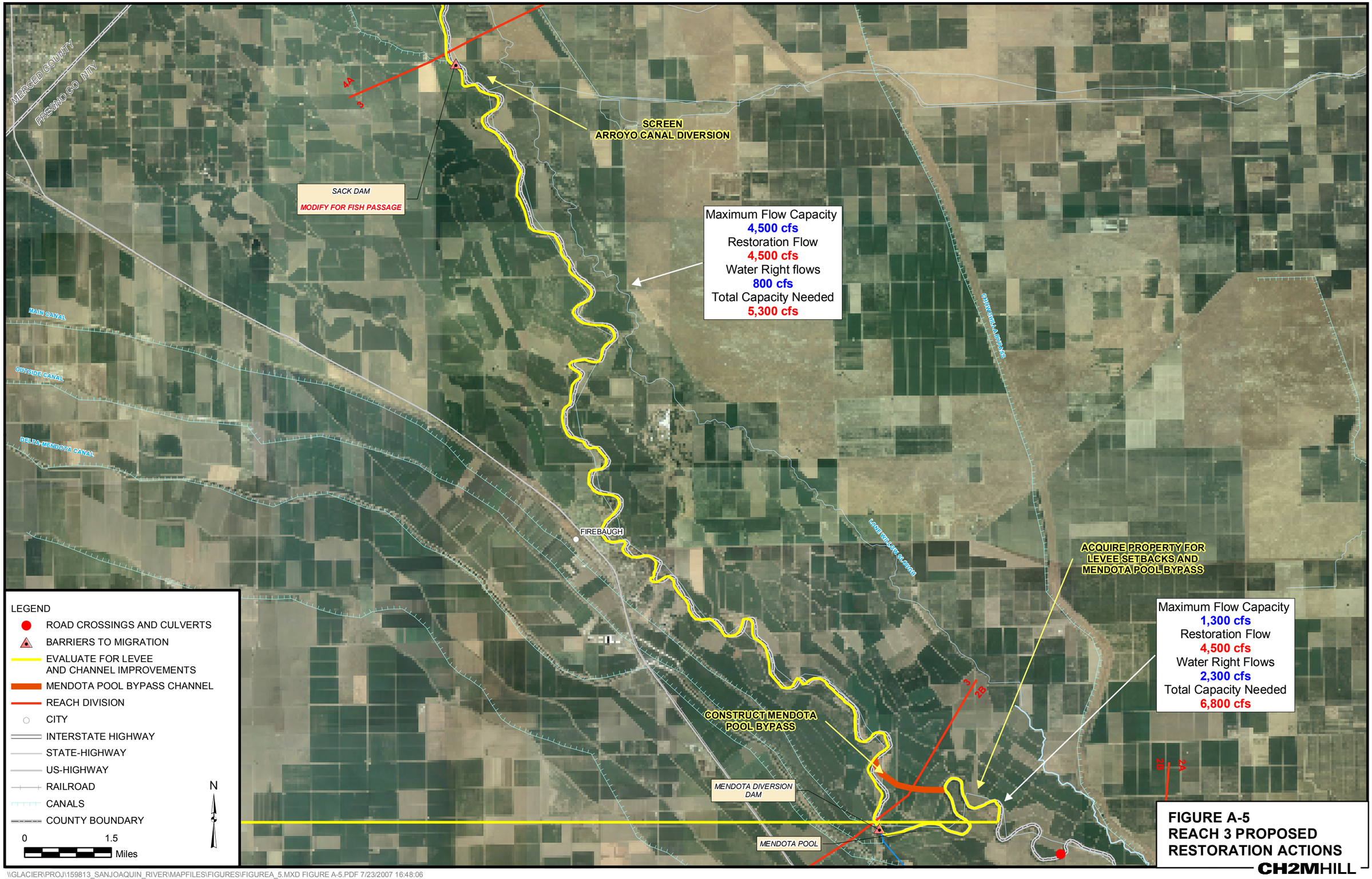

FIGURE A-5
REACH 3 PROPOSED
RESTORATION ACTIONS

CH2MHILL

\\GLACIER\PROJ\159813_SANJOAQUIN_RIVER\MAPFILES\FIGURES\FIGUREA_5.MXD FIGURE A-5.PDF 7/23/2007 16:48:06

FIGURE A-6
REACH 4A PROPOSED RESTORATION ACTIONS

CH2MHILL

\\GLACIER\PROJ\159813_SANJOAQUIN_RIVER\MAPFILES\FIGURES\FIGUREA_6.MXD FIGURE A-6.PDF 7/24/2007 08:40:41

4B Lower

4B Upper

MARIPOSA BIFURCATION STRUCTURE

MODIFY FOR FISH PASSAGE

MARIPOSA BYPASS

Maximum Flow Capacity
0 to 400 cfs
Restoration Flow
4,500 cfs

EAST SIDE BYPASS

ACQUIRE PROPERTY TO EXCAVATE CHANNEL AND SETBACK LEVEES

SCREEN DIVERSIONS AND DRAINS ALL REACHES

FISHERMAN'S BYPASS

SAND SLOUGH CONTROL STRUCTURE

MODIFY FOR FISH PASSAGE

4B Upper

4A

LEGEND

- ROAD CROSSINGS AND CULVERTS
- BARRIERS TO MIGRATION
- FLOW ROUTING THROUGH BYPASS SYSTEM
- EVALUATE FOR LEVEE AND CHANNEL IMPROVEMENTS
- SAN JOAQUIN RIVER
- REACH DIVISION
- CITY
- INTERSTATE HIGHWAY
- STATE-HIGHWAY
- US-HIGHWAY
- RAILROAD
- CANALS
- COUNTY BOUNDARY

0 1 Miles

N

FIGURE A-7
REACH 4B UPPER
PROPOSED RESTORATION ACTIONS

CH2MHILL

\\GLACIER\PROJ\159813_SANJOAQUIN_RIVER\MAPFILES\FIGURES\FIGUREA_7.MXD FIGURE A-7.PDF 9/18/2007 13:41:08

SCREEN SLOUGH OUTLETS

4B Lower

Maximum Flow Capacity
10,000 cfs
Restoration Flow
4,500 cfs

EAST SIDE CANAL

MUD SLOUGH

SALT SLOUGH

MARIPOSA BIFURCATION STRUCTURE

MODIFY FOR FISH PASSAGE

4B Lower

4B Upper

MARIPOSA BYPASS

LEGEND

- BARRIERS TO MIGRATION
- EVALUATE FOR LEVEE AND CHANNEL IMPROVEMENTS
- SAN JOAQUIN RIVER
- REACH DIVISION
- INTERSTATE HIGHWAY
- STATE-HIGHWAY
- US-HIGHWAY
- RAILROAD
- COUNTY BOUNDARY
- CITY
- CANALS

0 0.75 Miles

N

FIGURE A-8
REACH 4B LOWER PROPOSED RESTORATION ACTIONS

CH2MHILL

\\GLACIER\PROJ\159813_SANJOAQUIN_RIVER\MAPFILES\FIGURES\FIGUREA_8.MXD FIGURE A-8.PDF 7/24/2007 11:03:33

MERCED RIVER

SCREEN SLOUGH OUTLETS

Maximum Flow Capacity
26,000 cfs
Restoration Flow
4,500 cfs

165

MUD SLOUGH

SALT SLOUGH

5
43 Lower

LEGEND

- BARRIERS TO MIGRATION
- DAMS
- ROAD CROSSINGS AND CULVERTS
- EVALUATE FOR LEVEE AND CHANNEL IMPROVEMENTS
- REACH DIVISION
- SAN JOAQUIN RIVER
- INTERSTATE HIGHWAY
- STATE-HIGHWAY
- US-HIGHWAY
- RAILROAD
- COUNTY BOUNDARY
- CITY
- CANALS

N

0 0.75 Miles

FIGURE A-9
REACH 5 PROPOSED RESTORATION ACTIONS

CH2MHILL

APPENDIX B

Diversions by River Mile

TABLE B-1
Summary of Diversions along the San Joaquin River From Friant Dam to the Merced River

River Mile	Primary Use	Bank Location	Diversion Type	Intake Size (inches)	Maximum Diversion (cfs)
266.76	Agricultural	Right	Pump	6	1
266.57	Agricultural	Left	Pump	8	2
265.73	Recreation	Left	Pump	12	4
265.2	Recreation	Left	Pump	7	1
265.19	Agricultural	Right	Pump	15	6
265.13	Agricultural	Right	Pump	12	4
265.13	Agricultural	Right	Pump	12	4
265.13	Agricultural	Right	Pump	12	4
264.75	Recreation	Left	Pump	7	1
263.45	Agricultural	Right	Pump	12	4
263.45	Agricultural	Right	Pump	12	4
262.9	Agricultural	Left	Pump	12	4
262.72	Agricultural	Right	Pump	6	1
262.46	Agricultural	Left	Pump	6	1
262.46	Agricultural	Left	Pump	10	3
262.31	Agricultural	Left	Pump	10	3
262.16	Agricultural	Right	Pump	36	35
262.15	Agricultural	Right	Pump	8	2
261.65	Unknown	Left	Pump	Unknown	1
261.65	Unknown	Left	Pump	8	2
261.65	Unknown	Left	Pump	Unknown	1
261.55	Not in use	Left	Pump	8	2
261.3	Hatchery	Left	Weir	Unknown	5
261.25	Agricultural	Left	Pump	3	1
261.21	Agricultural	Right	Pump	12	4
261.05	Agricultural	Right	Pump	24	16
261	Industrial	Left	Pump	8	2
261	Industrial	Left	Pump	8	2
260.25	Agricultural	Right	Pump	7	1
260.25	Agricultural	Right	Pump	7	1
260	Agricultural	Right	Weir	Unknown	5
259.95	Agricultural	Left	Pump	3	1

TABLE B-1
Summary of Diversions along the San Joaquin River From Friant Dam to the Merced River

River Mile	Primary Use	Bank Location	Diversion Type	Intake Size (inches)	Maximum Diversion (cfs)
259.84	Unknown	Right	Pump	10	3
259.77	Agricultural	Left	Pump	9	2
259.67	Agricultural	Left	Pump	10	3
259.48	Agricultural	Left	Pump	6	1
259.48	Agricultural	Left	Pump	10	3
259.48	Recreation	Right	Pump	6	1
259.47	Agricultural	Left	Pump	10	3
259.47	Not in use	Left	Pump	6	1
259.2	Recreation	Right	Pump	4	1
259	Agricultural	Left	Pump	7	1
259	Recreation	Right	Pump	4	1
258.7	Agricultural	Left	Pump	12	4
266.76	Agricultural	Right	Pump	6	1
266.57	Agricultural	Left	Pump	8	2
265.73	Recreation	Left	Pump	12	4
265.2	Recreation	Left	Pump	7	1
265.19	Agricultural	Right	Pump	15	6
265.13	Agricultural	Right	Pump	12	4
265.13	Agricultural	Right	Pump	12	4
265.13	Agricultural	Right	Pump	12	4
264.75	Recreation	Left	Pump	7	1
263.45	Agricultural	Right	Pump	12	4
263.45	Agricultural	Right	Pump	12	4
262.9	Agricultural	Left	Pump	12	4
262.72	Agricultural	Right	Pump	6	1
262.46	Agricultural	Left	Pump	6	1
262.46	Agricultural	Left	Pump	10	3
262.31	Agricultural	Left	Pump	10	3
262.16	Agricultural	Right	Pump	36	35
262.15	Agricultural	Right	Pump	8	2
261.65	Unknown	Left	Pump	Unknown	1
261.65	Unknown	Left	Pump	8	2

TABLE B-1
Summary of Diversions along the San Joaquin River From Friant Dam to the Merced River

River Mile	Primary Use	Bank Location	Diversion Type	Intake Size (inches)	Maximum Diversion (cfs)
261.65	Unknown	Left	Pump	Unknown	1
261.55	Not in use	Left	Pump	8	2
261.3	Hatchery	Left	Weir	Unknown	5
261.25	Agricultural	Left	Pump	3	1
261.21	Agricultural	Right	Pump	12	4
261.05	Agricultural	Right	Pump	24	16
261	Industrial	Left	Pump	8	2
261	Industrial	Left	Pump	8	2
260.25	Agricultural	Right	Pump	7	1
260.25	Agricultural	Right	Pump	7	1
260	Agricultural	Right	Weir	Unknown	5
259.95	Agricultural	Left	Pump	3	1
259.84	Unknown	Right	Pump	10	3
259.77	Agricultural	Left	Pump	9	2
259.67	Agricultural	Left	Pump	10	3
259.48	Agricultural	Left	Pump	6	1
259.48	Agricultural	Left	Pump	10	3
259.48	Recreation	Right	Pump	6	1
259.47	Agricultural	Left	Pump	10	3
259.47	Not in use	Left	Pump	6	1
259.2	Recreation	Right	Pump	4	1
259	Agricultural	Left	Pump	7	1
259	Recreation	Right	Pump	4	1
258.7	Agricultural	Left	Pump	1	24
257.49	Agricultural	Right	Pump	30	25
256.77	Agricultural	Right	Pump	7	1
256.32	Agricultural	Right	Pump	10	3
256.31	Domestic	Left	Pump	3	1
255.84	Agricultural	Left	Pump	Unknown	0
254.9	Agricultural	Right	Pump	7	1
254.9	Agricultural	Right	Pump	7	1
253.95	Agricultural	Left	Pump	13	5

TABLE B-1
Summary of Diversions along the San Joaquin River From Friant Dam to the Merced River

River Mile	Primary Use	Bank Location	Diversion Type	Intake Size (inches)	Maximum Diversion (cfs)
253.4	Agricultural	Left	Pump	16	7
252.28	Industrial	Right	Pump	8	2
251.6	Industrial	Right	Pump	7	1
251.57	Agricultural	Right	Pump	15	6
251.37	Agricultural	Right	Pump	8	2
251.16	Agricultural	Right	Pump	7	1
249.66	Agricultural	Right	Pump	7	1
248	Agricultural	Right	Pump	36	35
247.2	Agricultural	Unknown	Weir	Unknown	5
246.88	Agricultural	Right	Pump	48	63
245.41	Agricultural	Right	Pump	36	35
241.62	Not in use	Left	Pump	6	1
240.56	Agricultural	Left	Pump	12	4
230.89	Unknown	Left	Pipe	5	1
230.13	Agricultural	Right	Pump	5	1
230.06	Agricultural	Right	Pump	10	3
230.06	Agricultural	Right	Pipe	10	3
229.85	Not in use	Right	Pump	10	3
229.56	Agricultural	Right	Pump	4	1
229.35	Agricultural	Left	Pump	8	2
229.35	Agricultural	Left	Pump	8	2
228.89	Agricultural	Right	Pump	12	4
228.78	Agricultural	Right	Pump	24	16
228.78	Agricultural	Right	Pump	24	16
227.72	Agricultural	Right	Pump	10	3
222.75	Agricultural	Right	Pump	12	4
215.5	Agricultural	Right	Pump	Unknown	1
210.89	Agricultural	Left	Pipe	19	10
210.7	Agricultural	Left	Pipe	11	3
210.43	Agricultural	Left	Pipe	10	3
209.61	Agricultural	Left	Pipe	20	11
209.61	Agricultural	Left	Pipe	16	7

TABLE B-1
Summary of Diversions along the San Joaquin River From Friant Dam to the Merced River

River Mile	Primary Use	Bank Location	Diversion Type	Intake Size (inches)	Maximum Diversion (cfs)
209.61	Agricultural	Left	Pipe	16	7
209.61	Agricultural	Left	Pipe	11	3
209.61	Agricultural	Left	Pipe	11	3
208.83	Agricultural	Right	Pump	24	16
207.73	Agricultural	Right	Pump	12	4
207.06	Agricultural	Right	Pump	Unknown	1
206.5	Agricultural	Left	Pump	12	4
206.5	Agricultural	Left	Pump	12	4
206	Agricultural	Right	Pump	10	3
202.07	Agricultural	Left	Pump	3	1
202	Domestic	Right	Pump	3	1
195.38	Municipal	Right	Pump	8	2
180.6	Agricultural	Right	Pump	5	1
170.75	Agricultural	Right	Pump	10	3
159.9	Agricultural	Right	Pump	10	3
159.6	Agricultural	Right	Pump	12	4
156.92	Domestic	Right	Pump	6	1
156.87	Agricultural	Right	Flashboard Riser	18	9
156.67	Unknown	Right	Flashboard Riser	18	9
156*	Agricultural	Right	Weir	24	16
155.3	Agricultural	Left	Pump	10	3
154.7	Agricultural	Left	Pump	9	2
154.7	Agricultural	Left	Pump	9	2
147.2	Recreation	Right	Pump	16	7
144	Wildlife Refuge Enhance	Right	Pump	36	35
130.3	Agricultural	Right	Pump	18	9
125	Agricultural	Right	Pump	16	7

Source: CDFG (California Department of Fish and Game). 2001. San Joaquin River Fish Screens and Fish Passage Project.

Note: Does not include diversions in the Mendota Pool or in the bypass system. Additional diversions may have been constructed since this inventory was conducted in 2001.

* Location, intake size, and maximum diversion are approximate.

APPENDIX C

Summary of Proposed Restoration Actions and Required Evaluations

TABLE C-1
Summary of Proposed Restoration Actions and Needed Evaluations

Reach or Area	Restoration Action Proposed	Potential Impacts	Evaluation Needed	Approvals and Permits Needed	Additional Considerations
1	Reconstruct channel/side channels and add gravel for spawning habitat	Hydrology and flooding (changes in the shape of the river channel, possible erosion and sedimentation impacts); water quality; air quality; biology; cultural	Channel surveys; HEC computer modeling; biological and cultural surveys; engineering design	Land easements or acquisition; access agreements; NEPA; CEQA; ESA; CESA; CWA; CAA; CCAA; State Lands Lease; Fish and Game Code Section 1600 Agreement	None identified at this time
	Fill and isolate gravel pits	Same as above	Same as above	Same as above	Same as above
	Screen diversions	Possible changes in pump hydraulics and increase in maintenance activities	Possible computer modeling and hydraulics modeling depending on pump size; engineering design	Cooperation and access from owner; NEPA; CEQA; ESA; CESA; CWA	Environmental compliance may be minimal for smaller diversions
	Remove or reconstruct barriers to migration (road crossings)	Hydrology and flooding (changes in the shape of the river channel due to removal or addition of structures in the channel); water quality; air quality; biology; cultural	Channel surveys; HEC computer modeling; biological and cultural surveys	Cooperation and access from owner; NEPA; CEQA; ESA; CESA; CWA; CAA; State Lands Lease	Assumes that some or all road crossings would be reconstructed; impacts and analysis would be less if no or less reconstruction
	Diversion pump facility near Gravelly Ford	Hydrology and sediment transport (changes in the shape of the river channel caused by scour and incision); water quality; air quality; biology	Channel surveys; possible HEC computer modeling; biological surveys; engineering design	Access agreements; NEPA; CEQA; ESA; CESA; CWA; CAA; State Lands Lease	Need to stabilize channel, provide fish passage, and screening
	Riparian habitat	Potential to conflict with flood management actions; other environmental impacts likely minor	Landscape design; engineering analysis to ensure sufficient channel capacity would exist with mature habitat	NEPA; CEQA; ESA; CESA; CWA; CAA; Reclamation Board and LSJLD Encroachment Permit	Environmental impacts likely to be minor and streamlined analysis and permitting possible; need clearly defined set of goals for vegetation area and structure to manage conflicts with flood operations/capacities

TABLE C-1
Summary of Proposed Restoration Actions and Needed Evaluations

Reach or Area	Restoration Action Proposed	Potential Impacts	Evaluation Needed	Approvals and Permits Needed	Additional Considerations
2A	Construct levee and channel improvements	Hydrology and flooding (changes in river channel and flood characteristics); water quality; air quality; biology; cultural; groundwater; impacts to adjacent agricultural lands and resources as a result of increased seepage	Engineering design to determine need for levee improvements, slurry walls, setback levees, new floodplain, and low-flow channel including: geotechnical studies to determine depth and area of slurry walls; topographic and channel surveys; HEC computer modeling; groundwater surveys and monitoring; and an overall mitigation and monitoring program	Land easements or acquisition; access agreements; NEPA; CEQA; ESA; CESA; CWA; CAA; Reclamation Board and LSJLD Encroachment Permit; State Lands Lease and Land Transfer	All infrastructure is assumed to be owned by state with O&M by a local maintaining agency; O&M agreement and funding needed; long-term establishment of a low-flow channel may not be possible due to soft channel substrate and possible damage during flood events; need to maintain original design flood water surface elevation
	Riparian habitat	Potential to conflict with flood management actions; other environmental impacts likely minor	Landscape design; engineering analysis to ensure sufficient channel capacity would exist with mature habitat	NEPA; CEQA; ESA; CESA; CWA; CAA; Reclamation Board and LSJLD Encroachment Permit	Environmental impacts likely to be minor and streamlined analysis and permitting possible; need clearly defined set of goals for vegetation area and structure to manage conflicts with flood operations/capacities
	Redesign or modify Chowchilla Bifurcation Structure for fish passage and prevent entrainment	Hydrology and flooding (changes in river channel and flood characteristics); hydrologic study; water quality; air quality; biology	Topographic and channel surveys; computer modeling; biological surveys; engineering design	NEPA, CEQA; ESA; CESA; CWA; CAA; Reclamation Board and LSJLD Encroachment Permit	Redesign will increase O&M costs, agreement and funding needed; long-term O&M ESA and CESA compliance needed
	Screen diversions	Same as described for Reach 1	Same as described for Reach 1	Same as described for Reach 1	None identified at this time

TABLE C-1
Summary of Proposed Restoration Actions and Needed Evaluations

Reach or Area	Restoration Action Proposed	Potential Impacts	Evaluation Needed	Approvals and Permits Needed	Additional Considerations
2B	Construct levee and channel improvements	Same as for levee and channel improvements described for Reach 2A	Same as for levee and channel improvements described for Reach 2A	Same as for levee and channel improvements described for Reach 2A	Same as for levee and channel improvements described for Reach 2A; additional capacity to convey water right flows needed beyond restoration flow capacity; total capacity of 7,000 cfs needed (4,500 cfs Restoration Flow and about 2,500 cfs for water right flows)
	Riparian habitat	Same as described for Reach 2A	Same as described for Reach 2A	Same as described for Reach 2A	Same as described for Reach 2A
	Reconstruct San Mateo Road crossing	Hydrology and flooding (changes in the shape of the river channel); water quality; air quality; biology; cultural	Topographic and channel surveys; HEC computer modeling; biological and cultural surveys; engineering design	Cooperation and access from owners/county; NEPA, CEQA; ESA; CESA; CWA; CAA; Reclamation Board and LSJLD Encroachment Permit; State Lands Lease	Assumes that some or all facilities would be reconstructed; impacts and analysis would be less if reconstruction not necessary
	Screen diversions	Same as described for Reach 1	Same as described for Reach 1	Same as described for Reach 1	None identified at this time
Mendota Pool Bypass	Construct bypass channel	Hydrology and flooding (changes in river channel and flood characteristics); water quality; air quality; biology; cultural; groundwater; agricultural resources (seepage and construction-related)	Topographic and channel surveys; HEC computer modeling; biological and cultural surveys; groundwater surveys and monitoring; engineering design	Land acquisition; access agreements; NEPA, CEQA; ESA; CESA; CWA; CAA; Reclamation Board and LSJLD Encroachment Permit; State Lands Lease and Land Transfer	Assumed to be federal or state ownership and O&M by a local maintaining agency; O&M agreement and funding needed; long-term O&M ESA and CESA compliance needed; changes to current bypass system operating rules necessary; land acquisition or easements for lands between bypass and San Joaquin River needed
	Construct new upstream, bifurcation structure	Hydrology and flooding (changes in river channel and flood characteristics); Mendota Pool water operations; water; quality; air quality; biology.	Topographic and channel surveys; hydraulic computer modeling; biological surveys; engineering design for variable flow scenario operations	Generally the same as above	Assumed to be federal or state ownership and O&M by a local maintaining agency; O&M agreements and funding needed; long-term O&M ESA and CESA compliance needed; design must consider pool backwater effects

TABLE C-1
Summary of Proposed Restoration Actions and Needed Evaluations

Reach or Area	Restoration Action Proposed	Potential Impacts	Evaluation Needed	Approvals and Permits Needed	Additional Considerations
Mendota Pool Bypass (cont'd)	Fish screens and related fish bypass facilities	Generally the same as above; groundwater impacts unlikely from fish facilities	Generally the same as above; groundwater surveys and monitoring likely not necessary for fish facilities	Generally the same as above	Assumed to be federal or state ownership and O&M by a local maintaining agency; O&M agreement and funding needed; long-term O&M ESA and CESA compliance needed
	Reconfigure the Columbia Canal Company's water intake and related facilities	Hydrology and hydraulics; water quality; air quality; biology; cultural; agricultural resources (possible loss of agricultural lands for new or relocated facilities)	Topographic and channel surveys; biological and cultural surveys; engineering design	Land easements or acquisition; access agreements; NEPA, CEQA; ESA; CESA; CWA; CAA; Reclamation Board and LSJLD Encroachment Permit; State Lands Lease and Land Transfer (for new intake facilities)	Assumes a new river intake structure would be needed
	Riparian habitat	Same as described for Reach 2A	Same as described for Reach 2A	Same as described for Reach 2A	Same as described for Reach 2A
3	Construct levee and channel improvements	Same as for levee and channel improvements described for Reach 2A	Same as for levee and channel improvements described for Reach 2A	Same as for levee and channel improvements described for Reach 2A	Same as for levee and channel improvements described for Reach 2A; additional capacity to convey water right flows needed beyond restoration flow capacity; total capacity of 5,300 cfs needed (4,500 cfs Restoration Flow and about 800 cfs for water right flows)
	Replace or modify Sack Dam for fish passage	Localized changes in river hydrology; possible changes in diversion hydraulics	Channel surveys; possible computer modeling and hydraulics modeling; biological and cultural surveys; engineering design	Approval from San Luis Canal Company and access agreements; NEPA, CEQA; ESA; CESA; CWA; CAA; Reclamation Board and LSJLD Encroachment Permit may be needed; State Lands Lease	Fish facilities and/or new dam is assumed to be under federal or state ownership with O&M by San Luis Canal Company; O&M agreement and funding needed; long-term O&M ESA and CESA compliance needed
	Screen Arroyo Canal	Localized changes in river hydrology; possible changes in diversion hydraulics	Channel surveys; possible computer modeling and hydraulics modeling; biological and cultural surveys; engineering design	Approval from San Luis Canal Company and access agreements; NEPA, CEQA; ESA; CESA; CWA; CAA; Reclamation Board and LSJLD Encroachment Permit may be needed; State Lands Lease	Assumed to be under federal or state ownership with O&M by San Luis Canal Company; O&M agreement and funding needed; long-term O&M ESA and CESA compliance needed

TABLE C-1
Summary of Proposed Restoration Actions and Needed Evaluations

Reach or Area	Restoration Action Proposed	Potential Impacts	Evaluation Needed	Approvals and Permits Needed	Additional Considerations
3 (cont'd)	Screen other diversions	Same as described for Reach 1	Same as described for Reach 1	Same as described for Reach 1	None identified at this time
	Riparian habitat	Same as described for Reach 2A	Same as described for Reach 2A	Same as described for Reach 2A	Same as described for Reach 2A
4A	Construct levee and channel improvements	Same as for levee and channel improvements described for Reach 2A	Same as for levee and channel improvements described for Reach 2A	Same as for levee and channel improvements described for Reach 2A	Same as for levee and channel improvements described for Reach 2A
	Screen diversions	Same as described for Reach 1	Same as described for Reach 1	Same as described for Reach 1	Same as described for Reach 1
	Screen and modify Sand Slough Control Structure for fish passage	Localized changes in river hydrology; possible changes in diversion hydraulics	Channel surveys; possible computer modeling and hydraulics modeling; biological surveys; engineering design	Access agreements; NEPA, CEQA; ESA; CESA; CWA; CAA; possible Reclamation Board and LSJLD Encroachment Permit	Assumed to be owned by state and operated by a local maintaining agency; O&M agreement and funding needed
4B (Upper) Flow Routing	Decision on flow routing for Reach 4B (flows routed down the Mainstem or through the Bypass System)	Varies, see discussion for flow routes below	Compliance with paragraph 11 in the Settlement and related legislative requirements; study of alternative routes, costs, benefits, and impacts	Decision to be submitted to Congress prior to the restoration of any flows other than Interim Flows based on existing conditions	Stakeholder and local agency involvement needed in decision-making process; see discussion in Section 4
4B (Upper) Flows Routed Through Mainstem	Construct levees and associated river channel and floodplain	Hydrology and flooding (changes in river channel and flood characteristics); water quality; air quality; biology; cultural; groundwater; impacts to adjacent agricultural lands and resources as a result of increased seepage; impacts to residences and agricultural infrastructure	Engineering design to determine need for levee improvements, slurry walls, setback levees, new floodplain, and low-flow channel including: geotechnical studies to determine depth and area of slurry walls; topographic and channel surveys; HEC computer modeling; groundwater surveys and monitoring; and an overall mitigation and monitoring program	Land easements or acquisition; access agreements; NEPA; CEQA; ESA; CESA; CWA; CAA; Reclamation Board and LSJLD Encroachment Permit; State Lands Lease and Land Transfer	All infrastructure is assumed to be owned by state with O&M by a local maintaining agency; O&M agreement and funding needed; long-term establishment of a low-flow channel may be challenging due to high groundwater levels and possible damage during flood events; landowner issues must be addressed and mitigated

TABLE C-1
Summary of Proposed Restoration Actions and Needed Evaluations

Reach or Area	Restoration Action Proposed	Potential Impacts	Evaluation Needed	Approvals and Permits Needed	Additional Considerations
4B (Upper) Flows Routed Through Mainstem (cont'd)	Riparian habitat	Potential to conflict with flood management actions; other environmental impacts likely minor	Landscape design; engineering analysis to ensure sufficient channel capacity would exist with mature habitat	NEPA; CEQA; ESA; CESA; CWA; CAA; Reclamation Board and LSJLD Encroachment Permit	Environmental impacts likely to be minor and streamlined analysis and permitting possible; need clearly defined set of goals for vegetation area and structure to managed conflicts with flood operations/capacities
	Reconstruct road crossings	Hydrology and flooding (changes in the shape of the river channel); water quality; air quality; biology; cultural	Topographic and channel surveys; HEC computer modeling; biological and cultural surveys; engineering design	Cooperation and access from owners/county; NEPA, CEQA; ESA; CESA; CWA; CAA; Reclamation Board and LSJLD Encroachment Permit; State Lands Lease	Assumes that road crossings would be reconstructed
	Screen diversions	Possible changes in pump hydraulics	Possible computer modeling and hydraulics modeling depending on pump size; engineering design	Cooperation and access from owner; NEPA; CEQA; ESA; CESA; CWA	Environmental compliance may be minimal for smaller diversions
	Screen and modify Mariposa Bifurcation Structure for fish passage	Localized changes in river hydrology; possible changes in diversion hydraulics	Channel surveys; possible computer modeling and hydraulics modeling; biological surveys; engineering design	Cooperation and access; NEPA, CEQA; ESA; CESA; CWA; CAA; possible Reclamation Board and LSJLD Encroachment Permit	O&M agreement and funding needed; long-term O&M ESA and CESA compliance needed
4B (Upper) Flows Routed Through Bypass System	Construct levee and channel improvements	Same as for levee and channel improvements described for Reach 2A; increase channel width to compensate for riparian vegetation growth	Same as for levee and channel improvements described for Reach 2A	Same as for levee and channel improvements described for Reach 2A	Use of bypass system will increase O&M costs, agreement and funding needed; long-term O&M ESA and CESA compliance needed; may conflict with current authorization and purpose of the Bypass System; expanded authorization and purpose needed; long-term establishment of a low-flow channel may not be possible due to soft channel substrate and possible damage during flood events

TABLE C-1
Summary of Proposed Restoration Actions and Needed Evaluations

Reach or Area	Restoration Action Proposed	Potential Impacts	Evaluation Needed	Approvals and Permits Needed	Additional Considerations
4B (Upper) Flows Routed Through Bypass System (cont'd)	Riparian habitat	Potential to conflict with flood management actions; other environmental impacts likely minor	Landscape design; engineering analysis to ensure sufficient channel capacity would exist with mature habitat	NEPA; CEQA; ESA; CESA; CWA; CAA; Reclamation Board and LSJLD Encroachment Permit	Environmental impacts likely to be minor and streamlined analysis and permitting possible; need clearly defined set of goals for vegetation area and structure to managed conflicts with flood operations/ capacities
	Screen diversions	Possible changes in pump hydraulics	Possible computer modeling and hydraulics modeling depending on pump/diversion size; engineering design	Cooperation and access from owner; NEPA; CEQA; ESA; CESA; CWA	Environmental compliance may be minimal for smaller diversions
	Screen and modify Mariposa Bifurcation Structure for fish passage	Localized changes in river hydrology; possible changes in diversion hydraulics	Channel surveys; possible computer modeling and hydraulics modeling; biological surveys; engineering design	Cooperation and access; NEPA, CEQA; ESA; CESA; CWA; CAA; possible Reclamation Board and LSJLD Encroachment Permit	O&M agreement and funding needed; long-term O&M ESA and CESA compliance needed
	Modifications to drop structures for fish passage	Localized changes in river hydrology; possible changes in diversion hydraulics	Channel surveys; possible computer modeling and hydraulics modeling; biological surveys; engineering design	Access agreements; NEPA, CEQA; ESA; CESA; CWA; CAA; possible Reclamation Board and LSJLD Encroachment Permit	None identified at this time
	Pumps to drain adjacent agricultural lands	Would need electrical supply	Minor engineering design and evaluation	Cooperation of landowner	None identified at this time
4B (Lower)	Construct levee improvements	Air quality; biology; cultural; groundwater; impacts to adjacent agricultural lands and resources as a result of increased seepage	Engineering design to determine areas where levee improvements may be needed and determine the need for slurry walls; geotechnical studies to determine depth and area of slurry walls; topographic and channel surveys; groundwater surveys and monitoring; and an overall mitigation and monitoring program	Access agreements; NEPA; CEQA; ESA; CESA; CWA; CAA; Reclamation Board and LSJLD Encroachment Permit	None identified at this time

TABLE C-1
Summary of Proposed Restoration Actions and Needed Evaluations

Reach or Area	Restoration Action Proposed	Potential Impacts	Evaluation Needed	Approvals and Permits Needed	Additional Considerations
4B (Lower) (cont'd)	Riparian habitat	Potential to conflict with flood management actions; other environmental impacts likely minor	Landscape design; engineering analysis to ensure sufficient channel capacity would exist with mature habitat	NEPA; CEQA; ESA; CESA; CWA; CAA; Reclamation Board and LSJLD Encroachment Permit	Environmental impacts likely to be minor and streamlined analysis and permitting possible; need clearly defined set of goals for vegetation area and structure to managed conflicts with flood operations/capacities
5	Screen diversions	Possible changes in pump hydraulics	Possible computer modeling and hydraulics modeling depending on pump size; engineering design	Cooperation and access from owner; NEPA; CEQA; ESA; CESA; CWA	Environmental compliance may be minimal for smaller diversions
	Screen Mud and Salt sloughs	Localized changes in river and slough hydrology	Channel surveys; possible computer modeling; biological surveys; engineering design	Access agreements; NEPA, CEQA; ESA; CESA; CWA; CAA; Reclamation Board and LSJLD Encroachment Permit; State Lands Lease	None identified at this time

Abbreviations:

CAA = Clean Air Act

CEQA = California Environmental Quality Act

CESA = California Endangered Species Act

CWA = Clean Water Act

ESA = Endangered Species Act

NEPA = National Environmental Policy Act

Note: Only primary environmental regulations listed. Compliance with a variety of federal, state, and local regulations would be required.

emailed to Marcia 9/14

Statement on San Joaquin River Restoration Program (SJRRP), August 2007 Scoping Meetings by Michael Martin, Ph.D., Resident, P.O. Box 2216, Mariposa, CA 95338; September 14, 2007.

I am a California native, a lifelong flyfisher; environmental scientist; Adjunct Professor, Environmental Toxicology, Department of Biology and Chemistry, City University of Hong Kong; American Fisheries Society, Professional Fisheries Scientist; Chairman, Fisheries Committee, Upper Merced River Watershed Council; and member, Merced Flyfishing Club. I have fished in the San Joaquin River, as well its major tributaries. I am familiar with the history of the demise of its salmonid fisheries (along with many others in California), and am encouraged that SJRRP seeks to mitigate some of the injuries and damages to those salmonid fisheries caused by water diversions. I am particularly interested in the activities of SJRRP, with respect to its potential impacts and benefits to the restoration of the San Joaquin River AS WELL AS SIDE BENEFITs TO its key tributaries, including the Merced River. My comments are directed to the following two items that the SJRRP requested by this Public Scoping session. I apologize for not being present at the meeting but was out of the country at the time of the meeting. Before I address issues within your requested comments, I have two issues to bring to the attention of the Program.

Public Notification. One issue that I would like to highlight specifically is the need for SJRRP to seek public input, recommendations, comments, and advice from the interested public. Personally, I only found out about this Scoping Meeting by a haphazard search of the Restoration Planning effort on the Web, early this week. I recommend that your notification process include a wider array of media for advertising your activities (newspapers, public radio and TV announcements, and direct mailings) to residents of all counties with San Joaquin River tributaries, including the Mokelumne, Stanislaus, Tuolumne, and Merced Rivers' watersheds, as restoration activities may have an influential bearing on these tributaries and their anadromous fish populations.

Funding Diversion. A second overarching issue that is of concern to me is the perceived impression that fisheries agencies (especially those funded by federal Water Development Agencies) are diverting all of their anadromous fisheries management staff to the San Joaquin River project, because "that is where all of the money is". I learned of this item, while attending a NMFS Salmonid Restoration meeting in Sacramento earlier this year. I urge those agencies to continue to strive to restore those rivers that they have started on (particularly, the Merced River), and not abandon them simplybecause apparently there is more (or all of the money for staff?) money diverted to this new effort.

Now to the items that were requested by SJRRP in the Scoping Meeting:

Item 1. Implementing SJRRP agencies ask to hear on these issues:

1) What environmental issues and impacts should be evaluated in the environmental review?

Comment: Issues and impacts that should be evaluated in the environmental review are the effects of restoration plans and associated

activities on the 3 historical salmonid species in the San Joaquin Drainage and tributaries (spring-run Chinook salmon, fall-run Chinook salmon, and steelhead or rainbow). Planning and evaluation efforts should consider ways of optimizing habitat [spawning, summer holding, other season holding, riparian habit, cover (boulders and flow relief), and temperature]; evaluations of adverse water quality impacts (chemical and physical),and probably the most important factor water flows and flow timing. With only an average of 341 cfs/day/for a yearly cycle under dry weather, and 766 cfs/day for a yearly cycle under wet weather, water will arguably be the critical issue. Recycling of agricultural and domestic waste waters should be evaluated or considered ONLY with the precautionary principal as guidance. The project should seek more water for the fish.

2) What local knowledge or information can you provide to assist in the environmental review?

Comment: I can assist the project by providing anecdotal fishing information on San Joaquin River tributary waters. I can also provide volunteer professional recommendations on ideas/plans for salmonid restoration as a fisheries scientist. I have an extensive knowledge of environmental contaminants, and environmental toxicology with respect to aquatic life, and can provide assistance and consultation on issues with respect to the San Joaquin River. Also the "third party input" and "other stakeholder input" looks very poorly organized, and might benefit by a "third party litigant" subcommittee and an "other stakeholder" subcommittee. It is is possible that that might provide a forum and focus for such parties to discuss and resolve minor issues (similar to recently organized FERC process for application and permit relicensing).

3) What options and alternatives should be considered and evaluated?
   a) Fish Restoration (physical changes, flows, etc.)

Comment: An option to include 3 species of salmon (spring-run Chinook, fall-run Chinook, and steelhead) should be considered. Final restoration plan should include restoration of steelhead, along with other salmon species (spring-run and fall-run Chinook salmon), as they were historic components of the San Joaquin River fish fauna, and thus maintain consistency with the settlement agreement stipulation among the litigating parties. The environmental document should discuss all aspects of restoration planning, implementation, and monitoring of these 3 species. Currently, in watered reaches of the San Joaquin and its tributaries, steelhead and fall-run Chinook salmon occur in decimated historic populations, but marginally survive. NMFS has designated those ESA as threatened, and the plan and restoration activities should include actions to assist in restoration of those species, at the minimum.