Department of Water Resources Comments (October 19, 2007)
On Features of Stakeholder Coordination Group Visions
(feature labels are from SCG vision map key)

These comments are responding to the Task Force's request of DWR to help inform the Delta Vision process regarding the feasibility and potential challenges of implementing the two Stakeholder Committee Group (SGC) visions – Flexible Delta and Resilient Adaptive Delta. The comments reflect our current level of understanding and analyses to date. DWR's responses are based on the SCG alternative visions' features as described in text and shown on the preliminary graphic maps. Our comments are presented by key features. The features are coded using the map key from the SCG's visions report. For example, comments on specific features of the Flexible Delta are indicated by FD.1, FD.2 and so on. The Resilient Adaptive Delta features are indicated using RAD preceding each feature number. Staff addresses each of the individual features of both SCG's alternative visions.

One over-arching recommendation that applies to any permutation of the visions' key features is that a new approach be applied to Delta planning and management. This new approach needs to be centered around long-term, more durable and sustainable solutions to Delta issues. Certainly, DWR recommends implementation of early actions and other economically justified actions that move us toward those long-term solutions. However, this needs to occur within the context of implementing the long-term Delta solution that offers more comprehensive and sustainable benefits. An incremental approach composed of small steps then evaluation and another small step towards those goals does not recognize the crisis we face in the Delta from neither a biological productivity standpoint nor a water supply reliability point of view. We need informed long-term decisions that are adaptable and have the best chance for sustaining values of the Delta. These decisions need to address the conflicts between fish and water movement through the Delta and the long-term issues regarding predicted sea level rise, higher peak flood flows, seismic vulnerability and land subsidence.

"Flexible Delta" SCG Vision (FD)

FD.1 - Protect the existing island configuration but confine water conveyance to an armored channel along South Fork of Mokelumne and Middle River. Partially segregate the water conveyance system and aquatic habitat with operable gates connecting Old and Middle Rivers, and siphon the Victoria Canal under Old River to deliver water to the Clifton Court Forebay. Enhance habitat along Old River and in west Delta, potentially with setback and/or vegetated levees.

Middle River Corridor

This scenario entails the segregation of Middle and Old Rivers and creating a through the Delta conveyance separated from "river functions" and an aquatic habitat along the Old River section. The project also requires a siphon connecting Victoria Canal with Clifton Court Forebay. A feasibility scoping process may identify an alternative to the proposed siphon that would serve this alternative better. Overall, there is not enough detail for analysis at this time on the treatment of the first reach of Middle River, the channel between the bifurcation from Old River in the south-eastern Delta to the intersection with Victoria Canal and Trapper Slough. Based on feasibility, design, environmental review, and construction, this project would take at least 4 years to implement.

Preliminary Delta modeling studies evaluating a configuration of a Middle River Corridor

with barriers in the sloughs between Old and Middle River and a siphon from Middle River to the exports suggests upstream of Victoria Canal may run dry, water velocities may cause scour, there may be no measurable improvement in water quality and there may be reverse flows on the San Joaquin River. The Bay Delta Conservation Plan (BDCP) is evaluating a Middle River Corridor option. Modeling work is being done by CH2MHill. The analysis of this option (number 2) is contained in the BDCP options evaluation previously submitted to you.

With estimates of sea level rise up to 1 meter, the benefits of this alterative as a long term solution would be severely compromised in terms of both facility integrity (hydrologic and seismic vulnerabilities) and water quality. This conveyance configuration does not lend itself to facility integrity improvements once implemented. Raising and/or stabilizing levees to make this alternative move robust would be costly. The DRMS Phase 2 estimates that the armored pathway aspects of this alternative would cost about $9.8 billion.

Areas to be addressed for future system design include water quality, water levels, scouring velocities, and the reversal of flows in the San Joaquin near the mouth of Old River allowing water, and potentially fish, to move upstream and back into Middle River. Modeling studies should also incorporate the effects of climate change, specifically changes in hydrology and sea level rise. DWR's climate change report gives some insight on some potential climate change effects expected in the future. http://baydeltaoffice.water.ca.gov/climatechange/DWRClimateChangeJuly06_update8-2-07.pdf#pagemode=bookmarks&page=1

FD.2 - Rebuild Highways 12, 160, 84 and 220 on top of seismically safe, 100-year flood levees

The seismically safe highway rebuilding option can be engineered and constructed but it would be expensive relative to the transportation benefits that would occur. Based on DRMS Phase I analysis, seismically safe levees could cost as much as $35M to $90M/mile of levee. Not all levees where the roads are located would need to be seismically upgraded, as the seismic threat decreases eastwardly in the Delta. The draft DRMS Phase 2 report indicates that the benefit of protecting highways as stand alone projects is much lower than the costs to seismically upgrade, or raise the highways.

FD.3 - Maintain Sacramento and Stockton ship channel levees to protect channel use

The DRMS Phase 1 report indicates that a loss of either port during a major flood or seismic event has a very low consequence cost. Therefore, based on current usage, costs to protect these ports would have a very low benefit/cost ratio. Future studies may show that an increase in port activity as the result of demand, highway congestion and fuel costs may change this ratio.

Department of Water Resources Comments (October 19, 2007)
On Features of Stakeholder Coordination Group Visions
(feature labels are from SCG vision map key)

FD.4 - Protect Sherman, Twitchell, Brannan, Bradford, Webb, Jersey, Bethel, and Ryer Islands with seismically strong levees. Explore whether they are best protected by a continuous ring levees or individual island levees by conducting cost analysis and reviewing other considerations, such as boat access.

The DRMS Phase 2 report indicates that the cost to upgrade these islands to seismic safety would be about $8B (Ryer Island was not included, but Bethel Island was included in the Phase 2 report). However, the Phase 2 report also states that hydrodynamic model results show that the benefits in terms of the impacts of salinity intrusion were higher if the Southern Islands were seismically upgraded (Bacon, Byron, Jones Tract, Orwood Tract, Union, Victoria and Woodward). Additional studies are required to determine the choice in ring levees or individual island levees.

FD.5 - Provide seismically-safe flood protection for Delta legacy towns, Sacramento, W Sacramento, and Stockton area

This added flood protection is not addressed in the DRMS reports, however other than the Delta legacy towns, a judgment call would have to be made regarding the high cost of seismically upgrading these levees versus the relatively low probability of a seismic event in these areas.

FD.6 - Protect critical infrastructure, including the water conveyance channel, and a South Delta infrastructure corridor (including Highway 4, the Mokelumne Aqueduct, and the BNSF Railroad) with seismically safe levee

The DRMS Phase 2 report, which has a similar building block, shows that this work would have a benefit/cost ratio greater than 1, so it appears to be a worthwhile effort.

FD.7 - Recirculate some export water from California Aqueduct to San Joaquin River

The United States Bureau of Reclamation (USBR) has completed two Recirculation Pilot Studies (2004 and 2007). The pilot studies objectives were to determine both the benefits and impacts of such a program. Data from these pilot studies will be incorporated into a larger environmental document which Reclamation is preparing for the Delta Mendota Canal Recirculation Project. The Flow Science consultants, with technical assistance provided by DWR Delta Modeling, has begun modeling studies of the recirculation project for USBR.

A 2003 DWR modeling study report contributed to a USBR recirculation study. The two main analyses look at utilizing recirculated flow to supplement San Joaquin River flow during the VAMP period and during the February through June period (excluding the VAMP period).

FD.8 - Convert Webb Tract and Bacon Island to in-Delta water storage islands to create flexible management options :

Converting Webb Tract and Bacon Island to in-Delta water storage was evaluated by DWR as part of the In Delta Storage Project (IDSP) by several studies including the

Department of Water Resources Comments (October 19, 2007)
On Features of Stakeholder Coordination Group Visions
(feature labels are from SCG vision map key)

2006 Supplemental Report to 2004 Draft State Feasibility Study, In-Delta Storage Project:

Despite extensive analysis, significant concerns and uncertainties remain unresolved regarding water quality impacts (i.e. dissolved organic carbon, dissolved oxygen, temperature, taste and odor) facility integrity and the resulting cost required to generate the estimated project benefits.

Furthermore, since the preparation of this document, there have been developments in the Delta that will likely reduce the benefits of any in-Delta storage project. These changing circumstances include the decline in the abundance of pelagic organisms and increased focus on seismic instability, rising sea level, and global climate change and their potential effects.

Additional work to add to the existing body of information and further reduce uncertainty regarding the In-Delta Storage project proposal would require significant new investment in field testing, data collection and modeling to better understand the effects of DOC, DO, temperature, and taste and odor on project operations and potential water supply benefits.

Analysis done after the IDSP studies suggest that a major earthquake on one of the faults near the Delta could cause many Delta islands to fail, having major and long-lasting effects. While the FS provides an embankment design for Webb Tract and Bacon Island that could likely withstand a major earthquake, the same cannot be said for the surrounding Delta islands. Without the surrounding islands in tact, salinity intrusion into the central Delta would likely further limit IDSP operations.

The 2006 project cost for IDSP was $789 million (2005 dollars), and these costs should be updated due to substantial increases in construction costs over the past years. Water supply benefits provided 107,000 Acre Feet (AF) initially and increase to about 120,000 AF after a few years of project operations. The reduction in initial year exports is due to higher carbon loading rates in the initial years of operation that prevent releasing water high in organic carbon which adversely affect the cost of urban water treatment.

In Delta Storage effects on hydrodynamics and water quality can be found in the reports listed at http://calwater.ca.gov/Programs/Storage/StorageReports.shtml. One of the primary concerns of the study is organic carbon from the stored water and its effects on drinking water quality. The water quality report can be found at http://calwater.ca.gov/Programs/Storage/InDeltaStorage/WaterQualityInvestigations/In-DeltaStorageProgramDraftWaterQualityReport.pdf

Additionally, data or modeling from the 2004 Jones Tract Flooding may provide some additional insight. For instance, the bloom of algae in the flooded island caused taste and odor issues with the water. This phenomenon was not considered for In Delta Storage environmental review.

Considering islands for inundation should include evaluations of the interior bank of the levees as these interior sides would be affected by wave erosion caused by Delta winds creating waves in the newly inundated island. Additional studies of the effect on the

IDSP from global climate change trends and rising sea level as well as changes in snowpack melt and its timing are needed.

FD.9 - Extend Contra Costa intakes to Middle River to avoid Old River.

An extension of the Contra Costa Water District (CCWD) intake at Old River and Highway 4 to Victoria Canal is being sought by CCWD as part of their Alternative Intake Project. This project has a certified EIR/EIS. The alternative intake would function much like an extension to Middle River as proposed.

A Middle River intake alternative was studied in the District's environmental document, but it was not selected. For any changes in Delta configuration or hydrology, modeling studies should be conducted to evaluate the effects on Old river flows related to the proposed federal court ruling on Delta smelt litigation and possible future biological opinions.

FD.10 - Restore floodplain along the Sacramento River (upstream of city of Sacramento) for the benefit of splittail and salmon, and to increase nutrient and carbon flows to Delta. Improve salmon spawning gravels upstream of Delta

Floodplain restoration is a particularly worthy objective for habitat restoration. There is a strong body of evidence that well-designed floodplain projects support spawning and rearing of splittail, and rearing of juvenile salmon and steelhead trout. Similarly, floodplains have been shown to generate high levels of high quality carbon (phytoplankton) and invertebrate biomass that is transported downstream.

Spawning gravel restoration is also important since changes in hydrology and geomorphology over the last hundred and fifty years (largely due to attenuation of peak flood flows and the armoring/channelization of the river) has reduced gravel recruitment and hindered natural habitat rejuvenation processes, Research on locations such as the Mokelumne River shows that placement of new gravels can be a successful strategy.

FD.11 - Explore infiltration of floodwaters upstream to reduce Delta floods and replenish Central Valley groundwater

Groundwater recharge programs have been pursued in the Central Valley for half a century or more for the purposes of providing more sustainable groundwater supplies and mitigating groundwater overdraft.

The recent Sacramento-San Joaquin River Basin Comprehensive Study identified potential floodplain areas that could be used conjunctively with groundwater recharge. Any peak flood flow reduction or attenuation objective associated with groundwater recharge projects must be coupled with conveyance and surface storage projects. Direct recharge of floodwaters during typically short duration and high intensity flows is generally not very effective. Thousands of acres of land with permeable soils and a low water table would be needed for flood management to recharge groundwater. Even in maintained recharge basins in permeable soils, recharge rates are relatively low, on the order of one foot to as much as 10 feet per day. One ft/day translates roughly to 0.5 cfs per acre of recharge basin. In the Central Valley, land with suitable recharge

characteristics is found on alluvial fans above the flood basin areas. New conveyances would be needed to re-route flood flows and new flood management levees would be required to hold the water until it infiltrated into the subsurface over a large expanse of privately-owned land. Agreements, compensation and assurances with landowners would be required.

New and/or re-operated surface reservoirs would enhance the operation of groundwater recharge. When flood storage space can be evacuated by drawing down reservoirs to recharge groundwater over the course of several months, significantly more water can be recharged. When reservoirs are subsequently filled during the winter, the "banked" groundwater exceeds supplies that would otherwise be available. When reservoirs don't refill, the banked groundwater could be used to replace the surface supplies.

Groundwater recharge programs face a host of institutional and environmental challenges as well, most significantly the unaligned systems of surface water vs. groundwater rights. Alternative energy would be desired to avoid increased power demands of pumping banked groundwater as part of a conjunctive use program. Terrestrial habitat and species can also be impacted by the intermittent inundation typical of direct recharge operations. Direct groundwater recharge is land intensive. For example, direct recharge involves shallow inundation depths and relatively slow groundwater percolation rates. For the same amount of water volume stored within one year, the amount of land that must be inundated can be hundreds of times greater than that of surface storage.

Taking the above into consideration, groundwater recharge and groundwater banking should be aggressively pursued where they are feasible for water supply purposes. Groundwater recharge may even be in conjunction with floodplain management and other objectives when possible. To gain maximum benefit for groundwater recharge and floodplain management on a regional scale there should be coordinated operations with reservoirs.

FD.12 - Manage Yolo Bypass for splittail and salmon, and to increase nutrient and carbon flows to Delta. Ensure that flood conveyance capacity of the Bypass, and water quality in the North Bay Aqueduct, are maintained

As described for F.10, floodplains are a particularly important habitat type. There is a strong body of evidence that well-designed floodplain projects support spawning and rearing of splittail, and rearing of juvenile salmon and steelhead trout. Similarly, floodplains have been shown to generate high levels of high quality carbon (phytoplankton) and invertebrate biomass that is transported downstream.

FD.13 - Enhance channel configuration and hydraulics of Elk, Sutter, and Steamboat Sloughs to provide alternative route for migratory fish that avoids Georgiana Slough and the Delta cross-channel

Past studies have shown that Delta Cross Channel gate operations influence flows and fish migration in Elk, Sutter, Steamboat and Georgina Sloughs. Any changes to the configuration of these sloughs should be coordinated with potential reoperation of the Delta Cross Channel (DCC) gates or proposed Through Delta Facility. The Delta

Conveyance Branch will be conducting a Regional North/Central Delta Salmon Study in the winter of 2008-09 to determine salmon smolt out migration behavior and route selection. The data gathered from the study will be used to build a modeling tool to predict fish movement given various flow regimes and Delta Cross Channel operations.

A reconnaissance study done for the U.S. Army Corps of Engineers in the 1990's explored using the Sacramento Ship Channel as an alternate migratory fish route. The study showed that by allowing or increasing the flow through the Ship Channel while not increasing the flow coming into the Delta did show that more water and potentially more fish moved through the ship channel but it also increased the residence time for water that flowed through other areas of the North Delta.

A Delta Modeling study done by DWR Flood Management entitled Preliminary North Delta Temporary Barriers Feasibility Study (memo dated April 6, 2007) as part of emergency investigations looked at adding barriers to Sutter, Steamboat and the Sacramento River downstream of Georgiana Slough. This study looked at the improvement to salinity levels for drinking water not the effects on fish. It could provide some insights. It can be obtained by contacting the Division of Flood Management.

FD.14 - Improve hydraulic residence time and tidal exchange between Cache Slough and the Delta to contribute organic carbon, nutrients, and plankton to the Delta. Connect Cache Slough and Suisun Marsh hydrologically and terrestrially

The Cache Slough complex is a critical habitat region for the threatened delta smelt. It is a key spawning area, and supports rearing through at least early summer. Moreover, the region is thought to be an important "food bank" for downstream areas. Because of the latter function, providing net positive downstream flows to transport food could be a successful strategy. Therefore, Cache Slough area is likely the most beneficial location to improve foodweb conditions for Delta smelt since this was where the largest populations of Delta smelt has been recorded. Providing better habitat in the northwest Delta would reduce the likelihood of a larger smelt presence in the eastern and southern Delta.

FD.15 - Restore Mokelumne and Cosumnes River corridors. Enter into formal flood flow agreements with private landowners in the Stone Lakes area and other potential flood bypass areas. Explore opportunities to increase flood flow areas.

The Delta Suisun Marsh Office (DSMO) studies of flood corridors along the Mokelumne and Consumnes Rivers indicate that these corridors would be viable projects. DWR has not studied the Stone Lakes agreement, which is not part of the North Delta EIR.

FD.16 - ***Convert managed wetlands into tidal wetlands as habitat restoration in Suisun Marsh (currently a brackish water habitat). Restore tidal action in each region of the Marsh, as detailed in vision narrative***

Historically, the Suisun Bay region had large areas of tidal marsh. These ecosystems provided habitat for some of the native fishes, and were likely key "food banks" for the Delta. Currently, much of the marsh is managed for waterfowl and supports a strong hunting heritage. Efforts to restore tidal marsh to support native species are a worthy

objective. It is important to note, however, that the success of restoration projects depends very much on hydrology and topography. Elevations in some areas, particularly Grizzly Island are subsided, and due to limited sediment availability may not support the development of tidal marsh. Restoration at these locations may result in sub-tidal habitat which can be a haven for invasive species such as centrarchids. The potential to create self-sustaining fully functional tidal marshes is much greater around the perimeter of the marsh, where elevations are at or above mean tide level. However, the availability of these properties is limited by willing sellers as much of this area is privately owned. Successful creation of tidal wetlands is dependent on (1) the development of well-designed projects in appropriate locations, which would be self-sustaining and resilient to external forces such as sea level rise; and (2) maintaining a balance with existing waterfowl habitat values. The Suisun Marsh Management Plan that includes restoration plans and alternatives' EIR/EIS is expected by 2008.

FD.17 - Restore floodplains on the San Joaquin River, including flood bypasses on Paradise Cut and south of Vernalis

As noted, seasonal floodplains are beneficial to surrounding areas because they can attenuate a peak flood flow, thus relieving pressure on surrounding levees. Seasonal floodplains are a necessary element of a larger flood flow routing plan, but are not typically the only element. A flood plain proposed for Paradise Cut should also include a method by which these additional flood flows would be routed through the South and Central Delta before rejoining the San Joaquin River. Seasonal floodplains have also been shown to benefit native fish species such as salmon and steelhead.

Modeling studies evaluating the effects of a flood bypass on hydrodynamics and water quality would need to be completed. This analysis was not part of the Sacramento-San Joaquin Rivers Basin Comprehensive study (2002 report).

FD.18 - Restore tidal marsh on Decker Island, Dutch Slough, west end of Sherman Island, west bank of Sacramento River, and at other opportune sites in west Delta

As noted above, historically, the Delta and eastern Suisun Bay had large areas of tidal marsh. These ecosystems provided habitat for some of the native fishes, and were likely key "food banks" for the Delta. Hence, efforts the restore tidal marsh are a worthy objective. It is important to note, however, that the success of these projects depend very much on hydrology and topography. Elevations in some areas are heavily subsided and therefore may not support much tidal marsh. Moreover, inadequate tidal and net flows can make tidal wetlands a haven for invasive species (e.g. centrarchids, Egeria) and harmful algal blooms. Unfortunately, one such example is an early project on Decker Island, one of the locations listed for this action. Well-designed projects, such as Dutch Slough, should include an adaptive management strategy that would allow resource managers to "learn" from initial efforts.

FD.19 - Manage Bouldin Island and Holland Tract for terrestrial habitat

Within the context of overall levee management and drivers of change, the practicability of this habitat management will be evaluated. The BDCP is focused on aquatic species

and habitats and will integrate existing habitat conservation plans for terrestrial habitat management.

FD.20 - Focus new tourism and recreation along Hwy 160 and 12, in north Delta waterways, and in legacy towns. Permit legacy towns to grow at historic growth rates driven by internal, locally-driven needs to expand local economies

Many of the legacy towns along the rivers and sloughs throughout the Delta are protected by levees. These roads and towns are dependent on the levees and subject to public safety concerns.

"Resilient Adaptive Delta" SCG Vision (RAD)

RAD.1 - ***Conduct an action-oriented staged implementation of water conveyance along South Fork of Mokelumne and Middle River. Experimentally segregate the water conveyance system and aquatic habitat by gating connections between Old and Middle Rivers, and siphoning the Victoria Canal under Old River. Manage Old River for aquatic habitat. Simultaneously intensively study design, costs and benefits of isolated conveyance channel. See vision description for more detail***

See Flexible Delta FD.1

<u>Isolated Conveyance Channel</u>
The second project is the study of an alternative conveyance channel from the Sacramento River at Hood to Clifton Court Forebay through the eastern side of the Delta. The exact alignment is not defined. In addition to the alignment, details that would need to be decided upon during the project definition phase are; conveyance capacity, fish screen design, and operating rules. Such a channel is feared by south Delta farmers as causing low water levels and poor salinity. As with the first project, this project lacks definition on the treatment of the first reach of Middle River. In this particular case, the first reach of Middle River matters more because the alignment of the alternative conveyance facility appears to utilize Trapper Slough and Victoria Canal, which are separated by the crossing of Middle River. A permanent operable gate is proposed for this reach of Middle River under the South Delta Improvements Program, which may address some of the issues raised by south Delta farmers.

Some preliminary CALSIM modeling evaluating different capacities of an IF has been completed. Delta modeling studies would need to follow in order to evaluate the effects on flow patterns, water levels, and water quality. Additionally more specific multi – dimensional modeling would be needed to model the intake.

The contractor to the BDCP effort has finished its initial evaluation of Options which includes an isolated conveyance system as Option 4.

RAD.2 - Improve seismic and flood safety for Highway 4, the Mokelumne Aqueduct, and the BNSF Railroad by placing in South Delta infrastructure corridor. Improve seismic and

flood safety for Highway 12. Explore potential recreation and habitat benefits of setback levees underneath highways

Regarding the use of a South Delta infrastructure in an armored corridor, the DRMS Phase 2 report has shown this work would have a benefit/cost ratio greater than 1. However, improving Highway 12 appears to have a benefit/cost ratio on much lower than 1. DRMS did not evaluate the potential recreation and habitat benefits of setback levees underneath highways.

RAD.3 - Implement seismic risk reduction program on eight western islands. Explore use of cross-levees on island interiors. Explore dredging of Yolo Bypass and quarrying of Montezuma Hills to rebuild Sherman Island to sea level

See Flexible Delta FD.4
Due to time constraints, the use of cross-levees has not been looked at by the DRMS authors.

RAD.4 - Enhance habitat along Old River and in west Delta with setback and/or vegetated levees.

Historically, the Delta and eastern Suisun Bay had large areas of tidal marsh. These ecosystems provided habitat some of the native fishes, and were likely key "food banks" for the Delta. Creation of setback levees with tidal marsh or vegetated levees may therefore be helpful. It is important to note, however, that the success of these projects depend very much on hydrology and topography. Elevations in some areas are heavily subsided and therefore may not support much tidal marsh. Moreover, inadequate tidal and net flows can make tidal wetlands a haven for invasive species (e.g. centrarchids, Egeria) and harmful algal blooms.

RAD.5 - Extend Contra Costa Water District and East Contra Costa Irrigation District intakes to Middle River.

See Flexible Delta FD.9

RAD.6 - Restore floodplain along the Sacramento River (upstream of city of Sacramento) for the benefit of splittail and salmon, and to increase nutrient and organic carbon flows to Delta. Improve salmon spawning gravels upstream

See Flexible Delta FD.10

RAD.7 - Explore infiltration of floodwaters upstream to reduce Delta flood risk and replenish Central Valley groundwater

See Flexible Delta FD. 11

RAD.8 - Manage Yolo Bypass for splittail and salmon, and to increase nutrient and carbon flows to Delta

As described for FD10, floodplains are a particularly important habitat type. There is a strong body of evidence that well-designed floodplain projects support spawning and rearing of splittail, and rearing of juvenile salmon and steelhead trout. Similarly, floodplains have been shown to generate high levels of high quality carbon (phytoplankton) and invertebrate biomass that is transported downstream.

RAD.9 - Enhance channel configuration and hydraulics of Elk, Sutter, and Steamboat Sloughs to provide alternative route for migratory fish that avoids Georgiana Slough and the Delta cross-channel

See Flexible Delta FD.13

RAD.10 - Improve hydraulic residence time and tidal exchange between Cache Slough and the Delta to contribute organic carbon, nutrients, and plankton to the Delta, for the benefit of Delta smelt among others. Create a hydrologic and terrestrial connection between Cache Slough and Suisun Marsh

See Flexible Delta FD.14

RAD.11 - Restore Mokelumne/Cosumnes floodplain and McCormack Williamson Tract. Create Stone Lakes flood bypass

Modeling studies evaluating the effects of a flood bypass on hydrodynamics and water quality would need to be completed. This analysis was not part of the Sacramento-San Joaquin Rivers Basin Comprehensive study (2002 report).

A flood bypass could potentially conflict with the alignment of an Isolated Facility. Therefore a proposal to place a flood bypass in the area should be considered at the same time as a proposed isolated facility.

RAD.12 - Convert managed wetlands into tidal wetlands as habitat restoration in Suisun Marsh (currently a brackish water habitat). Restore tidal action in each region of the Marsh, as detailed in vision narrative

See Flexible Delta FD.16

RAD.13 - Restore seasonal floodplain on lower San Joaquin River, including flood bypass on Paradise Cut

Seasonal floodplains are beneficial to surrounding areas because they can attenuate a peak flood flow, thus relieving pressure on surrounding levees. Seasonal floodplains are a necessary element of a larger flood flow routing plan, but are not typically the only element. A flood plain proposed for Paradise Cut should also include a method by which these additional flood flows would be routed through the South and Central Delta before rejoining the San Joaquin River. Seasonal floodplains have also been shown to benefit native fish species such as salmon and steelhead.

RAD.14 - Restore tidal marsh on Decker Island, Dutch Slough, and west bank of Sacramento River

As noted above, historically, the Delta and eastern Suisun Bay had large areas of tidal marsh. These ecosystems provided habitat for some of the native fishes, and were likely key "food banks" for the Delta. Hence, efforts the restore tidal marsh are a worthy objective. It is important to note, however, that the success of these projects depend very much on hydrology and topography.

RAD.15 - Purchase terrestrial habitat and wetlands easements from willing landowners. Maintain working landscapes that also serve ecological and recreational enhancement goals. Explore trail development in eastern Delta uplands

Terrestrial habitat helps address subsidence and water quality. Multiple objective easements are used by DWR for floodplain management and incorporating various management approaches into a comprehensive plan for working landscapes feasible. Levee management is key to the success of such a program. Trail development should be comprehensively and collaboratively planned to avoid conflicts with habitat development.

RAD.16 - Explore creation of tidal habitats on selected portions of Fabian Tract and Netherlands Tract

There are no DWR studies for tidal habitat creation on Netherlands Tract and Fabian Tract, and future studies could explore the potential to create tidal habitat and/or seasonal floodplain habitat (as appropriate) in the Delta – including at these two extreme-north and extreme-south Delta locations. As with other locations, well-designed projects, with an adaptive management strategy would allow resource managers to "learn" from initial efforts.

RAD.17 - Explore controlled inundation of selected western Delta islands (especially Webb and Bacon) for operational flexibility in water management, ecosystem management and levee failure risk reduction

Various studies including the DRMS Phase 2 report looked at various combinations of flooding different islands in the Delta. Selected islands were investigated for flooding in the Western, Eastern, and Southern Delta. The most promising option appears to be selecting sets of islands in the Southern Delta and leaving those islands closed to tidal exchange. Bacon Island is one of the Southern islands selected to be flooded.

In-Delta Storage effects on hydrodynamics and water quality can be found in the reports listed at http://calwater.ca.gov/Programs/Storage/StorageReports.shtml. One primary concern (for drinking water) of the study is organic carbon from the stored water and its effects on drinking water quality. The water quality report can be found at http://calwater.ca.gov/Programs/Storage/InDeltaStorage/WaterQualityInvestigations/In-DeltaStorageProgramDraftWaterQualityReport.pdf

Any data or modeling from the Jones Tract Flooding may provide some additional insight. One potential change not strongly considered for In-Delta Storage but that occurred with the Jones Tract flooding was the bloom of algae that caused taste and odor issues.

Considering islands for inundation, even controlled inundation, should include evaluations of the interior bank of the levees as these interior sides would be affected by wave erosion caused by Delta winds creating waves in the newly inundated island.

RAD.18 - Explore creation of perennial, non-tidal habitats on Bouldin Island, Holland Tract and elsewhere

Perennial, non-tidal habitat creation is feasible. Within the context of overall levee management and drivers of change, the practicability of this habitat creation will be evaluated. The BDCP is focused on aquatic species and habitats and will integrate existing habitat conservation plans for terrestrial habitat management.

RAD.19 - Concentrate tourism and recreation investments along Hwys 160 and 12, in north Delta waterways, and in legacy towns. Permit historic sustainable growth to allow for socially and economically viable communities in legacy towns

Many of the legacy towns along the rivers and sloughs throughout the Delta are protected by levees. These roads and towns are dependent on the levees and subject to public safety concerns.