M & T / Llano Seco Fish Screen Facility
Short-Term/Long-Term Protection Project

Orientation and Information Workshop

November 12 – 14, 2003
Llano Seco Ranch Headquarters
Chico, CA

M I N U T E S

Wednesday
November 12, 2003

A site visit on the river was conducted (See Attachment 1 – photos) by Olen Zirkle, Ducks Unlimited, Inc. (DU), using river boats provided by U.S. Fish and Wildlife Service and California Department of Fish and Game. The following individuals attended:

Yantao Cui, Research Scientist, Hydrology/Geomorphology
Wade Flournoy, Engineering, Equipment Operator, U.S. Fish and Wildlife Service
Kevin Forester, Project Leader, Sacramento Valley National Wildlife Refuge, U.S. Fish and Wildlife Service
Jim Gaumer, Consultant Engineer, M&T Chico Ranch
Michael Harvey, Principal Geomorpholgist, Mussetter Engineering, Inc.
Les Heringer, Manager, M&T Chico Ranch
Eric Larsen, Research Scientist Geology
Chris Leininger, Project Development, Ducks Unlimited, Inc
Robert Mussetter, Principal Engineer, Mussetter Engineering, Inc.
David Sieperda, Manager, Rancho Llano Seco
Paul Ward, Associate Fishery Biologist, Region 2, California Department of Fish and Game
Olen, Zirkle, Manager, Conservation Programs, Ducks Unlimited, Inc.

Thursday
November 13, 2003

Introductions

The first Workshop was held at Llano Seco ranch headquarters, 8369 Hugh Baber Land, Chico, CA, beginning at 8:00 a.m. The meeting was facilitated by Olen Zirkle, Conservation Programs, Ducks Unlimited, Inc. (DU) and introductions were made by the following list of individuals:

Koll Buer, Chief, Geologic Investigations Section
Stephen Caswell, Project Engineer, Corollo Engineers
Yantao Cui, Research Scientist, Hydrology/Geomorphology
Dennis Dorratcague, Principal Engineer, MWH Americas
Woody Elliott, District Resource Ecologist, California Department of Park and Recreation, No. Buttes District
Rebecca Fris, Restoration Coordinator, Calfiornia Bay-Delta Authority
Jim Gaumer, Consultant Engineer, M&T Chico Ranch
Michael Harvey, Principal Geomorpholgist, Mussetter Engineering, Inc.
Les Heringer, Manager, M&T Chico Ranch
Brian Kinnear, ESA Biologist, National Oceanic & Atmospheric Administration
Eric Larsen, Research Scientist Geology
Chris Leininger, Project Development, Ducks Unlimited, Inc
Fritz McKinley, Director, City of Chico, Department of Public Works
Dan McManus, Hydrogeologist, California Department of Water Resources

Robert Mussetter, Principal Engineer, Mussetter Engineering, Inc.
Vickie Newlin, Sacramento Valley Regional Coordinator, California Bay-Delta Authority
Scott Parker, Project Manager, Corollo Engineers
David Sieperda, Manager, Rancho Llano Seco
Robert Strand, Consultant Engineer, MWH Americas
Marc Sulik, Supervisor, City of Chico, Water Pollution Control Plant
Neil Schild, Principal Engineer, MWH Americas
Dick Thieriot, Owner, Rancho Llano Seco
Ken Walters, Supervisor, Resource and Planning, California Department of Parks and Recreation
Paul Ward, Associate Fishery Biologist, Region 2, California Department of Fish and Game

After introductions were made Olen presented an overview of the project scope of work. He explained that CALFED requested that expertise from outside the state be brought together to develop a realm of possibilities that will support a long-term solution to the problems identified in the M&T/Llano Seco Fish Screen Facility Project. This first Workshop has been convened to discuss possibilities and scenarios that will address sediment deposition that threatens the functionality and operations of the pumping and fish screen facility, as well as, the City of Chico Wastewater Treatment Plant Outfall and the natural function of river meander. Issues papers will developed from the exchange of knowledge presented at this first workshop that will discuss possible alternatives to solve the problems associated with the diverting surface water in the Sacramento river and the pumping location. Once these issues papers have been drafted, they will be circulated to the Steering Committee members for further input and a third workshop will be convened to provide an opportunity for the stakeholders and scientists to test and refine an understanding and potential for unintended effects between managing the natural riverine system, fisheries requirements and pumping requirements for the identified potential solutions.

Olen explained that the selected alternatives or recommendations will be presented to CALFED for their review by June 2004 in a proposal format that will request on-going support to further develop the recommendations for eventual implementation.

Historic Background

Olen introduced Les Heringer who presented historical background of the previous M&T/Llano Seco Fish Screen Facility Project. Les presented maps and aerial maps to more graphically explain the history. He discussed the gravel bar encroachment, presented photos of flood stages and regular flows stages. He also brought copies for the committee members of the pumping plant and fish screen specifications.

Les explained the early collaborative planning effort that was conducted with City of Chico, U.S. Fish and Wildlife Service, California Department of Fish and Game (DFG) and The Nature Conservancy. He explained the 1989 sale of part of the ranch to U.S. Fish and Wildlife Service (USFWS) who then became a diverter to supply water to wetland areas. In 1984, as a result of the impacts to the fishery in Big Chico Creek associated with the M&T Pumps, a feasibility study was conducted by CH2MHILL to move the Big Chico Creek pumping facility to a new site in the Sacramento River. Les further explained that Montgomery Watson was awarded the contract to build the new pumping facility and fish screens. Construction for the new pumping plant was begun at the end of 1996 with funds from USFWS and CALFED. In connection with moving the pumping facility, 40 cfs of adjudicated water, that would have gravity flowed to the M&T Chico Ranch and Rancho Llano Seco, was allowed to remain in Butte Creek for salmon restoration. The project to relocate the pumps was completed in 1997.

Since the relocation, Les described the migration and removal of the gravel bar that is currently threatening the facility in the river. The gravel bar began to migrate in 1997. Les also described the threat to the City of Chico's wastewater outfall downstream from the pumping facility.

In late 2000, the gravel bar created a significant threat to the pumping facility and the outfall. At that time, a study was conducted by Stillwater Sciences to understand the problems and develop recommendations for a short-term solution. The study recommended that the gravel bar be extracted to the 1996 position until an alternative could be determined for the long term. Removal of 144,000 yards of gravel cost $300,000;

$100,000 for permits and mitigation; City of Chico shared one-half of the costs and the two ranches shared the other half. Les paid tribute to the significant cooperation between the private, state and federal stakeholders and entities who facilitated the gravel bar extraction. It took one year to put together the permits, an incredibly short time period.

Les explained that the pumping facility has become a year-round facility to ensure a water supply to agriculture and to wetlands. When the ranches were only involved in agriculture, the system was utilized for 6 to 8 months. Due to the mix of farming and wetlands, it has now become a year-round system.

Olen attributed the M&T relocation project as being the front runner to a series of screen projects in the Sacramento River that have resulted in almost 80% of the major diversions now being screened. This Initial screen projects set the tone for literally 80% to 90% of all major diversions up and down the river. Olen attributed M&T relocation project, under Les' leadership, as the signature project that set the tone and initiated restoration of significant anadromous fish habitat.

Paul Ward gave a history of listing of salmon in the Sacramento River; a history of funding by state and federal agencies to find solutions that would result in implementation actions. Paul described the issues of diversions and their impacts on spring run Chinook and steelhead in Butte Creek and Chico Creek. He explained how collaborative efforts were implemented to remove dams, construct fish screens and improve flows in Butte Creek and Chico Creek.

Paul explained that there appears to be conflicting objectives. We have some rigid requirements for fish screens and for fish passage, but we also have a larger need along the river to allow or even mimic a natural river meander. The contradiction here is that they may be mutually exclusive. He explained that part of the charge for this Steering Committee is to understand how to resolve this contradiction.

Question to Paul: How rigid is the infrastructure of the fish screens?

Reply: Fish screen standards developed in the late 1980's and 90's by DFG and the National Oceanic & Atmospheric Administration (NOAA) are fairly rigid in terms of the hydraulic characteristics. There are exceptions, but they have never been tested. When previous projects where implemented, the issues were focused on fish restorations and not wildlife habitat restoration.

Discussions were held about recruitment gravel processes in the river and the connection with river meander. The discussion focused on the approach to maintain as much natural function of the river as possible within existing constraints, whether it be levees or hard points; and, not totally trying to recreate what the Sacramento River was before development. Associated costs and uncertainties regarding river restrictions were discussed.

Paul discussed research conducted to understand habitat opportunities for out-migrating salmon. This restoration may provide habitat for juveniles to reside in before exiting the river system; acknowledging benefit of having structural variety in a water system within the constraints of our own human needs.

Les explained that since the beginning of the Sacramento River Conservation Area program in 1986, participants have recognized that hard points were necessary. Woodson Bridge and Butte City Bridge are in the process of designing structural protections from river meander.

Question was raised about the consideration of Shasta Dam and the long-term impact on the river from the dam. Is meander being impacted because there is no gravel recruitment due to the dam (the dam is an artificial situation created by man and up to man to mitigate)?

Mike Harvey explained that this is a difficult question to answer. If you take the book model, rivers should respond a certain way below a dam for a number of reasons; typically, because the hydrology is changed and the sediment supply is cut off. On the Sacramento River, at least further down the system, the bed should get coarser and there should be more bank erosion to compensate for the reduction in upstream sediment supply. This, however, just depends on balance of how the flows are affected. The reach, where

the M&T Pumps are located, has stayed stable for a long period of time and that's one of the reasons that the pump site was selected. And, in the more recent past, things are suddenly starting to happen again. Part of the dynamics is the flood sequence that has been fairly active recently. The other thing that might be happening (pure speculation) is that, if we are in fact running out of sediment, we are starting to see the impacts of the upstream dams and sand and gravel mining in the upstream tributaries. One of the things we might see is an increased rate of bank erosion to resupply sediment. The river has a certain capacity to transport sediment and it will get it from somewhere. If its not being supplied, the next easiest place to acquire sediment is the bank. And, one of the reasons we are seeing more activity in this reach and in the longer run of the river, might be that we are running out of an upstream sediment supply. Mike qualified that by saying it's pure speculation on his part. However, it might help support concerns that a local solution developed for the M&T Pumping Plant problem may need to look at river movement farther upstream. Is there the possibility of having to lock the river in from upstream of Scotty's and more or less revet the whole west bank to ultimately hold the river in that location? This is an important question.

A discussion was held regarding the Glenn-Colusa Irrigation District (GCID) Diversion and how similar issues compared to the M&T Project. The problem is not the actual structure, although is creates some localized effects. The problem is one that this group needs to think about seriously for this project – there is an old revetment at river mile 208 that was constructed under the U.S. Army Corps of Engineers (COE) Chico Landing to Red Bluff authorization in about 1978. It hasn't been maintained and the revetment is coming apart. If that revetment fails, the present facility could be flanked if you look at the probable rates of migration of bends of that radius within the project life of GCID. It has nothing to do with the local problem; it's what's going on up the river. Yet the structure is at river mile 206 and the problem is at river mile 208 where the threat exists. The M&T may be the exact same thing in the long-term – a local fix and eventually the river takes off and the fix is flanked.

There is a possibility that the river may go around the facility. If you apply just the average rates of migration and average rates are dependent on the flood sequence (a flood-driven system). If you get a 50-year project life, then there is a real possibility that upstream revetment falls in further and the river could bypass the structure on the east side. This is a problem that must be thought about.

Paul commented that this project is the first of about four existing new fish screen facilities that have similar issues and three of those facilities are below the M&T Project, however, not to this stage – Provident, Princeton-Cordora, Glenn. It's likely, that in the lifetime of Reclamation District 1004, the river may flank to the east created sediments issues for Reclamation District 108. The present M&T project is setting a baseline for how we deal with these sorts of issues. The Sacramento Conservation Area process has tried to address the concern that everyone along the river would like to have a hard point to protect their properties and improvements. Paul suggested that this project may need to be qualified as a hard point. However, strong justification must be advanced to substantiate that decision, otherwise we rip rap the entire river.

Bob Mussetter commented that the direct effect of cutting off the sediment supply upstream is seen in the river dynamic as they work down through the system. In particular, coarse materials that supply to sites like the M&T comes from a more local area in the near term resulting from the migration and movement of the river. So that, every time you pin the river, you just accelerate that process more and more. Obviously, that must be done in places, but the more you lock the river in, the more you cut off the supply between the dam and the site. He felt this observation is something to evaluate.

Eric discussed the question of dealing with the Woodson Bridge issue where there was erosion into the State Recreation Area and the infrastructure of the bridge. The current thinking is to allow not only river meandering but river avulsion to solve the problem. This would utilize the natural dynamics and avulsion to solve the problem in more cost effective way than by traditional rip rapping. For the first time, the COE is going to remove rip rap upstream. Removal will take place two miles above the bridge and be placed downstream along the bank where the river is eroding.

The comment was made that Shasta Dam is located 100 miles upstream. It is certain that the dam is cutting off sediment, however, there are tributaries contributing to significant sediment supplies such as

Cottonwood Creek that has no dams. There are also Thomas Creek, Reeds Creek, and other streams making such contributions. As mentioned, the starvation of gravel from Shasta is moving downstream and is currently being assessed over a period of time by measuring the size of the bottom sediment and watching the armoring process that is taking place. The armoring process is now going on all the way down to about Cottonwood Creek. From there on Cottonwood Creek seems to be able to supply the spawning gravel for that particular reach all the way to Red Bluff. Below Red Bluff, most of the gravels still come from bank erosion, 85% according to some calculations. It's important to have that bank erosion occur somewhere and if you plan on putting rip rap on opposite bank of the pumping plant here Eric suggested, that you can mitigate for it by removing rip rap from somewhere else.

Mike Harvey explained that there is a lot of rip rap in the Butte Basin that was put in with the very best of intentions to basically maintain flow splits into the Butte Basin. You could argue now that some of the rip rapping is probably not necessary based on more recent information. It appears that the river self compensates in terms of how it keeps flows in the channel and how it puts flows out. The COE funded Ayers & Associated to study County Road 29 evaluation 2D Model of the whole system. It appears as though there is a self-balancing system that is not as dependent on maintaining the existing planform of the river as was previously thought.

Paul concluded the historical background by reviewing the life-history requirements of Chinook salmon in the river.

Review of Project Hypothesis and Conceptual Model

Olen presented the group with a handout of the Conceptual Model and reviewed the working hypothesis and project goal. He explained the critical path of the Conceptual Model and how the evaluations of the recommended alternatives must meet fish screen criteria, pumping requirements and river meander, as well as, engineering and feasibility criteria. The conceptual model provides an off-ramp for a non-goal alternative that cannot meet any of the acceptable criteria. The charge of the Steering Committee is to test developed recommendations against the criteria. Once agreement has been made on an approach, a proposal will be written for review by CALFED.

Olen anticipated that the project would not begin implementation until 2008 or 2010. Olen explained the following chronology:

- Planning Process - Spring 2004
- Request for Funding –Planning – Summer 2004 or Fall 2004
- Money Available by mid-Summer 2005
- Begin Planning and Environmental Documentations (1 to 11/2 yrs) 2006 – 07
- Write another proposal to build the project 2008
- Implementation between 2008 – 2010

Olen further explained that there is funding available to remove the gravel bar one more time. If the movement of the river triggers another gravel bar extraction, late fall of 2005 would be time to extract the bar back to the 1996 level. This action would provide an increased operating time of two to three years while the project proceeded to implementation. (cost: approx. $325,000) If there is a higher estimated cost, the group will request a budget change amendment. A key point was made that the gravel bar extraction should be initiated to keep the material at a manageable level.

Olen explained that proposals for this project will be slated for final consideration even though it will be submitted during the state competitive grant process.

CALFED Goals

Since Rebecca Fris, Restoration Coordinator, Bay-Delta Authority (CBDA), had not arrived at the meeting yet, Vickie Newlin, Regional Coordinator for the CBDA, gave an overview of the expectations for the project. She explained that the Record of Decision sets a standard to create a meander corridor in the Sacramento River that includes an adaptive management approach. CBDA is asking the Technical Committee to evaluate options, to be creative, to be science-based and innovative. CBDA is supporting the balance between the river meander and the selection of hard points so that goals in the hypothesis can be met. Not a small order. Vickie explained that Rebecca will attend later to further explain the Ecosystem Restoration goals for this project. She thanked everyone for participating in such a benchmark project.

Handouts were given to the Steering Committee regarding the CBDA Science Program relating to adaptive management and science-based decision making. The information described a framework of research and collaboration to ensure that a body of knowledge is established for CBDA actions that must be, both in perception and reality, unbiased, relevant, authoritative, integrated across program elements, and communicated to the scientific community, CBDA agency manager, stakeholders and the public. This project will be asked to perform under those standards.

Sacramento River Conservation Area Principals

In the absence of Burt Bundy, Manager, Sacramento River Conservation Area (SRCA), Olen asked Paul Ward to give background on the organization. Paul explained that the program began as Senate Bill Legislation (SB1086) to develop a riparian and fisheries habitat restoration program for the Sacramento River that extended from Keswick to the mouth of the Feather River. The original report was completed in 1989. Within that report, a suite of fisheries restoration projects were recommended and, with the funding created by Central Valley Improvement Act, most of those projects were implemented, including GCID, temperature curtain as Keswick, Red Bluff project and others up and down the river. Several hundred million dollars of project have resulted from this process. Subsequent to fishery restoration, habitat restoration has been implemented by the organization of a 501(c)(3) and a forum that brought together seven counties along the reach of the river, as well as other responsible agencies called the Sacramento River Conservation Area Forum, that oversee over 300,000 acres. The goal is to accommodate human activities while recreating some function within the river that is beneficial to fish and wildlife. The structure and operation of the organization was discussed.

Burt Bundy arrived at the meeting and gave a detailed history of the SB 1086 process and history. Handbooks are available that chronicle the history and the program strategy, as well as the information available on the following website: www.sacramentoriver.ca.gov. Burt explained that the program is a consensus-based process with the following adopted goal and principals and key to approaching the river meander management:

GOAL: to preserve remaining riparian habitat and reestablish a continuous riparian ecosystem along the Sacramento River between Redding and Chico, and reestablish riparian vegetation along the river from Chico to Verona.

PRINCIPALS:

- Use an ecosystem approach that contributes to the recovery of threatened and endangered species and is sustainable by natural processes;
- Use the most effective and least environmentally damaging bank protection technique to maintain a limited meander, where appropriate;
- Operates within the parameters of local, state and federal flood control and bank protection programs;
- Participation by private landowners is voluntary; never mandatory;
- Give full consideration to landowner, public, and local government concerns;
- Accurate and accessible information/education is essential to sound resource management.

Burt further explained that implementation guidelines for bank stabilization is within a limited meander approach. He quoted the following text from the SRCA Handbook, as "places along the river where bank stabilization will be necessary to limit the meander in the river zone. This limitation will take into account the potential need to protect existing land uses including agriculture and structural hard points such as buildings, bridges, pumping plants, flood management control structures, and levees from bank erosion. A structural hard point is defined as a structure or group of structures within the area of recent river meander that because of various attributes including but not limited to historic locations, public or private investment and government commitment is deemed necessary to protect it from river movement. Burt felt that the M&T Project is an opportunity to apply the adopted principals and approach.

Burt further explained how the agencies and landowners contribute by their participation and resources, as well as, the integration of authorities and past and present projects. Burt answered questions about program coordination and the project evaluation through the Technical Advisory Committee.

Olen added, that once the Steering Committee has developed a recommendation(s) for the project, a presentation will be made to the SRCA for review and comment. This presentation will also be advertised to the general public for review and comment. Burt will be closely involved with the project as the representative of SRCA to ensure that recommendations are developed within the scope of the SRCA.

Review of Existing Conditions and Existing Studies

Sacramento River Meander – Koll Buer, Chief, Geologic Investigations, California Dept. of Water Resources (DWR), gave a detailed presentation of the erosion sites and gravel bar movement within the river segments of the project. With the help of aerial photographs, Koll described the locations of the bank protection areas and the erosion areas and explained that it's not clear where the gravel contribution is coming from. Normally, when bank erosion occurs the gravel deposits down stream in first place where you have slower velocities. The gravel typically doesn't move too far from the point of erosion to the point where it deposits.

Koll pointed out in the photograph that the river is basically constrained within a geologic control. Koll explained that the river has stayed within those boundaries for an estimated 10,000 years. Koll described areas of the river meander has historically narrowed and expanded over the last 100 years. He related the river in terms of the pumping plant location. He furthered explained the relationship between the topography of the area and the river meander; and, how the site selected for the present pumping facility was based on the natural geological constraints imposed on the river. Based on historical data, there was no other better place to put the pumps along the river that was as stable as the present pumping site. Koll felt that, it is not a matter of moving the pumps to find a more appropriate site to divert the water.

Eric Larsen presented information from a study he conducted on the river and further described the erosion and deposition of the river in the area of the gravel bar. His information depicted river meander since 1896 to the present. His information confirmed that the current pumping plant site is the most stable within a feasible geographic area for pumping irrigation flows to the farming areas. Discussion was held regarding the present movement of the gravel bar. Conclusions were drawn that this is a result of the natural dynamics of the river system. Natural channel evolution over time is moving the river away from the pumps. It was felt that the river is not being capricious but actually hydraulically consistent with the shape of the river upstream. It is interesting that this is the first time in 100 years that the river has come to this point.

Koll reiterated that the rip rap may have an influence on this process. The group discussed previous COE river reports, as well as , reports from California Department of Water Resources.

Discussions were held regarding the location and migration of the present gravel bar upstream from the pumping plant and the predictability of movement.

Eric Larsen made a presentation of a study that he conducted by his research group over a year ago for the Natural Conservancy along the Sacramento River. Within this river meander study, Eric had the

opportunity to evaluate the reach of the river where the pumping plant is located. The full report is located on the Sacramento River Portal website. www.sacramentoriverportal.org. Modeling was conducted from above Scotty's to below the pumping site. The study looked at the historical movement of the river and future river tendencies. It shows geological provinces that contribute sediment input into our basin. It also shows the domains of faulting. The study attempts to broadly understand how the river relates to the earths tectonics.

Eric found maps of the river pre-1896 (1870) Flows and widths were unknown. Eric described how the bends of the river have moved downstream over time. Eric felt that this information provided more confidence in understanding the movement of river. He presented maps for detailing the river in 1887, 1920 and 1937. The pumping plant site exhibited stability throughout this time period. He explained that, as the river meander moves down, so does the mouths of the tributary creeks.

The study seems to project that, as the river meander moves down the system, so too does the mouths of the tributary streams. This could explain the gravel bar deposits that have formed near the mouth of Big Chico Creek. Eric continued to present maps from 1952 that showed evidence of the sinuous nature of the river. However, the pumping plant site remained stable. 1974 maps depicted upper reach sinuosity gained over time, stability is still exhibited at the pumping site. After 1973, river stabilization took place that constrained movement. Eric presented 1980 mapping that brought attention to the river's response to rip rapping. Later mapping conducted in 1987 detailed dynamic changes in the river meander. The study tried to identify areas where cutoff occurred and tease out the dynamics of the meander. Eric explained the layers of modeling and how the mapping exhibited the response of the river before and after rip rapping projects where in place.

Mike Harvey then discussed the bends located near Kimmelshue bend. Local geologic control on the west side of the river had prevented the bend from migrating to the west. As a result, the bend had deformed and would have cutoff if the Golden State Island revetments and Murphy Slough plug hadn't been constructed by the Corps and the State following the 1986 flood.

The study tried to understand the changes in sinuosity in the whole reach over time. Discussions were held regarding the nature of this sinuosity.

Eric discussed the average widths, depths and slope of the river in the project area that were revealed by the study and also explained how the study calculated the averages.

Roundtable discussions were held concerning the presented information.

Eric continued the presentations by explaining that the study made predictions into the future in partnership with DWR data, based on the hydraulics of the flow and the hydraulics of the sediment transport. Eric discussed how far river bends tend to migrate downstream as a result of upstream conditions. He commented that modeling is not supposed to give you an answer, it is supposed to help you think about an answer.

Eric further presented modeling results in an ArcView environment. The model showed general migration up through the 2072 from 1997 and, based on the hydraulics and sediment transport and the tendencies of meandering, the prediction was that the center line would be moving about 102 meters to the west. This suggests that the natural tendencies of the river that the movement was not capricious; it wasn't a log; it was that the actual hydraulics and the shape of the whole river had been leading up to moving in that direction at this point. To tease out some of the reasons that might be the case, in the modeling, the rip rap was removed. Interestingly enough, with the riprap removed, the river had a tendency to migrate further to the west.

Bob Mussetter commented that he was guessing at why the model makes the predictions it does. Essentially the bends are going to fprm and the amplitude is going to grow a little bit and they are going to move in the downstream direction. Eric then explained how flow contributed to the model. The model is based on the flow. It you model the flow, the model doesn't just take curvature and work from there, it

takes the curvatures then it models the velocities in the channel then it models erosion or channel migration proportionally to the near-bank velocities relative to the velocities in the channel, and where the velocities occur, and where the maximums occur and losses occur.

Roundtable discussions were held about how this applies to the gravel bar in context with the overall dynamics of the Sacramento River based on the predictions of the study.

Eric explained that, for the purposes of this meeting, a quick application was added to the model in order to have the ability to model a variable erosion field for two categories, agricultural land and nonagricultural land. This would help understand more about clay plugs and movement that changes according to bank height and relative elevations. This information is another useful and site-specific way to understand a factor contributing to migrations.

The study of historical migration and bank erosion is related to cumulative stream powers above and below certain thresholds. There are very good correlations regarding bank erosions combined with the bank erosion data from DWR. It is possible to model forward and now pause for five or six years when there are not big enough flows. Then all of a sudden the river will move rather radically when there is a big flow. This type of modeling is now available. This was not done for the original project.

More discussions were held regarding river migration and the prediction model. The question was raised about including well-established habitat areas along the river into the model. Eric agreed this could be accomplished if it is accurately calibrated and keeping in mind all other dynamics.

The question was raised about the vegetation modeled as a geotechnical effect or a hydrologic effect or a just a log? He believed he would consider a geotechnical effect.

Eric explained that the predictions were empirical just to see what would happen. The model doesn't speculate why it happened. Eric explained that he would like to take some next steps and do some additional site-specific study rather than the whole reach.

After looking at all the maps and projections, Olen asked the following question: Would it be adequate statement to say that the river would not migrate more than 250 to 300 meters away to the west? The group responded by pointing out the river is highly unpredictable.

Eric explained that it is particularly dangerous to assume that this measurement correct, since the movement has been observed. Certainly, the hydraulic tendencies are present precluding some local event. Modeling the whole reach does give the indication that the river will move in that direction. He said he is comfortable with that general statement.

Koll felt that the growth of the gravel bar was contributing to the situation. Eric explained that he did not model the growth of the gravel bar at all. There are two effects, the gravel bar and hydralic tendencies of meander migration both resulting in a capricious gravel bar.

It was felt that if the gravel bar was removed it would only return. Bob felt that it was not capricious but due to flow separation.

Koll explained that the gravel bar wasn't there twenty years ago – that gravel bar was about 1,500 feet upstream.

The question was asked, what would happen if you pulled 120 cfs back up Big Chico Creek during the summertime. Mike Harvey explained that he doubted that this would have any effect on the gravel bar.

Yantao brought attention to the historical data and pointed out that the gravel bar is a continuous process.

More discussions were held about the model and how the predictions were calculated.

Paul raised the question about the evaluation of impacts here as it relates to the manipulation of the gravel in Chico Creek. In the past, the stream truncated east of Chico at five mile which occurred 80 years ago. Has that input or lack of input showed any effects?

Koll said that issue was not looked at and would be worth investigation.

Paul explained that the gravel was extracted for flood control purposes by the county, however, it has not be re-injected into the system. Otherwise, fine sediments would be reaching the project area. Koll felt that the gravel bar had more to do with the river action and not attributable to the creek; except for the hydralic effect of the backwater when Big Chico Creek is flooding and the Sacramento River is low. He felt that deposition could sometime occur under those circumstances.

Olen asked Eric to address what he thought would be the absolute outside migration of the river to the west during the life of the pumping plant.

Koll responded to the question by saying that since 1995 to 2003 there was 250 ft; in 8 years there was 30 ft per year. During that time there was the 1997 flood; also 1994 and 1995 were big flood years, a lot of bank erosions occurred. Since then, there hasn't been much flow and the bank erosion has been limited. Koll commented that if you use rough numbers his guess is (based on 8 years of history) would be 30 feet per year on an average.

Mike Harvey asked if some geometrical assumptions can be made about where the apex of the bend is and develop a radius of curvature beyond which it is going to cut off. Would that give provide the absolute maximum distance?

More discussions were held regarding the unpredictability of predictions and changing river conditions.

Olen commented, at some point it is not feasible for the engineers to chase the migration of the river.

Mike Harvey commented that if the river migrates out some 500 to 600 feet to the west that's no longer just a gravel bar, it becomes a much less ephemeral feature. More discussions were held regarding this issue.

Olen brought the discussions to a close and moved to the next agenda item.

M&T/Llano Seco Pumping Plant

Neil Schild, Principal Engineer, MWH Americas, provided a history of the firm's early participation in the project. He explained that Montgomery Watson was contracted in the summer of 1996. A feasibility study had been conducted by CH2MHILL under the authority of DWR and the Bureau of Reclamation (BOR) and Howard Wilson, Engineer with CH2MHILL, who wrote the study. He was slated to be at the following meeting to provide background and answer any questions. A pumping plant site had been selected at that time.

The firm developed a design that engineered hydraulic cylinder screens in the river. This was thought ideal because there was a deep hole at that bank. Flat plate screens were looked at as a viable alternative. However, if that type of structure was placed in the river, a cleaning mechanism would be necessary. The hydraulics, the topography of the riverbed and the riverbank led the engineers to these cylinder screens and proceeded with the cylinder screen design in the fall of 1996.

The pumping plant was 150 cfs in size and 4,200 feet of 72 inch line runs up to the canal. The design was engineered to excavate through the levee. The pumping plant was a state-of-the-art design. Bids came in at $4 million, however, MWH won the bid at $3 million. Two credible construction companies sat down with Jim Well at Ducks Unlimited, Inc. (DU) and Neil Bann, Project Engineer, Montgomery Watson. Kuwia Construction, Fresno and IMA Construction, Tracy (later changed name to Diamond Oakes Construction). Competitive bids were asked of the two companies to see which firm could feasibly meet the budget. A five-foot cover over the pipeline was reduced to three feet. The cover over the pumping

plant was eliminated and one pump was also eliminated and other value engineering developed. The ranch took the responsibility of constructing the natural gas line to the pumping plant and took care of dust control. U.S. Fish and Wildlife provided another pump and motor to ensure maximum pumping capacity. IMA received the bid of $2.7 million and started construction in June 1997. Neil commented that tremendous teamwork and collaboration occurred between the state and federal agencies, as well as, the project stakeholders.

Neil presented construction photos and discussed major dewatering challenges. Construction of the pipeline from the canal to the pumping station was successfully completed without any complications. The outfall into the canal worked very well. Fish screen construction went smoothly and everything functioned properly at the end of construction.

M&T/Llano Seco Fish Screens

Neil shifted his presentation to the construction of the fish screens. The fish screens are a T-screen that has a stainless flank in the center, stainless steel on both ends and a round wedgewire center section. There are four screens 54 inches in diameter in banks of two manifolded together approximately 16 feet long. This represented a large area that had to be dewatered.

Neil explained that since the construction of the fish screen, yearly inspections made by divers have shown that the screen bolts did not secure the screens on the flanges from the manifolds and the screen were coming up. Nuts were used on both ends to fasten the screen and they were coming loose. The divers tightened these screws only once and there has not been a problem since. It was felt that the vibration from airburst cleaning system was the cause. This system has two six inch stainless air lines that run down to the screen that blows the water and debris away from the screens. The system works very well.

The four T screens have a minimum of three foot of cover that are the COE navigation requirements. When the facility was designed H beams were put down in all four corners for protection.

Neil offered to provide a book of pictures for anyone who wanted the information.

Olen asked the question - Was it feasible from an engineering and design perspective to leave the pumping plant and pipeline where they are and chase the river to the west with the screen manifold system? He asked if it would be feasible to move the facility out another 100 feet every 10 to 20 years?

Les explained that since the gravel bar was removed, the streambed is back down to level when the pumping plant was first constructed. It did scour out after the gravel bar was removed.

Discussions were held about the pumping and delivery requirements, functions and estimated costs of Raney Collectors and infiltration galleries.

The discussions then turned to existing groundwater data available about the area.

Dan McManus presented a handout to the group with existing data about an existing well near the river located down from the pumping plant. He explained that this well probably gets two thirds of the water from the river citing the following data: pumps approximately 3,500 gal/min and within about 9 minutes at a draw down of about 12 feet and then stayed constant.

This showed that a significant portion was coming in from the river side. Other data from mapped wells in this area shows that there is a good 50 ft of gravel about 25 ft below the surface. There is a potential there to look at some alternative pumping scenario off river.

Dan explained that a perforated interval doesn't start until 120 feet where there is a hard pan layer between the gravel zone and where the well is supposedly actually drawing from. Pulling water from significantly below where it might be interacting with the river. Data showed that the water level dropped down and

obviously hit a recharge boundary so there is some interconnection with the river and where this well is pulling from.

Discussions continued regarding a series of wells or an excavated area to collect water off river.

Infiltration galleries were discussed and the feasibility of determining how much head was possible and redesigning the pumping plant to take advantage of the head to move it through the levee over into the wet well. Concern was discussed about the river moving away from the infiltration galleries or the gravel bar migrated over the perforated pipes and minimizing the level of water into the pipes.

Discussions continued about the unknowns associated with the depth of gravels covering the perforated pipes and the ability of sufficient flow to infiltrate the gravels to meet the pumping capacity.

Dan suggested that even if the river migrated to the west and the gallery was in place, the groundwater levels will still be maintained high at the level of the river. He commented that in most of this area groundwater flows towards the river and in most places the groundwater levels are actually a little bit higher than the river that contributes to the flow of the river. He felt, that even if the river migrated away from the infiltration gallery, it would still be fully saturated.

More discussions were held regarding this issue. No conclusions were made. Olen concluded and the meeting broke for lunch.

Lunch Break

After lunch, Olen resumed the discussions and moved the agenda item, City of Chico Water Pollution Control Plan Outfall to be next item of discussion. The presenters requested to speak earlier due to time constraints.

City of Chico Water Pollution Control Plant Outfall

Marc Sulik, Wastewater Treatment Plant Supervisor, Scott Parker, Corolla Engineers, Treatment Plant expansion, Fritz McKinley, Public Works Director, Steve Caswell, Project Engineer, Corolla Engineers.

Marc Sulik, Wastewater Treatment Plant Supervisor, presented the history of the City of Chico's outfall. He explained that 1.5 miles of pipeline comprising two pipeline outfalls 32in (original line) and 48 in line in parallel with the original pipe. Marc present the history of plant development and expansion from 1971 to the present. Marc also explained that the existing pipe that delivers wastewater into the river is a 42 inch diameter steel concrete encased steel pipe with seven diffuser ports that are 3 foot high gooseneck style that are facing downstream.

Marc further explained that in the past, dredging has been necessary to clear the area around the pipe. After flooding occurred in 1986, dredging was again necessary. He explained that the diving team that conducts annual diving inspections for the plant is also the same diving team used to inspect the M&T Pumping Facility. In the 1988, diving inspections revealed that the diffuser had detached and rolled over in the riverbed 3 to 4 ft downstream from the pipeline.

In 1992 the diffuser was shortened and the outfall was moved 40 feet closer to the river embankment. No problems occurred until the gravel bar began to migrate down the river in the late 1990's that created more deposition on the diffusers and pipe. Videos taken by the divers show the on-going depositions of gravel similar to the pumping facility. The inspections conducted this year showed the diffusers looked much better than in pervious years.

Marc further explained that the facility has plans to expand the diffusers. Plans have not been finalized in regard to the number of diffusers required to meet the capacity of future flows. The plant will be expanded to a 12 mgd capacity and the build out capacity will be 15 to 20 years to 15 mgd capacity. We want to size the new construction to build out to 2005 for and ultimate capacity of 15 mgd.

Scott Parker, Corolla Engineers, Treatment Plant expansion, then addressed the group. He explained that future expectations included plant build out to a future 15 mgd. He commented that the last project expansion was built out to 9 mgd. At that time, there were transmission lines that were ran out to the river that were capable of 15 mgd capacity. He explained that the lines may result in hydraulic issues for their 9 mgd plan and in the future a river project would be necessary.

Some of the complex design issues facing the diffuser include water quality guidelines, adequate dilution, and protection from any damages. Now the plant is not only looking at geomorphology issues but also diffuser models for various diffuser configurations for meeting water quality and wildlife regulations. It appears that in terms of hydrologic capacity, the size of the outfall will go from approximately 42 inch to 84 inch. A significant increase across the cross section of the river would occur due to the increase in pipe capacity, in addition to the size increase of the diffusers and spread. For this reason, Ayres & Associates and Stillwater Science have been contracted as consultants to evaluate the same issues as this Steering Committee regarding river movement.

Ayres & Associations are evaluating the most appropriate site for the diffusers along the river. It appears that the current site is the most stable. The study will evaluate the how much flexibility should be built into the new construction to accommodate any future river activity. Work has just been contracted to conduct studies and environmental documentation.

Discussions continued regarding physical conditions in the river and outfall requirements and movement of the mouth of Big Chico Creek toward the diffuser. This raised questions regarding the ability of the diffuser to meet state water quality requirements due to flow and dilution factors.

It was reported that future designs were evaluating the option of moving the diffuser as the river moves to ensure adequate mixing opportunities. When the diffuser was shortened 40 feet, it appeared that this action was taken in response to the movement of the deepest part of the channel moving closer to the bank around 1992. According to previous river sounding, the main channel used to be closer to the levee than it is now.

Discussions were held regarding the use of wastewater for agricultural use. It was discussed that certain crops prohibited the use of wastewater.

Discussions were held regarding feasibility and cost issues for alternative treatments for reclaimed water.

Olen concluded the discussions.

At that time, Rebecca Fris, Restoration Coordinator, California Bay-Delta Authority joined the meeting.

Groundwater Conditions

Dan McManus, Hydrogeologist, California Department of Water Resources, presented information regarding groundwater conditions in the area. He explained that in response to the popular approach of conjunctive use, DWR began to more actively conduct groundwater studies to understand potential impacts. Dan presented maps depicting the geology and crops of the Sacramento Valley. Dan presented handouts regarding previous local data compiled on the M&T Ranch and pumping tests on a well located near the pumping facility.

The question was raised regarding the ability to know if the wells were pumping river water. Dan explained that tracers could be introduced, however, his study was concerned with comparing capacity versus draw down with wells that had similar construction in the area. This information was targeting at trying to understand the characteristics of the aquifer.

Dan presented maps showing well locations that were studied. Studies showed strong continuous gravel lenzes throughout the area. Dan also reviewed the driller's logs of the wells and their consistent reports of the same strata of gravel. Dan concluded that these wells were probably pumping river water through the

thick strata of river gravel in the area. Dan concluded that it wouldn't take too much to construct some wells (60' to 80') and excavate a trench to test the pumping rate that would reach 10,000 gpm. This would provide an opportunity to determine how much river water is being pumped compared to groundwater.

More discussions were held regarding the characteristics of the various wells and the potential for future pumping tests.

Dan suggested that, if the geomorphology suggests that there is some bank stability, it might be feasible to put an infiltration gallery and some space wells to tap into the lines. This approach may provide a long-term solution. The placement of new pumps and new connections into the existing pipelines may have to occur.

Les explained that the pumps that Dan is referring to are existing pumps delivering water to areas outside the delivery area of the river pumps. Under a pressure system, these wells are putting out 2,000 gpm about 5cfs. It was noted that the need for the M&T pumping facility was 150 cfs.

Dan suggested that it might be possible to reach 8,000 gpm. A test well would probably provide pertinent information.

Further discussions were held about the various scenarios concerning pumping capacity, low water years and groundwater impacts.

The question was raised about water rights associated with this approach and off-channel pumping.
Les raised the question about the necessity of conducting studies to ensure that one well did not interfere with another well during pumping.

Paul asked if any studies had been conducted to determine the impacts on infiltration rates as the river moved farther to the west. Is there data to show that it is possible to maintain a consistent infiltration rate?

Dan referred to a test that was conducted ½ mile from the river at Princeton. It looked at water levels and a draw down to water levels at the river level. The river had not moved away, it was already moved away making the point that the gravel is contiguous. This shows that groundwater levels seem to stay the same.

More discussions were held regarding the potential for groundwater mixing.

Dan suggested that a pilot project be conducted to test these issues.

Jim Gaumer reported that previous excavations revealed that groundwater elevations were at the top of the existing aquifer. Previous gravel excavation shows that water levels were right at the gravel levels.

Olen asked the question – When the river migrates what happens to the depth of the channel? Does it go down until it hits a hard point?

Eric replied by explaining that the cross section shape is somewhat conservative. As it gets more related to curvature, it gets a little deeper on the outside and a little bit shallower on the inside. As a first approximation, one can assume that the cross section area will be the same. With the kinds of sinuosities that are present, as a first approximation one can assume that the shape would be roughly the same. It will be relatively shallow and relatively wide. It will look just about the same only go across. As Koll explained, generally and theoretically, as one side moves, the other side builds to match that movement so that it has a constant width. It stays roughly the same and the depth stays roughly the same.

Olen asked the following questions: What limits the depth?

The balance of depth and width in the river are internally controlled by the hydraulics of water and physics. The classic answer is the river is building itself by the forces that are in it. It interacts with the world around

it and if it bumps into something it can't move, it will be restricted by that obstacle. Releasing the river from those kinds of restrictions, the cross sections shapes are self-forming from the hydraulics of flow.

Olen asked the following questions: How is the river tied into the substrata of gravel that was discussed by Dan? Does the relationship stay the same? Is the river always tied to the substrata because of its depth? Does it make a lot of difference where the river is located?

It was agreed that the groundwater data would provide answers to those questions.

More discussions were held regarding the variables associated with gravel strata and permeability as well as the need for a pilot well.

The question was raised about potential costs for a monitoring or test well.

Dan explained that based on costs associated with double completions down to 1,000 feet estimated costs are $30,000. He estimated that costs for a 100 foot monitoring well would be associated with mobilizing the rig – depending on how you can get through the gravels – not more than $5,000 plus.

There are some existing monitoring wells on the ranch. One deep well exists down to the lower aquifer. Then there are two old abandoned wells that have been converted into monitoring wells. However, these wells are located miles away from the pumping site. The closest well is near the old tower located on the map.

More discussions were held regarding requirements for a monitoring well.

The question was asked if the data collected from previous monitoring wells would be pertinent to the M&T/Llano Seco Project. Dan informed the group that this study was intended to find a lower aquifer that would be separate from the upper the zone and have no impact on the wells in the area. It was an opposite approach to this project. These wells were not intended to measure how well we could pull surface water. Typically, we are trying to avoid that interaction if possible.

Dan suggested that a motor could be rented for the test well rather than purchasing a motor. Dan suggested that he could call to get some estimates. Approximate costs might be $20,000. Dan suggested that the well be drilled to the hard cap layer. He suggested to hit the gravel layer at 25 feet and 80 feet and 10 feet more to make sure that the well was out of these layers. This would make room for a cellar in a production well to catch the sediment and screen the whole zone. The well construction would potentially be a 100 foot well.

The question was asked about the ability to query DWR well data throughout the valley to find the maximum amount of groundwater pull from any well. Dan replied that DWR has compiled some of that data. There were results compiled from a 10-year study conducted by PG&E (well tests) and a Butte County groundwater investigation. DWR looked at yield and specific capacity from those test results over that 10-year period. He explained that when you get to the Butte Basin area where people tap into the upper and to the lower tuscan, wells show production at 5,000 gpm. He stated that those are not gravel zones like what is seen here at the M&T Ranch.

The following question was raised: Is there a way to calculate capacity at the first 50 feet of aquifer here? Further comments: If you run an estimate of gravel size, it is possible to assess hydraulic conductivity and a method to calculate the amount at certain intervals of perforation. This would provide an estimate to see if it is feasible to move forward.

Other discussions were held speculating potential capacity and potential number of wells to meet present pumping capacity.

Discussions were also held regarding the feasibility of an open pit reservoir, pumping and construction issues and potential levee subsidence.

Koll made the observation that the gravels are highly permeable, practically 25 –35 % water -- high porosity. Water moves through there approximately 3,000 feet per day. The draw down will be relatively small. If you have a decent size pond, you will have the same water level in the pond as you do in the river--and no fish screens.

Discussions were held regarding potential head loss through the gravels and well capacity.

Koll explained that a well that is 24 inches in diameter is drawing from a well that's 24 inches in diameter. If you have a pond that is 300 feet by 300 feet, you going from the surface area of the bottom and the sides of that pond. You are pulling from a much larger area.

Dan suggested that a couple wells be placed in the middle of the pond. He also suggested a series of wells along the levee. He commented there is a potential to get out of the river, however, it must be feasible.

Koll suggested that if you had an infiltration pond, the silts cover the bottom but if the water is asked to come out of the bottoms and the sides it keeps the gravels clean. Versus, if you're trying to bring the water down into the groundwater.

Neil asked if this was to keep free water inside of the pond -- because gravel will keep moving into the pond. Reference was made to a similar pond where it was impossible to get an excavator bucket out of the pond.

Significant discussions were held concerning the configuration, function and capacity of a pond.

Discussions were also held regarding the political challenges and regulations associated with groundwater projects in Butte County.

Olen moved the discussion on to the next item on the agenda. Olen asked the question - What is the current fish screen criteria and can the criteria be changed to accommodate innovative solutions?

M&T/Llano Seco fish Screens

Paul Ward, Associate Fishery Biologist, Region 2, California Department of Fish and Game, started the discussion by distributing a handout that described fish screen criteria mandated by the California Department of Fish and Game (DFG) and National Oceanic & Atmospheric Administration (NOAA). Paul pointed out that they are much different from one another. Paul explained that the standards the agencies are designing are based on the swimming capabilities of a fry Chinook salmon. The bottom line for fry Chinook salmon is the through screen velocities that are limited to a 1/3 foot per second. Using this criterion, you can roughly calculate the required surface area. The passing flow is at least twice the gross approach velocity in this example, 2/3 foot per second.

The second flow requirement is the most onerous for the M&T/Llano Seco Pumping Facility. Aside from the fish screen criteria issue, there is the issues of the adult attraction flow at this particular sight. There may be enough flow to maintain the passing flow by the fish screen, but there may not have hydraulics for the channel configuration that would allow Chico Creek to exit into the river attracting adult fish into Big Chico Creek. One last thought – 20 years ago agencies made every exception to fish screen criteria that turned out to be detrimental. Now the there are no exceptions. However, there are state and federal policies where exceptions could be made. This project may require a test for those policies and processes.

Dennis E. Dorratcague, Principal Engineer, MWH Americas, explained that there have significant debates on the flow velocity requirements. If one looks at the DFG requirements, sweeping velocities are twice the approach -- NOAA is equal the approach. NOAA also requires that fish cannot be exposed any longer than 60 seconds. This requirement means that one takes the length of the screen and how long is the fish exposed if he is just drifting in the water. The 60-second exposure time has been seriously debated. It was developed with little data. With these requirements in mind, one of the possible solutions for this project is

to get part of the river going by the screens by digging a channel through the gravel bar. This would provide minimal sweeping flow to pass the screens to barely meet the criteria. Dennis felt that the sweeping flow and the exposure time is not an issue here because the screens are only 15 feet long each.

Discussions were held regarding fish screen technology and the flow requirements to maintain proper velocities to meet fish screen criteria. Dennis discussed fish screen technologies applied at Red Bluff and GCID. Paul explained that a number of species of fish in the river would not be protected by existing screen technology should the become listed. He felt that the regulatory agencies currently agreed that screens targeted for the river would be designed to meet steehead criteria. Paul felt that the problem with the M&T/Llano Seco facility was not with the screens but the hydraulic characteristics in the river.

Olen asked the group if the regulatory agencies would have flexibility regarding fish screen criteria?

Paul believed that if this issue only addressed the fish screen and its relationship to screening juveniles, it would not be as difficult. However, this issue also entails addressing adult fish as well.

Dennis explained that the criterion was developed to ensure that the fish have the ability to swim away from the screens and not be sucked up against the screens. The established criterion was set for the weakest species. Dennis discussed a variety of criteria and associated issues.

Discussions were held regarding the contributions of flow to the Sacramento River by Big Chico Creek; and, the potential of a change in the location of the confluence of the creek. Also, the members discussed the relationship between the fish screens and the change in the river dynamics.

Review and discuss Draft Technical Memorandum

Neil Schild, Pr. Engineer, MWH Americas presented a Draft Technical Memorandum that summarized available information and issues regarding the M&T/Llano Seco Fish Screen Facility, including a brief description of associated water rights. Neil also presented copies of a Cal Trans negative declaration and report that reviewed the construction of a rock groin at the Butte City Bridge.

Neil also explained that he was in the process of obtaining the physical model performed by UC Davis. He explained that UC Davis was not in a position to release the information until is was authorized by Cal Trans. Neil contacted Cal Trans and there has been a request submitted to the hydrology department to obtain the model. In addition, Neil explained that a literature search was being conducted by a student at University of California, Davis directed by Eric Larsen.

Eric Larsen explained that the search was still in draft form. He informed the group that more time will be spent on refining the database to facilitate retrieval of information. Eric further explained how the information was compiled, the source of information and the type of software used to bring the database together. He gave the group hardcopies of the draft information and also offered CDs.

Neil provided the group with copies of the Draft Technical Memorandum and requested their review and comments. He explained that the Tech Memo listed pertinent reports and studies; this list will continue to increase as more information becomes available. He described the list of documents and explained the background of each report.

Olen explained that the Technical Memorandum will be a work in progress. The Tech Memo will document past and present knowledge about the project, describe potential solutions and finally document Steering Committee recommendations.

Eric added background information regarding the modeling project conducted at the Butte City Bridge and past study efforts. Eric concluded that the river meander seemed predictable based on river dynamics.

Open Discussions regarding conflicts and uncertainties associated with simultaneously protection river meander, pumping plant capacity and fish protection.

Olen distributed a handout to illustrate the CALFED objectives of the project and questions that help to frame the tasks of the Steering Committee.

Questions:

- What is the rate and uncertainties associated with river meander and sediment deposition. (referred to meeting discussions)

- What is the realm of possible alternatives to meet the water requirements of the beneficiaries? (referred to meeting discussions with groundwater – raised new questions about delivering water of river. Another potential of how you get water to the site)

- What are the current fish screen criteria and can those criteria be changed to accommodate innovative solutions?

Paul commented on fish screen criteria. Possible two kinds of velocities – approach velocity and the velocity going past the screens. It seems that a balance between the two may be achieved and flexibility built into a project. He felt that the real issue was the pocket of dead water.

Roundtable discussions continued about each of the questions.

Olen explained that this workshop was charged at looking at the existing data and background information. The next phase will look at alternatives using outside expertise.

Olen reviewed the content of the Draft Technical Memorandum and explained that the second steering committee meeting would be convened to review and discuss the findings of this workshop. Any alternatives would be compiled into the Draft Tech Memo and, ultimately a final tech memo will be prepared. All alternatives will be evaluated for addressing river meander, pumping capacity and fish screen criteria. He commented that the group should be address a whole realm of alternatives. He explained that the technical reviews developed by the group will be circulated prior to the next meeting.

Roundtable discussions continued about coordinating and formatting the information.

Olen reminded the group that the group that recommendations be timely for future funding requests. Paul reminded the group that addressing fish screen criteria is a process separate from the project – time and funding is associated with this issue. Paul reminded the group that CALFED would probably not fund a project that was not in compliance with current fish screen criteria. This issue may take a considerable amount of time to reach acceptability.

It was suggested that another year be taken to address unknowns that may be necessary to ensure that feasible recommendations are moved forward. Request for another year of gravel extraction may be necessary to protect the facility until all information and recommendations are put together.

Rebecca suggested that, since this is a directed action, the project is not under timeline restraints. Project recommendations can be sent out for technical review as soon as they are presented by the Steering Committee.

Burt suggested that this Steering Committee work with him to develop a comprehensive stakeholder and public outreach through the Sacramento River Conservation Area framework. It was discussed that the federal and state agencies responsible for permits and environmental documentation should understand the project approach early in the process. It would be important to use the lead agencies that were used in the past.

There was concern that there is not a sound basis for any alternative to advance a proposal for a specific alternative in the spring. Suggestions were made to develop pilot project that would provide data to support a preferred alternative.

Identify and discuss data gaps.

All alternatives will have data gaps and raise new questions.

Chris suggested that the charge CALFED gave to the Steering Committee is to make recommendations based on the best knowledge brought together through this project. CALFED would rather see the Steering Committee present well-thought out recommendations and not be constrained by funding cycles. The reality of the project might be more studies to more clearly understand the natural dynamics and how appropriate alternatives will fit into that scenario. It might be necessary to conduct a groundwater study or a 2D model of the river to come up with solid alternatives.

Neil suggested that the group should identify and compile additional data that would help make the decision about choosing the most viable alternatives.

Dan was concerned that any ground water information presented to the group at the next meeting would only be a pre-feasibility analysis and would not have the opportunity to be tested to ensure accuracy.

More discussions were held regarding what kind of data or pilot studies should be conducted.

Neil suggested that an important piece of information for this project is the determination of how a change of surface diversion to groundwater diversion will affect existing water rights.

Burt felt that more information and data should be compiled regarding water reuse from the sanitation district and tertiary treatment costs in comparison with new outfall technologies. The group agreed.

More discussions were held regarding pumping capacity for the project.

The group also discussed the levee and levee construction. It was suggested that the Reclamation Board be contacted to see if any data has been compiled on the existing levee.

Eric suggested that data be requested from the COE and the Comprehensive Study.

Eric commented that HDR and DWR were studying fish screen issues and river geomorphology at GCID; and, those studies may have some pertinent information for this project.

It was suggested that all pertinent information be available for the gravel bar for future discussions to answer questions about future dredging to gain a fix for over 15 years (similar to cosmetic supports at GCID).

Mike Harvey suggested that the focus should be taken off the gravel bar and look at the other side of the river. During the site visit, the experts could physically see that the bank was failing. Mike commented that as long as the bank keeps failing and the material is continuing to be removed by the river and moved down the river, the gravel bar will follow it. The more this process continues, the less likely that a short-term fix will work.

Summary of discussions and action items

More discussions were held about the feasibility of dredging and the changing river dynamics should there be a large flood event.

Discussions were regarding relevant modeling and COE data pertinent to this project conducted by Ayres Associates.

Concerns were expressed regarding future funding.

Brian Kinnear suggested that the agencies meet and agree on a collaborative approach regarding the fish screens. It was also suggested that CALFED bring fish screen recommendations to the Science Panel to support a criteria that may be tailored to this project.

Performance Measures

Discussions were held regarding potential performance measures and the approach to understanding performance measures associated with the project. It was agreed that this was too early in the project to propose performance measures.

Adjourn

Olen concluded the meeting and thanked everyone for all the hard work and informative presentations. Meeting was adjourned.

Friday
November 14, 2003

The third day of the Workshop was held at Llano Seco ranch headquarters, 8369 Hugh Baber Land, Chico, CA, beginning at 8:00 a.m. The meeting was facilitated by Olen Zirkle, Conservation Programs, Ducks Unlimited, Inc. (DU) and introductions were made by the following list of individuals:

Howard Brown, Fishery Biologist, National Oceanic & Atmospheric Administration
Yantao Cui, Research Scientist, Hydrology/Geomorphology
Dennis Dorratcague, Principal Engineer, MWH Americas
Woody Elliott, District Resource Ecologist, California Department of Park and Recreation, No. Buttes District
Jim Gaumer, Consultant Engineer, M&T Chico Ranch
Michael Harvey, Principal Geomorpholgist, Mussetter Engineering, Inc.
Les Heringer, Manager, M&T Chico Ranch
Eric Larsen, Research Scientist Geology
Chris Leininger, Project Development, Ducks Unlimited, Inc
Robert Mussetter, Principal Engineer, Mussetter Engineering, Inc.
David Sieperda, Manager, Rancho Llano Seco
Robert Strand, Consultant Engineer, MWH Americas
Neil Schild, Principal Engineer, MWH Americas
Ken Walters, Supervisor, Resource and Planning, California Department of Parks and Recreation
Paul Ward, Associate Fishery Biologist, Region 2, California Department of Fish and Game

Opening Remarks - Recap Thursday Workshop

Olen recapped Thursday discussions regarding river meander and migration of the gravel bar.

Les Heringer brought pictures of project during construction. He also brought copies of a report describing the regulatory guidelines associated with affluent reuse on production acreage.

Kevin Forester added that water reuse would not be an option for the wildlife refuge. U.S. Fish & Wildlife Service is not opposed to the City of Chico creating treatment wetlands, however, diverting the water to the existing wetlands is not an option for the refuge.

Kevin also explained that the property to the west where the bank is eroding is owned by USFWS. If the technologically, economical and political solution for the M&T looks at a hard point on this property,

substantial justification will be necessary. He felt that, if the technological and economical side of the equation favored a hard point, the political side would follow. However, it will be very difficult to rock that bank due to current policy. In addition, the property was bought with CALFED support and the agreement behind that purchase was to manage the property according to the record of decision. As a result, it may be very problematic to put rock on that side of the river. It will be a Director level decision. Justification of the technical and economical side of an alternative that would create a hard point on this land will have to be strongly advanced if that becomes the only alternative.

Paul explained that DFG and USFWS are looking to this project and the Steering Committee to provide the kind of valid information that would determine if the only alternative is a hard point on the river. The agencies are not excluding this approach, however, strong justification and facts will be necessary to implement that preferred alternative.

Olen suggested that it is important that the Steering Committee can support that they have looked at every viable alternative that points to a final selection.

Les commented that one of the guiding principals of the SRCA is to limit the river meander where it's appropriate.

Discussions were held regarding potential mitigation associated with river stabilization.
Chris suggested that if a hard point on the river was determined to be a solution, CALFED would want strong justification from the experts how that hard point would fit into the riverine system as a whole.

Presentation of project alternatives developed for current pumping plant installation

Howard Wilson, Sr. Engineer, CH2MHILL, joined the meeting and provided background associated with the initial feasibility study that was conducted at the time the pumps were relocated from Big Chico Creek to the Sacramento River.

CH2MHILL was asked to identify the issues associated with the adverse impacts that the pumping facility in Big Chico Creek had on the anadromous fish populations, especially survival of juvenile smolts. This study was conducted from the east side of Bidwell Park to the river. In addition, the firm was also asked to prepare a creek design study for the purpose of locating a pump station on the river. At the time, there was consensus that a pump station would not continue to be located on Big Chico Creek.

Two alternatives were studied. One alternative was a pump station located higher up on Big Chico Creek and the other alternative was a pump station on the river. The first alternative proved to be too expensive and there was not a feasible location along the creek. Two locations were looked at on the river.

As the study progressed, it became more obvious that the pump station was not an issue but that the selection of fish screen technology that would meet river requirements, e.g., flat plate screens or cylindrical screens. In addition, a project priority was to find a site located upstream from the City of Chico Wastewater Treatment Facility outfall. The ranch did not want to pull the water out of river below the outfall. No new study addressing river geomorphology was conducted at that time. Instead, existing data compiled from DWR was used to determine a stable section of the river. One reason for this decision was the limited budget assigned to the Feasibility Study. In addition, no alternative water supplies were studies no geotech studies were conducted; and, no sediment studies were conducted.

It was noted that the City of Chico also contributed to this study by looking at impacts from the park on the fishery in Big Chico Creek.

In summary, the Feasibility Study made the recommendation for putting the pumps on the landside of the river or the levee side of the river.

No further questions were asked.

Olen moved the discussion on to asking the members if there was additional information needed in order to move forward.

Mike suggested that a way of looking at feasibility is to evaluate what kind of substantive parameters are necessary to meet the yield of 150 cfs. He proposed that an up front model be conducted to prove out the range of parameters that are necessary to evaluate those parameters in the context of what we already know. This will help determine investment in further investigations, e.g., groundwater studies.

More discussions were held regarding the speculations associated with the groundwater, gravels and water rights.

It was suggested that a water right issue could substantially impact recommended scenarios.

Neil referred to a legal issue surrounding the Mendota Pool and groundwater wells that were shown to extract water from the pool similar to the potential of drawing river water from riparian wells.

Paul also brought up the issues associated with the Butte County Groundwater Ordinance. He suggested that it is important to understand the economics associated with changing from surface water diversion to groundwater pumping.

Discussions were held regarding pumping impacts associated with off-stream reservoirs and infiltrations galleries.

The question was asked, can you build the collection gallery large enough to pump 150 cfs?

The suggested alternative (Zirkle Project) should be studied (A large perforated pipe running horizontal along the levee that would collect enough water to meet 150 cfs.).

Les noted that when construction was conducted for the original project, excavations showed that there is a lot of sand in the gravel at the project site.

The suggestion was made that borings should be conducted.

A question was raised about whether a proposed reservoir should be leveed?

More discussions were held about possible pumping needs and aquifer dynamics.

No conclusions were drawn except that more information is needed.

Chris will follow up with Dan Mc Manus to compile existing information.

Neil would try to work with Dan to look at permeability.

Bob suggested that the group look at fatal flaws for all the alternatives.

Olen concluded the discussion by reviewing the history of where the river has been, the history of where we are currently, and projections of where the river may go over the next 100 years.

He reviewed the issues surrounding the project, i.e., demand, capacity, fish screens, meander.

Develop and agree to a process for Steering Committee interaction and reporting.

Discussions were held regarding the interaction and exchange of information between Steering Committee members to investigate the scenarios discussed at the Workshop.

The river experts will work as a team to develop a discussion paper on river meander and sediment deposition.

Mike Harvey suggested that alternatives should be based on a better understanding of the river geomorphology. Existing conditions are not optimal. He listed the following approaches: a no action alternative, where the river continues its process with no constraints; a constrained analysis; or a constraint that is fairly open-ended.

It was agreed that a hard point should be addressed within the analysis.

A comment was made that the river is continuing to move west even with the dredging.

It was agreed that the group should look at a broad ranges of alternatives.

Comments were made that there is some level of knowledge based on the gravel bar extraction and the continual movement of the river. A clearer understanding of the problem is necessary. Les suggested that removal and re-deposition of the gravel bar has contributed new knowledge about the driver dynamics in the project area.

Discussions were held about the study being currently conducted by a student to take cross sections of the river. It was suggested that the project manager be contacted to take cross sections near the pumping site.

Olen charged the river meander group to move ahead as a team to attempt to predict riverine dynamics.
He charged Dennis, Paul and NOAA to develop a review of fish screen requirements.
In addition, Olen charged the group with bringing together pertinent information necessary to determine feasibility for infiltration galleries, production wells, alternative fish screen, and water rights. The group felt that groundwater extraction require a new approach to water right law.

Discuss project deliverables and timelines.

Olen suggested that the Steering Committee should look at all the alternatives for an infiltration gallery. Montgomery Watson will take on the charge to look at the challenges of this alternative.

Olen explained that all pieces of information and recommendations will be addressed in the Draft Technical Memorandum. The question to ask - do we chase the river or find solutions outside the river?

It was agreed that pertinent information was not available to accurately evaluate the feasibility of each discussed “brainstormed” alternative.

It was agreed that there is not enough information to choose a preferred alternative at the next workshop. Chris suggested that CALFED would work with the Steering Committee to provide support for further investigations.

It was agreed by all participants that there is not a sound basis to choose a preferred alternative.

It was agreed that a list of brainstormed alternatives to be part of the Technical Memorandum.

It was agreed that the City of Chico is integral to making contributions to each of the alternatives and in turn provide clarity for their long-term solutions and to be actively involved in this process.

Set date and agenda to reconvene Steering Committee.

Next meeting slated for February 18, 19, and 20, 2004.

Les brought up the concern about how difficult it was to obtain permits. Les explained that he requested a multi-year maintenance permit – that request was rejected. Les asked if he should begin working on the permits now. He explained that it was not an option to interrupt the water supply.

The Technical Memorandum should support gravel bar extraction to facilitate permits.

Meeting Adjourned