

4.7 HYDROLOGY AND WATER QUALITY

SETTING

Climate

The San Joaquin Valley is bounded to the east by the Sierra Nevada and to the west by the Diablo Range. The Diablo Range forms a rain shadow and average annual precipitation decreases markedly east of the crest of the mountains. The majority of the annual precipitation falls as rain during the winter rainy season from November through April. The mean annual precipitation at the project site is between 10 and 12 inches per year (Rantz, 1971).

Surface Water

The project site is located on a gentle, northeastward sloping alluvial surface at the base of the eastern flank of the Altamont Hills. The elevation of the site ranges from approximately 160 feet above mean sea level (msl) along the central portion of the western boundary to less than five feet (msl) along the northern boundary. The eastern flank of the range is drained by northeastward flowing streams that discharge to the Sacramento-San Joaquin River Delta system, including Old River, which forms the northern boundary of the project site. The levee on the project site protects the site from flooding.

The Delta is one of the largest protected waterways in the western United States and one of the most valuable freshwater resources in California. Export of water from the Delta to other areas of California has been occurring since the completion of the Contra Costa Canal in 1940. The two major water export projects, the Central Valley Project and the State Water Project, control operations of the Delta-Mendota Canal and the California Aqueduct. The California Aqueduct ~~drains~~ **diverts** water from the Clifton Court Forebay facility in the southwest portion of the Delta. The Delta-Mendota Canal receives water pumped from intakes located near the northwest corner of the proposed project.

Several major modifications of the Delta water supply network are proposed for improving circulation within the Delta and increasing operational flexibility of the State Water Project (California Department of Water Resources, 1987). These modifications include channel widening in the north Delta and installation of proposed flow control barriers, or "tide gates," on Grant Line Canal, Middle River, and Old River. The temporary barrier on Old River has been installed within that reach of Old River forming the northern boundary of the project site. The barrier allows eastward flow during the rising tide and prevents westward flow during the falling tide to maintain increased water elevation within Old River. The barrier is operated primarily during the irrigation season when increased water surface elevation is most advantageous.

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A 5,400-foot long dredged canal (Westside Irrigation District Canal) along Wicklund Road forms the eastern boundary of the northeast corner of the project site (Figure 4.7-1). Levees on the western and eastern banks contain this canal which is open to Old River. West of the northwest corner of the project site, a levee has been constructed along the eastern margin of a small marina (Del's Harbor as shown in Figure 4.1-1).

Mountain House Creek

Mountain House Creek, which trends northeast-southwest through the central portion of the project site, is one of two northeastward flowing stream channels that traverse the project site (Figure 4.7-1). Two small earthen dams have been constructed off-site to create small ponds (Figure 4.7-1). Mountain House Creek is siphoned beneath two irrigation canals that are operated by the Byron-Bethany Irrigation District (BBID). The canals trend northwest-southeast, approximately parallel to the contours of the ground surface at elevation of 155 feet and 120 feet msl. "Canal 155" and "Canal 120" cross the southwestern corner of the project site (Figure 4.7-1).

Within the project site, the creek channel is wide with banks typically less than three feet high. Levees have been constructed by the farmers to minimize bank overtopping. The Creek flows under BBID Canal 70 at the approximate center of the project site (Figure 4.7-1). Downstream of this crossing, Mountain House Creek has a poorly defined channel to Byron Road. The creek flow is conveyed under Byron Road through three 36-inch culverts and under the small trestle for the Southern Pacific railroad.

Downstream of Byron Road, Mountain House Creek flows through a narrow irrigation ditch to a dredged cut at Old River. No natural channel exists through this area. With irrigation ditches not able to contain storm water flows, the area north of Byron Road has flooded during prolonged storms. The terminus of Mountain House Creek at Old River consists of an 800-foot long dredged cut that serves to collect low flow from the Creek. Water is pumped from the dredged cut and distributed by an irrigation system. Flow out of the cut is controlled by two 18-inch pipes into a channel connected to Old River. During dry periods, water is pumped from the channel to the dredged cut to supply irrigation water or is pumped from the channel into Old River. Levees contain the channel and pumping facility (Figure 4.7-1).

BBID and Mountain House entered into a Water Services Option Agreement on August 31, 1993 in which BBID in part agreed to continue to provide agricultural drainage as required by law, to lands within Mountain House which remain under agricultural irrigation provided that the Bankhead agreement belonging to BBID would be assigned to and become the responsibility of the Mountain House Community Services District (CSD) as of the date of executing the Water Services Option Agreement made effective on August 31, 1993. To the extent that the development and/or development activities within CSD increased the burden upon BBID to maintain the level of drainage services provided by BBID prior to execution of the Water Services Option Agreement, CSD agreed to provide the additional services required. CSD granted to BBID the right to use Mountain House Creek from Alameda County to Old River, or an alternate water course as determined mutually by CSD and BBID, for discharge of agricultural drainage water and current flood flows. CSD agreed to reasonably maintain

Mountain House Creek within San Joaquin County as a natural drainage channel as required by the above purposes.

Dry Creek

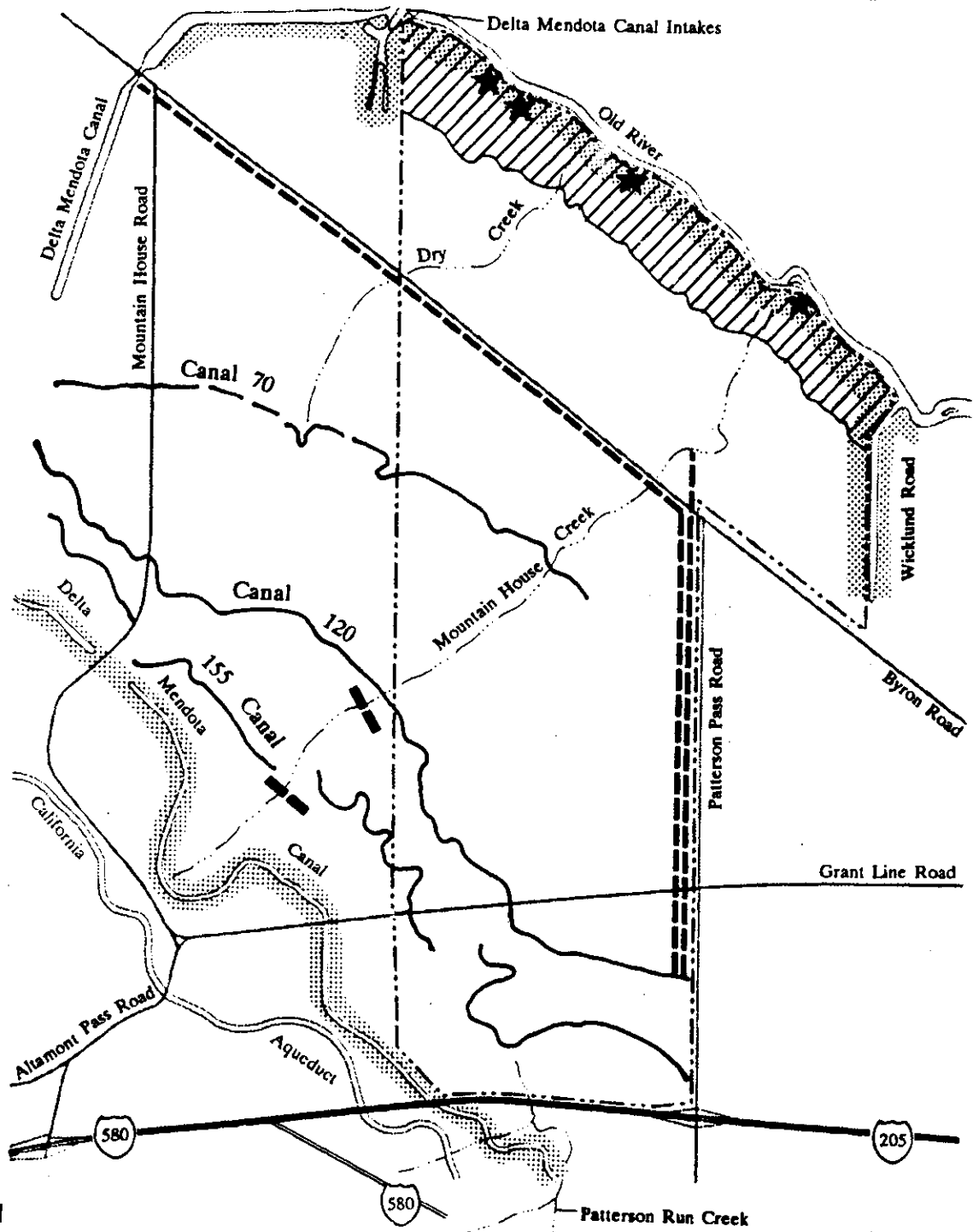
Dry Creek is located parallel to and approximately 8,000 feet northwest of Mountain House Creek (Figure 4.7-1). Dry Creek has a drainage area of about 6.8 square miles, extending into the foothills to the east. The natural creek channel has been significantly modified by agricultural practices downstream of the crossing of the Delta-Mendota Canal.

Internal Drainage






A network of numerous small ditches provides drainage of the interior of the project site. These ditches collect the majority of the site's surface water flow and also intercept shallow groundwater in some areas of the site. South of Byron Road, the majority of runoff is directed by the drainage




SITE DRAINAGE FEATURES

Figure 4.7-1



Legend

-  Area Subject to Flooding during 100-Year Event
-  Drainage Channel
-  Irrigation Canal
-  Earthen Dam
-  Farm Drain

-  Levee Slope
-  Pump Station
-  Project Site Boundary



BASELINE

ditches to three farm drains along Patterson Pass Road and Byron Road (Figure 4.7-1). Only minor amounts of runoff are directed into the Mountain House Creek channel. Northwest of Mountain House Creek, the ditches discharge to a 24-inch farm drain that runs parallel to and southwest of Byron Road (Figure 4.7-1). Water collected in this "Byron Road drain" is pumped northwestward and discharged to the Delta-Mendota Canal, located approximately 1.5 miles northwest of the western boundary of the site (Figure 4.7-1).

Runoff from the area southeast of Mountain House Creek is directed eastward to two parallel farm drains, parallel to and west of Patterson Pass Road. The most easterly of these drains is buried at a shallow depth and drains through a culvert under Byron Road and the Southern Pacific railroad track. Runoff collected by this drain discharges into the drainage ditches that define the modified channel of Mountain House Creek north of Byron Road. The other farm drain is perforated pipe set at a greater depth. The pipe functions as a shallow groundwater drain that discharges collected water to the Byron Road drain.

North of Byron Road, the farm fields are drained by ditches that direct runoff northward toward Old River. The runoff collects in ditches along the base of the Old River levee where it is pumped into Old River by four private pump stations (Figure 4.7-1).

Flooding

Levees within the Delta are constructed and maintained for Federal flood control projects ("project levees") or constructed and maintained by private landowners or local agencies ("nonproject levees"), such as reclamation districts. The levees at the project site along Old River and the Westside Irrigation District Canal are nonproject levees. Failure of nonproject levees is generally considered more likely because of uncertainty about the quality of construction.

The stability of Delta levees could be impacted by the raised water levels caused by sea level rise (Logan, 1990). Marginally stable levees may also fail during moderate to strong ground shaking expected within the Delta during large earthquakes on active regional faults (Finch, 1985).

The northern portion of the project site is identified by the Federal Emergency Management Agency (FEMA) as being within the 100-year floodplain of Old River (Federal Emergency Management Agency, 1988) (Figure 4.7-1). The flood zone forms a band, approximately 1,500 to 2,000 feet wide, along the base of the levee at the north end of the project site. Although the levee provides flood protection for the site during lesser storms, potential failure or overtopping of the levee during a 100-year event is implied by the inclusion of this protected area in the flood zone. The northern portion of the site may also be inundated by flood waters generated by failure of the dams impounding New Melones and San Luis reservoirs, large reservoirs outside the project area (San Joaquin County Office of Emergency Services, 1977).

The existing stream channels of the lower reaches of Mountain House and Dry creeks, including areas within the project site, are not able to contain storm flows during periods of intense precipitation. This problem has been exacerbated by increased sedimentation of these stream

channels and their limited size in relation to the volume of water to be carried. The majority of runoff is currently conveyed by farm drains that prevent flow into the creek channels. The runoff is carried by the drains and removed from the site by pumps that direct the runoff to Old River and the Delta-Mendota Canal. Flooding occurred within the project site and along the base of the levee at Old River during storms in 1982 when runoff exceeded the pumping capacity of the existing pump stations.

Subsurface Water

The depth to significant water-bearing zones, the direction of groundwater flow, and the potential aquifer yields in the area of the project are not well known. Available subsurface information suggests that the hydrogeologic conditions are complex in this area (Iwonima, 1991). Groundwater has been encountered at shallow depths (4 to 16 feet below ground surface) in borings drilled at the site for geotechnical investigations (Earth Systems Consultants, 1990). Although the project is not located in an area recognized as a significant recharge zone (San Joaquin County Flood Control and Water Conservation District, 1988), the shallow groundwater table is probably recharged from surface streams and overland flow during storms and irrigation.

The quality of the groundwater resources in the area of the project site is marginal. Water from wells in the area typically have relatively high total dissolved solids (TDS) concentrations (Miller, 1991). The high TDS is possibly related to salt water intrusion from the Delta or saline formation water. Relatively high concentrations of nitrates and sulfides have also been reported from wells in the area (Kaufman, 1991). High nitrate concentrations may be caused by livestock management at dairies or releases from household septic systems.

IMPACTS AND MITIGATION MEASURES

Significant impacts related to hydrologic conditions are those that cause substantial flooding or erosion; substantially degrade water quality; contaminate a public water supply; or interfere substantially with groundwater recharge. Although the implementation of the project would result in a significant increase in impervious cover at the project site, groundwater recharge would not be significantly reduced because the area is mantled by low permeability soils.

MASTER PLAN

Flooding caused by overtopping or failure along Old River could result in human injury and property damage within the northern portion of the project site. Flood protection in the Draft Master Plan is proposed by the construction of new levees parallel and landward of existing levees at the site. The new levees would be constructed in compliance with minimum Federal standards (44 CFR Chapter 1) and would provide protection from 100-year flood hazards. Construction of the new levees would allow preparation of a Letter of Map Revision by FEMA, which would revise the flood hazard designations within the project boundaries from within the 100-year flood zone to between the limits of the 100-year and 500-year floods.

Surface water quality within Old River and streams within the project site could be adversely affected by erosion and sedimentation related to site development. The Draft Master Plan proposes to minimize the deposition of sediment from Mountain House Creek into Old River through widening and deepening the channel to cause a reduction of flow velocity in the lower reach of the Creek. In addition, wetland check berms along the channel are proposed to reduce sediment transport to the terminus of the Creek. A reduction of sediment transport would also be caused by the incorporation of detention basins as an implementation proposed under the discussion of the Primary Storm Drain Collection System (Appendix C).

Proposed structures and facilities on the project site could be inundated by flooding within the 100-year floodplain. The 2,000-foot wide flood zone along the base of Old River levee is expected to be inundated by flood waters during a 100-year flood and possibly in the event of a dam failure outside and upstream of the project site. Flooding of the area may be caused by overtopping of the levee or levee failure. Levee failure could occur as the result of structural collapse of potentially weak sections of the levee during periods of high flow in Old River or during strong seismic shaking caused by a large earthquake on one of several regional faults. Proposed development within the flood zone includes residential uses in the northern portion of the project site. Flooding of this area could result in human injury and property damage.

The Draft Master Plan proposes construction of a new levee system to meet FEMA flood protection requirements for areas of the site currently identified as within 100-year flood hazard zones. The Draft Master Plan also proposes monitoring of the levee system to allow identification of developing problems. The project would provide adequate mitigation of the 100-year flood hazard.

At project buildout, almost all runoff would be carried by Mountain House Creek to Old River. Development of the project would result in the construction of areas of impervious cover that would increase the estimated discharge to Mountain House Creek during the 100-year event at the discharge point by Old River.

The proposed project includes modifications of the Mountain House Creek channel, including deepening and widening the existing channel. Without channel bed stabilization or specific velocity dissipation design, erosion of the bed and banks of the Mountain House Creek channel would be expected. Increased discharge and increased erosion would cause increased sediment loads in Mountain House Creek and possibly destabilize stream banks and stream crossing structures.

The project includes measures to minimize erosion and sedimentation in the Mountain House Creek channel and Old River through control of flow velocity, construction of berms, and structural streambank modifications.

Impact M4.7-1

Increased sedimentation within Old River would be caused by runoff from Mountain House Creek and operation of the proposed marina.

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The proposed project would concentrate runoff into Mountain House Creek and allow direct discharge into Old River during high flow events. The runoff from the lower portion of the Mountain House Creek watershed during low flow events currently does not flow directly into Old River. The sediment load carried by the runoff is currently deposited in the drainage channel on the site and in fields where ponding of storm water occurs. Implementation of the project would result in increased discharges of storm water runoff and sediment load at the terminus area along Old River.

During high flow events, sedimentation could possibly result in the formation of a sand bar in Old River at the discharge point of Mountain House Creek. Formation of a bar would decrease the depth of Old River and possibly cause changes in the hydraulics of the River. The discharge of sediment-laden water could also result in localized increase in the turbidity (suspended sediment load) in Old River. The quality of water entering the Delta-Mendota Canal may be degraded by the increased turbidity. The Canal supplies water for a large number of users throughout Central California.

Development of the proposed on-site marina could result in increased sedimentation in Old River. Shoaling at the outlet to marinas within the Delta is common. Sediment accumulation would ultimately interfere with operation of the marina and could cause changes in the hydraulics of the River. It is expected that periodic dredging may be necessary to remove accumulated sediment from the River. Suction dredging is commonly used for the expected scale of sediment removal. Increased turbidity during dredging could result in temporary degradation of water quality in Old River.

The dredged sediments may contain residual levels of salts, pesticides, herbicides, and metals. These materials have been used throughout the Delta for levee construction and other types of fill. These materials, if used in urban areas, could result in the exposure of people, particularly children, to health effects associated with the potential presence of toxins within the sediments. The disposal of dredged materials would be an impact associated with the dredging operation. A suitable disposal area would be required.

The Draft Master Plan does not directly address the potential impacts related to sedimentation caused by construction and operation of the proposed marina.

Mitigation Measure M4.7-1

The Draft Master Plan should include the following Objective, Policy, and Implementations under Parks and Recreation (Appendix C) as mitigation measures for reduction of sedimentation impacts related to construction and operation of the proposed marina:

"Objective:

"To ensure that the design and operation of private recreation areas do not adversely affect water resources.

"Policy:

"The marina on Old River shall be designed, constructed, operated, and maintained to minimize the accumulation of sediment within the marina and the Old River Channel.

"Implementation:

"a) A dredging plan shall be developed at the specific plan stage for the Marina portion of Neighborhood K along Old River for removal of accumulated sediment from the Old River channel in the area of the proposed marina outlet. This plan shall comply with the requirements of dredging permits issued by the U.S. Army Corps of Engineers and shall have provisions for controlling turbidity during dredging.

"b) Prior to obtaining a dredging permit, a disposal area for the dredged sediments shall be established by the applicant and approved by the Central Valley Regional Water Quality Control Board. The disposal area shall be identified in the recommended dredging plan. The characteristics and design of the dredge disposal area shall minimize the potential discharge of sediments to surface water and potential discharge of contaminants to the surface water or groundwater. A sampling plan to evaluate the potential levels of contaminants within the sediments shall be incorporated in the recommended dredging plan. The collected samples shall, as a minimum, be analyzed for trace metals, salts, pesticides, and herbicides."

Impact M4.7-2

Inadequate water circulation would potentially create water quality problems within the proposed on-site marina.

Modeling of water circulation within the proposed marina, performed for the FEIR (BASELINE, 1992a), has indicated that the maximum residence time for water in the marina would be 10 to 12 days. The relatively long residence time and low flow velocity within the marina could lead to stagnation and thermal stratification of the water. These conditions could cause prolific algal growth "blooms," particularly during summer and fall. The algal blooms would create increased marina maintenance requirements to control adverse odors and visual effects. Improper waste disposal practices, such as discharges of human waste, bilge water, or garbage, at the marina could increase the potential for degradation of water quality at the marina.

The Draft Master Plan does not address potential water quality impacts associated with the design and operation of the proposed marina on Old River.

Mitigation Measure M4.7-2

The following Objective, Policy, and Implementations are recommended for inclusion under Parks and Recreation (Appendix C):

"Objective:

"To minimize the potential for water quality degradation at the marina on Old River.

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"Policy:

"The marina shall be designed and operated to minimize the potential for water quality degradation associated with inadequate water circulation or waste discharge at the marina.

"Implementation:

"a) The design of the marina shall include, if necessary, a forced circulation system capable of reducing the residence time of water in the marina to less than five days. The marina design and operation plan shall be presented at the specific plan stage for Neighborhood K, which includes the marina.

"b) Convenient and adequate waste disposal facilities for human waste, bilge water, engine fuels and lubricants, and garbage shall be incorporated in the marina design and operation plan."

Impact M4.7-3

Water quality in Old River could be impacted by increased turbidity caused during construction of the proposed marina.

The construction of the proposed marina would require excavation and construction of levees. If the construction area is opened to water flow from Old River, increased turbidity and sedimentation within Old River could affect water quality and wildlife habitat.

The Draft Master Plan indirectly addresses potential water quality impacts of marina construction. The project proposes that grading operations adjacent to Old River be conducted in a manner to ensure that soil does not spill into Old River.

Mitigation Measure M4.7-3

The following Implementation should be included under the Objective and Policy proposed by Mitigation Measure M4.7-2:

"c) Construction of the marina shall be staged to delay breach of the Old River levee until construction of the marina basin is completed and stabilized. The Storm Water Pollution Prevention Plan for marina construction shall specifically require construction techniques to minimize erosion and sediment transport during and after breaching of the levee."

Impact M4.7-4

Shallow groundwater at the project site could present adverse conditions for construction of foundations and detention/retention basins. Ultimate development of the project site could cause a rise in shallow groundwater levels as a result of removal of subsurface drains.

Groundwater levels throughout the project site range from 4 to 16 feet below the ground surface. The eastern farm drain along Patterson Pass Road is perforated and serves to locally lower

groundwater levels. Removal of the drain during development of the project would result in a rise in the groundwater level. Higher groundwater levels could reduce the strength and increase the shrink-swell potential of soils underlying foundations and pavements. High groundwater levels could result in partial filling of proposed detention/retention basins excavated below the groundwater level, causing a reduction in the design capacity of the affected basins. Other subsurface drains may also be present in other areas of the site and may be removed or disturbed during project construction.

The Draft Master Plan does not address the potential impacts of high groundwater levels or increased groundwater levels caused by disruption of subsurface drains within the project site during project development.

Mitigation Measure M4.7-4

The following Implementation is recommended for inclusion under Objective 3 in Primary Storm Drain Collection System (Appendix C):

"e) Preliminary Soils Report. The soils report required for each subdivision shall identify the seasonal high groundwater level at the site of any detention/retention basins proposed as part of the stormwater management system. The report shall provide recommendations for appropriate design elevations for the detention/retention basins that would avoid saturation or partial filling by groundwater. The report shall specifically address the potential for increased groundwater levels caused by removal or disruption of existing subsurface drains. The report will provide recommendations for subsurface drains for all newly constructed structures or facilities. These recommendations all include provisions for routing and disposal of drain discharges that will not result in adverse flooding or saturation hazards within other areas of the project site."

Impact M4.7-5

Increased boating within Old River and the South Delta waterways, expected as the result of the operation of the proposed marina, would contribute to the erosion of levees by waves generated as boat wakes. Erosion could result in adverse sedimentation within the waterways and levee instability.

The operation of boats within the leveed channels of the South Delta waterways, such as Old River, create boat wakes. These boat wakes have sufficient energy to present a significant contribution to the processes that cause erosion of the levee slopes. Erosion of the levee slopes can potentially cause significant reduction of the stability of levees and increase levee maintenance costs.

The Draft Master Plan does not directly address the potential increased erosion of levees caused by increased boating activities.

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Mitigation Measure M4.7-5

The following Implementations should be added to the Draft Master Plan under Objective 1 in Flood Protection (Appendix C):

"g) The design of the levee improvements shall consider and mitigate the potential causes of erosion, including boat wakes. Possible design components for the prevention of erosion could include rock revetment structures, such as riprap. The erosion controls shall, to the extent possible, be designed to provide protection of existing riparian vegetation. Specific design components for erosion abatement shall be required as a condition of levee design approval.

"h) Boat speed limits to reduce the generation of potentially damaging boat wakes shall be established and enforced by the San Joaquin County Sheriff's Department, Boating Safety Division, in conjunction with other Delta area law enforcement agencies."

Impact M4.7-6

The sediment load transported by Mountain House Creek could be deposited within the project site, potentially interfering with flood control and the enhanced habitat function of the Mountain House Creek corridor.

The narrow, shallow channel of Mountain House Creek within the northern portions of the project site indicate that significant sedimentation is currently occurring. The sedimentation is expected given the low slope of the channel and the restricted outlet at Old River. The transport of the sediment load would be improved by creek channel modifications proposed by the project. However, the sediment could be transported to the northern end of project site and discharged to Old River, potentially degrading water quality. Alternatively, the sediment would be deposited in the proposed "flow reduction" lower reach of Mountain House Creek. Removal of sediments deposited in this reach would increase maintenance activities.

Mitigation Measure M4.7-6

The following Implementation should be added to the Draft Master Plan under Objective 2 in Mountain House Creek Improvements (Appendix C):

"• A sedimentation basin or other effective sediment control structure shall be designed and constructed near the point where Mountain House Creek crosses the western project boundary. The basin shall be designed to effectively remove sediment from the creek flows entering the project site. The basin maintenance shall be the responsibility of the CSD. The basin design and maintenance program shall minimize the potential for wetland development in the basin which could hinder the function or maintenance of the structure."

SPECIFIC PLAN I

Issues related to hydrology and water quality are addressed in several sections of the Draft Specific Plan I. Development under Specific Plan I would include modification of portions of Mountain

House Creek within the Central Mountain House subarea. The Creek modifications would include the construction of small earthen check dams within the Mountain House Creek channel to protect and enhance wetlands along the Creek. Policies and implementations that address the design, operation, and maintenance of proposed temporary retention basins are presented in the discussions of Primary Storm Drain Collection System and Best Management Practices in the Draft Master Plan (Appendix C).

Impact S4.7-1 (c)

Specific Plan I is inconsistent with the Master Plan regarding timing of development of streambed modification plans.

The Draft Master Plan requires that streambed modification proposals be presented in each specific plan. Specific Plan I defers such action until submittal of the first Development Permit. At such time, the applicant would submit a full Creek modification design to ascertain if the segment in Specific Plan I would function as a whole.

Mitigation Measure S4.7-1 (c)

The Draft Master Plan should be revised to require streambed modification proposals to be submitted to the County prior to submittal of the first Development ~~Agreement~~ Permit