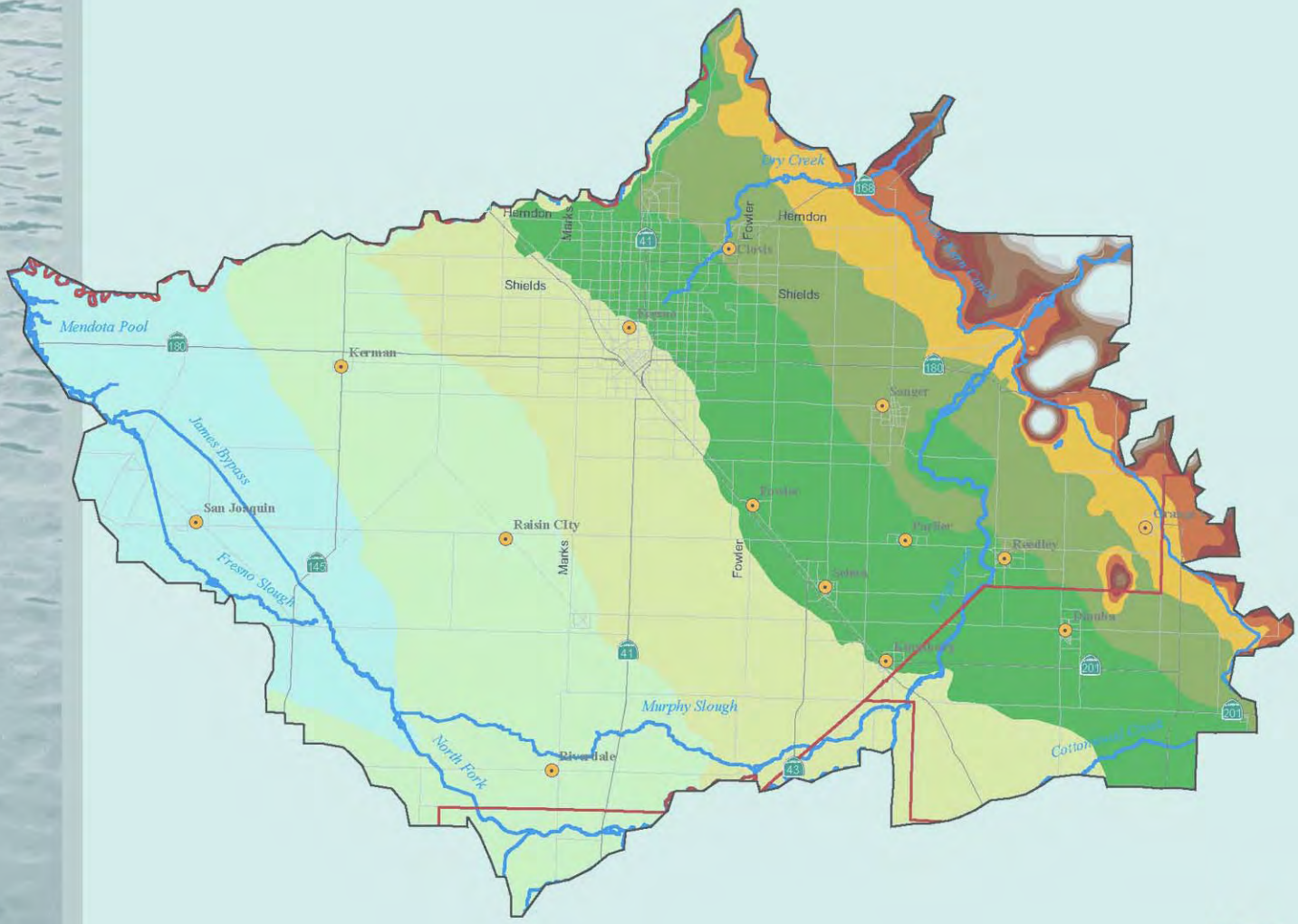
Consolidated Irrigation District

Groundwater Management Plan

March 2009



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Consolidated Irrigation District Groundwater Management Plan

Submitted to:
Consolidated Irrigation District

Date: March 6, 2009
Project No. 073350

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Abbreviations and Acronyms

AID	Alta Irrigation District
BAP	Basin Advisory Panel
Basin	San Joaquin Valley Groundwater Basin
bgs	below ground surface
BMOs	basin management objectives
BMPs	Best Management Practices
CEQA	California Environmental Quality Act
cfs	cubic feet per second
CHK	Cortese-Hetzberg-Knox
CID	Consolidated Irrigation District
CIMIS	California Irrigation Management Information System
CPT	cone penetrometer
CU3	Conjunctive Use Element 3
CVP	Central Valley Project
DCE	dichloroethane
Delta	Sacramento-San Joaquin River Delta
DHS	Department of Health Services
DMS	Data Management Systems
DWR	California Department of Water Resources
DWSAP	Drinking Water Source and Protection
EHD	Environmental Health Division
ET	evapotranspiration
EWA	Environmental Water Account
EWMP	Efficient Water Management Practices
FID	Fresno Irrigation District
GAC	GroundwaterAdvisory Committee
GAMA	Groundwater Ambient Monitoring and Assessment
GWMP	Groundwater Management Plan
gpd/ft	gallons per day per foot
gpm	gallons per minute

GWMP	Groundwater Management Plan
IRWMP	Integrated Regional Water Management Plan
IGSM	Integrated Groundwater and Surface Water Model
IS/MND	Initial Study/Mitigated Negative Declaration
Kings IGSM	Kings Basin Integrated Groundwater and Surface water Model
KRCD	Kings River Conservation District
KRWA	Kings River Water Association
LAFCO	Local Agency Formation Commission
LUST	leaking underground storage tank
M&I	municipal and industrial
MCL	maximum contaminant level
mg/L	milligrams per liter
MMR	Monitoring, Measurement, and Reporting
M&O	maintenance and operations
MOU	Memorandum of Understanding
MSL	Mean Sea Level
NCDC	National Climatic Data Center
NOD	Notice of Determination
NRCS	Natural Resources Conservation Service
OPR	Office of Planning and Research
PAEP	Project Assessment and Evaluation Plan
PBE	Physical Barrier Effectiveness
PCAs	Potential Contamination Activities
PCE	tetrachloroethylene
ppb	parts per billion
Program	Groundwater Mitigation and Banking Program
PSP	Proposal Solicitation Package
QAPP	Quality Assurance Project Plan
RCUP	Regional Conductive Use Program
Region	Upper Kings Region
RWQCB	Regional Water Quality Control Board
SB	Senate Bill

SCADA	Supervisory Control and Data Acquisition
SOI	sphere of influence
SSJVWQC	South San Joaquin Valley Water Quality Coalition
SWAMP	Surface Water Ambient Monitoring Program
SWP	State Water Project
SWPPP	Storm Water Pollution Prevention Plan
TAF	thousand acre-feet
TCE	trichloroethylene
TDS	total dissolved solids
USACE	U.S. Army Corps of Engineers
USBR	U.S. Bureau of Reclamation
USGS	U.S. Geological Survey
UWMPs	Urban Water Management Plans
VOC	volitile organic compound
Water Forum	Upper Kings Water Forum
WHPA	Wellhead Protection Area

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Executive Summary

Background

The purpose of this document is to update the 1995 Consolidated Irrigation District (CID) Groundwater Management Plan (GWMP). It defines management actions to be implemented by CID to ensure that there is a long-term, sustainable supply for current and future water needs.

The proposed projects, programs and policies defined in the GWMP are intended to complement the existing CID conjunctive use program which has been in operation since 1921, when the District was formed. CID has actively managed its Kings River water through conjunctive use which is the combined management of surface water and groundwater supplies and storage.

CID encompasses 145,000 acres of which the largest land use is agriculture and the majority of the water demand is to support the agricultural economy. Crop water requirements are met through irrigation application of both surface and groundwater. Surface water delivered to agriculture reduces the reliance on groundwater. Part of the surface water applied to agricultural, specifically that not consumed by the crops, percolates downward and recharges the groundwater basin. The intentional use of surface water in lieu of groundwater pumping is part of CID conjunctive use operations. Incorporated cities within the boundaries of CID include Fowler, Kingsburg, Parlier, Sanger, and Selma (CID Cities). Total urban water demands are much smaller than the total agricultural water demands, but the growing urbanized areas are reliant exclusively on groundwater.

Purpose and Need for Groundwater Management Planning

Despite the active management of Kings River water by CID and the other overlying water districts, groundwater overdraft is occurring in the Kings Basin on an average annual basis. This means that on average more groundwater is removed than recharged. This is shown by the long-term decline in groundwater levels. The results of the analysis of the regional water budget using the Kings Basin Integrated Groundwater and Surface Water Model (Kings IGSM) also demonstrate overdraft conditions. Based on the Kings IGSM, the average annual overdraft within CID for the 40 year period from 1964 to 2004 was approximately 24,000 acre-feet. The entire Kings River Basin was overdrafted by approximately 160,000 acre-feet per year during the same time period.

Long-term overdraft is not sustainable. Potential effects of overdraft include land subsidence, increased pumping costs, migration of poor quality water, and reduced economic activity in both agricultural and urban sectors. Overdraft may create conflicts between

overlying land owners; between different types of water users; or between existing and new users that are all reliant on the common groundwater supplies. The worst case scenario is that the overdraft would spawn conflicts that result in litigation over the rights and entitlements to groundwater and a loss of local control.

Historically, the management of the groundwater resources in the Kings Basin has been limited to independent operations by overlying local water agencies and individual water users. Piecemeal planning has constrained the potential for solutions to overdraft.

The CID Board of Directors has recognized that continued groundwater overdraft and the urban growth pressure call for improved water resources management within CID and the overall Kings Basin. CID GWMP will help the Board of Directors work with the community to plot a course of action to address overdraft and gain a consensus on project solutions and funding.

CID has been part of the Upper Kings Water Forum (Water Forum) that has prepared the Upper Kings Integrated Regional Water Management Plan (Upper Upper Kings IRWMP) to address the larger regional overdraft. The Water Forum has provided a diverse range of perspectives from cities, counties, irrigation districts, environmental interests, and other stakeholders regarding the long-term strategies needed to manage available water supplies. The Upper Kings IRWMP recommended that the irrigation districts update their GWMPs as needed to be responsive to the unique operational, infrastructure, and institutional environments within their jurisdictional areas.

The Upper Kings IRWMP defined the Regional Conjunctive Use Program (RCUP) to reduce overdraft. CID will implement RCUP concepts through the Groundwater Management Plan.

GWMP Goals and Objectives

The CID Board established the following goals and objectives for the CID GWMP:

- Halt and ultimately reverse overdraft and provide for sustainable management of surface water and groundwater.
- Increase the water supply reliability, enhance operation flexibility, and reduce system constraints.
- Improve and protect water quality.

To be compatible with the Upper Kings IRWMP, the CID GWMP incorporates the following general objectives from the Upper Kings IRWMP:

- Define local and regional opportunities for groundwater recharge, water reuse/reclamation, and drinking water treatment.
- Develop large-scale regional conjunctive use projects and artificial recharge facilities.

- Negotiate and develop institutional arrangements and cost sharing for water banking, water exchange, water reclamation, and water treatment.

Additional GWMP general objectives adopted by CID are to:

- Support cities in streamlining project reviews.
- Provide a GWMP that will serve as a regional water supply assessment for purposes of evaluating proposed development.
- Through funding, adoption, and participation in the GWMP; provide CID Cities with a mechanism to verify a water supply for proposed projects and for mitigating groundwater supply impacts.
- Develop a standard practice by which CID can develop financing for land and water purchases; evaluate land for its recharge potential; and obtain environmental clearances to acquire property and water for purposes of recharge and overdraft reduction.
- Develop the necessary environmental documentation that would support the recharge programs.

Potential Uses of the GWMP

Opportunities exist for CID and the land use agencies to integrate General Plan, UWMPs, and GWMP requirements to streamline the decision process; avoid conflicts; meet current and future demands; and sustain the local economy. CID is the regional water agency with appropriate powers and authorities to develop the GWMP for the region. CID intends to use the GWMP to define projects that ensure a reliable water supply is available. The potential uses of the GWMP are as follows:

- Streamline development review process for CID Cities, water suppliers, and CID.
- Document regional water demand and supply sources to a level of detail such that the GWMP would serve as a regional water supply assessment for CID Cities when considering new development.
- Define projects (physical solutions) to overdraft that will provide mitigations for groundwater impacts related to new projects that increase groundwater demands.
- Provide the mechanism for CID Cities to verify water supply availability and adopt legally defensible findings of sufficiency.

GWMP Components

In addition to the Upper Kings IRWMP RCUP components that are integrated into the 2008 CID GWMP, there are three additional components intended to ensure compliance with the water code. These include seven (7) mandatory components from SB 1938, twelve (12) voluntary components of AB 3030 and SB 1938, and seven (7) suggested components identified in DWR Bulletin 118 (DWR, 2003).

The GWMP summarizes the water resources regionally and within the CID area. It includes a discussion of the current and future land use and associated water demands, water supplies and sources, existing water supply facilities, groundwater levels, and water quality conditions; and the historical and baseline conditions of the water resources within CID.

The GWMP presents and evaluates alternative water management strategies that the Board considered during development of the overall groundwater management strategy. Many of the programs identified by DWR for consideration in the GWMP have been addressed in the Upper Kings IRWMP, and CID will meet some of the GWMP requirements through the continued participation in the Water Forum and implementation of the Upper Kings IRWMP. The CID Board analyzed water management constraints and opportunities, made specific findings and identified subsequent actions for:

- Conjunctive use, groundwater storage and banking
- Land acquisition and protection of recharge areas
- Conveyance and extraction facilities
- Coordination with land use planning agencies
- Groundwater and related monitoring

Conjunctive Use, Groundwater Storage, and Banking

In general, the CID Board found that overdraft requires a dedicated response if local control and management are to be preserved. CID will use the CID GWMP as a guide to define, fund, and implement a Groundwater Mitigation and Banking Program that will include capital facilities projects, programs, and policies to manage available groundwater storage capacity and provide mitigations to groundwater impacts of new urban development.

CID will supplement local resources and keep local costs down by identifying federal, state, and regional funding opportunities. The Board is committed to protecting overlying groundwater rights; and to working with the cities to develop the institutional arrangements and agreements that provide funding for recharge facilities with tangible yields that provide a long-term, sustainable water supply for new development.

On the plus side, the GWMP notes that there is surface water available to CID for recharge; that there is available capacity within CID facilities to convey water, though some conveyance facilities may need to be modified or expanded; and that there is land within CID that has appropriate hydrogeologic conditions for additional recharge ponds and that is located near useable CID conveyance facilities.

The CID GWMP provides guidelines for the groundwater mitigation and banking program that are intended to avoid environmental impacts and third party effects. The Board is committed to expanding the groundwater recharge operations by pursuing new in-lieu or direct recharge projects using available surface water and flood water; improving and

protecting canal conveyance capacity; developing agreements and funding mechanisms in cooperation with CID Cities; and by acquiring additional lands for purposes of developing additional recharge capabilities.

In addition, CID will evaluate maintenance and operations at existing recharge ponds to identify opportunities to increase recharge rates; and investigate the feasibility for constructing extraction facilities to improve the distribution of recharged and banked water. Longer term actions include coordinating with other Kings Basin Water Forum members to aggressively pursue development of additional regional facilities for conjunctive use.

Surface Water Treatment

There is no current imperative to develop municipal surface water treatment plants in CID Cities, but this may be necessary in the future. If urban lands continue to develop and rely exclusively on groundwater, and if recharge facilities are not developed to help meet future urban demands, treatment of surface water for municipal use in lieu of groundwater may be needed.

Land Acquisition

One of the biggest constraints to further development of recharge facilities is related to the ability for CID to acquire land. A cooperative program between CID and the cities is needed to generate revenues to acquire lands when they are available. CID will work with CID Cities and Fresno County to acquire land for multiple benefits including flood control, recharge, open space, and recreation purposes; and to further develop and implement a land acquisition process for acquiring lands through purchase (for direct recharge facilities) or easement (for spreading).

Conveyance

CID conveyance facilities move water from the Kings River to agricultural water users and recharge facilities. The conveyance facilities include natural channels and constructed facilities, such as canals, pipelines, and diversion structures. Groundwater aquifers also convey water from recharge areas to areas of pumping. Improvements to the existing conveyance system could provide more flexibility to move water from the available supply sources to existing, improved, or new groundwater recharge facilities. Improved conveyance facilities might also allow surface water to be delivered to a larger irrigation service area within CID in lieu of groundwater pumping. There is a backlog of deferred maintenance on CID facilities and a need to modernize some components of the existing system. CID Cities currently derive uncompensated benefits from use of the irrigation canals and conveyance facilities for both groundwater recharge and storm water disposal. CID needs to work with the cities to protect, preserve, or improve existing capacities in developing areas.

Land Use and Water Supply Planning

The Board found that there are opportunities for improving interagency coordination during decisions on new development. City general plans and UWMPs do not recognize overdraft or the limitation of the groundwater source, nor do they define how cities will mitigate water supply impacts of new development. Without firm plans for developing and funding water supply projects and ensuring that water supplies are available to meet current and future water demands, CID Cities may have trouble making sufficiency determinations and complying with statutory requirements; land use decisions may be subject to successful legal challenge; and economic development could be affected. CID Cities need to mitigate for the groundwater impacts of new development during the development review process. This can be done through demonstrating that the city is not contributing to overdraft (e.g., requiring the developer or city to procure a new water supply in lieu of using groundwater) or by participating in a groundwater mitigation and banking program.

To help address the issues, CID will continue to act as responsible agency and actively engage in the development review process of CID Cities and Fresno County to ensure impacts to groundwater and CID facilities are mitigated. The CID Board will make findings and adopt policies to be used by staff and the cities such that groundwater impacts are recognized and mitigated during the development review or CEQA review process. Where appropriate, CID will work with the developers or water purveyors to provide groundwater mitigations and banking solutions where cities have not mitigated groundwater impacts of new development; and will continue to work with Fresno County LAFCO to ensure that CID Cities are responsive and that the development review and annexation process are used to effectively mitigate groundwater impacts and impacts to CID facilities.

Groundwater and Related Monitoring

The purpose of monitoring is to provide the data needed to identify problems; define and evaluate alternatives; reduce uncertainty when making important resources decisions; measure and document progress in meeting basin management objectives; and to provide data to demonstrate that the anticipated benefits of proposed projects and programs are being realized. CID has been monitoring groundwater levels since the 1920s and has well-established quality control and assurance procedures, and will continue to maintain and support the current water level monitoring efforts, participating in more regional efforts in the Kings Basin when such a program is developed. The District will use an annual water resources report that describes water resources and groundwater conditions; including groundwater levels hydrographs, groundwater contours, diversions, recharge estimates, and change in storage. This report could also include a summary of hydrologic conditions in the Kings Basin and describes the progress made in implementing management activities and the effects of these activities on meeting basin-wide goals and objectives. When projects are to be built, CID will adopt pre- and post-project monitoring protocols to support project development and to document project benefits.

Recycling

The Upper Kings IRWMP contained an evaluation of recycled water use. The Upper Kings IRWMP found that use of recycled water in lieu of groundwater pumping for non-potable uses, including agriculture, would benefit the Kings Basin by allowing more water to remain in groundwater storage, but that the water budget benefits and yield of recycled or reclaimed water projects only accrue where the sources of wastewater are originally from surface water, and not from pumped groundwater. The Forum also found that wastewater treatment plant upgrades and 'purple' pipe distribution facilities are expensive and not cost effective when compared to currently permitted practices for disposal of wastewater in most areas of the Upper Kings Region and within CID. To achieve that potential, CID and others in the Upper Kings Region would need to make substantial investments in additional treatment and distribution infrastructure. Within CID the Selma-Kingsburg-Fowler (SKF) Regional Sanitation District and the other municipalities treat and dispose of wastewater under permit from the RWQCB. There is currently very little wastewater discharged directly to the Kings River, and therefore, very little wastewater currently is flowing out of the CID area. There is a potential to match treated water quality to appropriate uses (e.g., power generation, urban landscaping) as part of an In-Lieu Recharge Program. The current wastewater disposal practices result in recharge to the groundwater basin consistent with the current standards, permits, and requirements of the RWQCB and actions to upgrade to higher levels of treatment to allow for direct reuse are not currently cost effective. CID will work with cities and the SKF Regional Sanitation District to support the reclamation and reuse of reclaimed wastewater when determined to be cost effective and safe in comparison to other alternative supplies.

Program Description and Plan Implementation

The Groundwater Mitigation and Banking Program (CID Program) is comprised of a preliminary list of proposed projects and management actions. The management actions include the programs, policies, and agreements that are needed to be funded and implemented. CID is working with the community to finalize the projects, programs, policies, and agreements based on the findings and actions related to the overall Groundwater Mitigation Banking Program. CID proposes to develop, own, operate, and maintain the groundwater banking facilities and manage the banked groundwater on behalf of overlying land owners and the participants in the program.

CID projects will meet the overall GWMP and Upper Kings IRWMP Basin Management Objectives (BMO). These BMO quantities are the result of the engineering feasibility studies and preliminary designs; historical operations at the existing 1,300 acres of recharge ponds; and best engineering judgments. Consistent with near-term (1 to 3 years) BMOs, the CID Program is to design and develop up to 10,000 acre-feet per year of recharge project capacity on 100-200 acres with an instantaneous recharge rate between 150-300 cubic feet per second (cfs). This will be accomplished throughout the CID system.

The common Groundwater Mitigation and Banking Program Elements include:

- Land Acquisition, Purchase, Easements
- Surface Water Sources
- Project Sizing and Phasing
- Diversion, Conveyance Facilities, and Wheeling
- Pond Construction and Maintenance
- Extraction of Stored Water
- Environmental Features
- Project Specific Monitoring

The program implementation plan discusses the project sponsors and role, potential participants, and funding along with discussion of how progress will be reported and measured; community affairs and public outreach; integration with land use plans and GWMP; and environmental compliance for the GWMP.

A priority for CID is to develop recharge projects along the C&K Canal, but this does not exclude development of projects on viable recharge sites that may be located throughout CID's jurisdictional area. CID is actively seeking to acquire controlling interest in potential project properties consistent with the intent of the GWMP. CID will also work to further identify canal improvements and pond facilities that would increase operational flexibility and increase recharge system-wide. Improvements to existing ponds, including changes to the maintenance routines, will be investigated to increase recharge, determine if the ponds performance could be improved and how the existing ponds may provide multiple benefits for both groundwater recharge and storm water management.

Surface water for purposes of recharge will come from (1) CID water entitlements; (2) CID diversion of unregulated Pine Flat flood releases; (3) CID diversion of fish flow releases from Pine Flat Reservoir; (4) Central Valley Project (CVP) 215 flood releases; or (5) other Kings River water rights of Kings River Water Association members. Floodwater would be diverted and recharged primarily in wet years

The proposed projects will be developed over the next five to ten years based primarily on the availability of funding, number of sponsors or participants, and a project contribution to meeting measurable basin management objectives. Each of the individual projects will be developed in context of the overall program and will need to go through a specific design, development, and permitting process.

1 Introduction

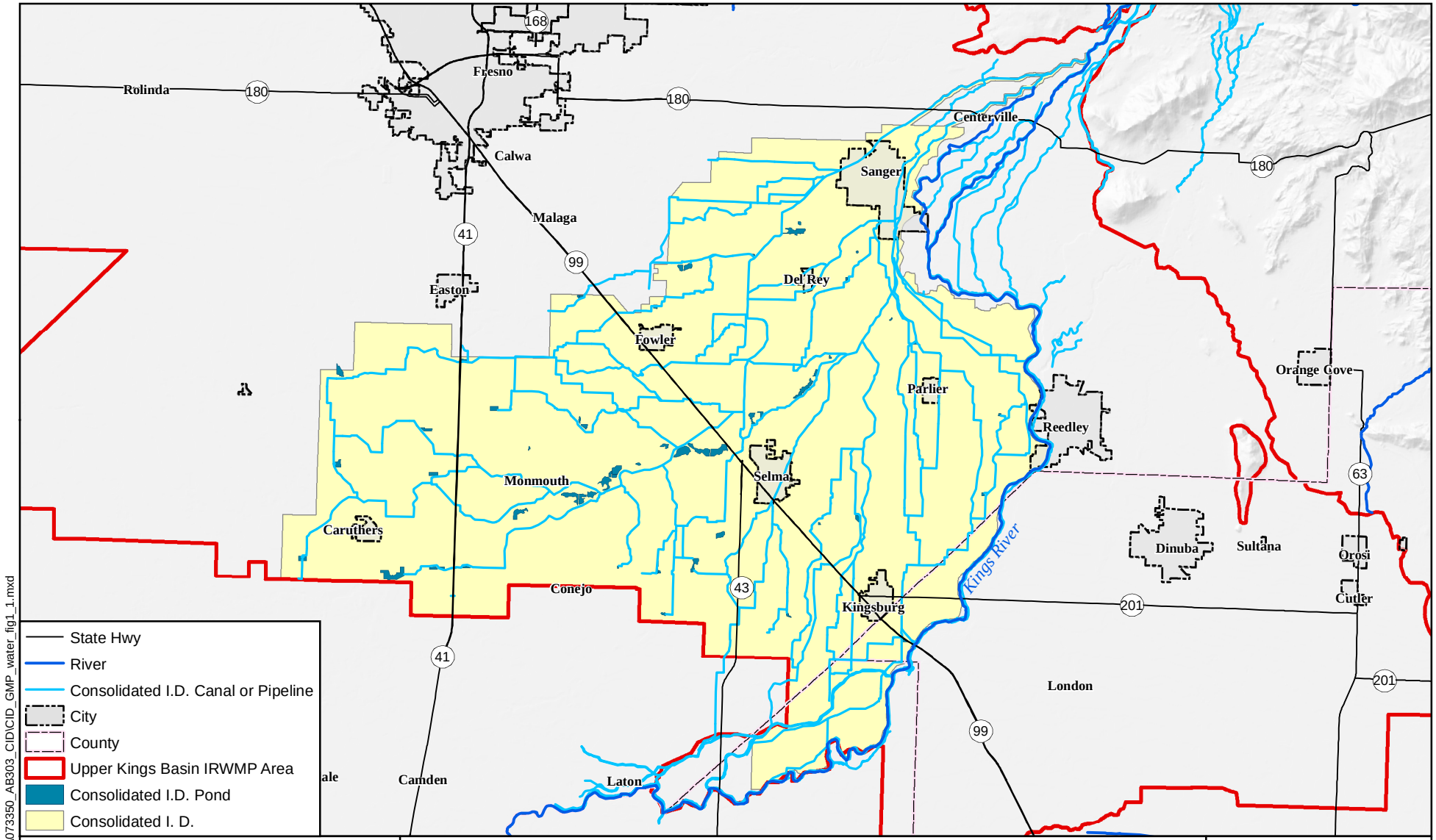
1.1 Introduction and Plan Area

Consolidated Irrigation District (CID) is located in the San Joaquin Valley, on the eastern side of Fresno County, and includes small portions of Tulare and Kings Counties. Figure 1.1 shows the boundaries of CID, CID canals and recharge ponds, and the developed areas. CID overlies the Kings Groundwater Subbasin (Kings Basin), which is part of the larger San Joaquin Groundwater Basin, as defined in the California Department of Water Resources (DWR) Bulletin 118 (DWR, 2003). Figure 1.2 shows the surrounding groundwater basins, institutional and planning boundaries, and the area of the Upper Kings Basin Integrated Regional Water Management Plan (Upper Kings IRWMP; KRCD, 2007).

The purpose of this document is to update the 1995 CID Groundwater Management Plan (GWMP) and define management actions to be implemented by CID to better manage groundwater. These actions are intended to complement the existing efforts of CID which has maintained a longstanding program of groundwater recharge and management. It is also intended that actions defined herein are consistent with policies and programs identified in the Upper Kings IRWMP.

CID was organized on September 8, 1921, in accordance with the California Water Code and has been actively managing local water supplies through conjunctive use since the agency was formed. **Conjunctive use** is the combined management of surface water and groundwater supplies and storage. The District's historic conjunctive use program includes the diversion, in wetter years, of allocated Kings River water and Kings River flood releases into the District's service area for irrigation and groundwater recharge. In drier years, growers irrigate with available surface water supplies supplemented by pumping of recharged groundwater

CID is comprised of 145,000 acres, the majority of which is in agricultural production. Incorporated cities within the boundaries of CID include Fowler, Kingsburg, Parlier, Sanger, and Selma (CID Cities). Other smaller urban enclaves are found in the unincorporated areas and include Caruthers and Del Rey. Total urban water demands are much smaller than the total agricultural water demands, but the growing urbanized areas are reliant exclusively on groundwater. The majority of the water demand within CID is to support the agricultural economy. Crop water requirements are met through irrigation application of both surface and groundwater. Surface water delivered to agriculture reduces the reliance on groundwater.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Conejo
Kingsburg
Kings River
Dinuba
Sultana
Orosi
Cutler
London
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Camden
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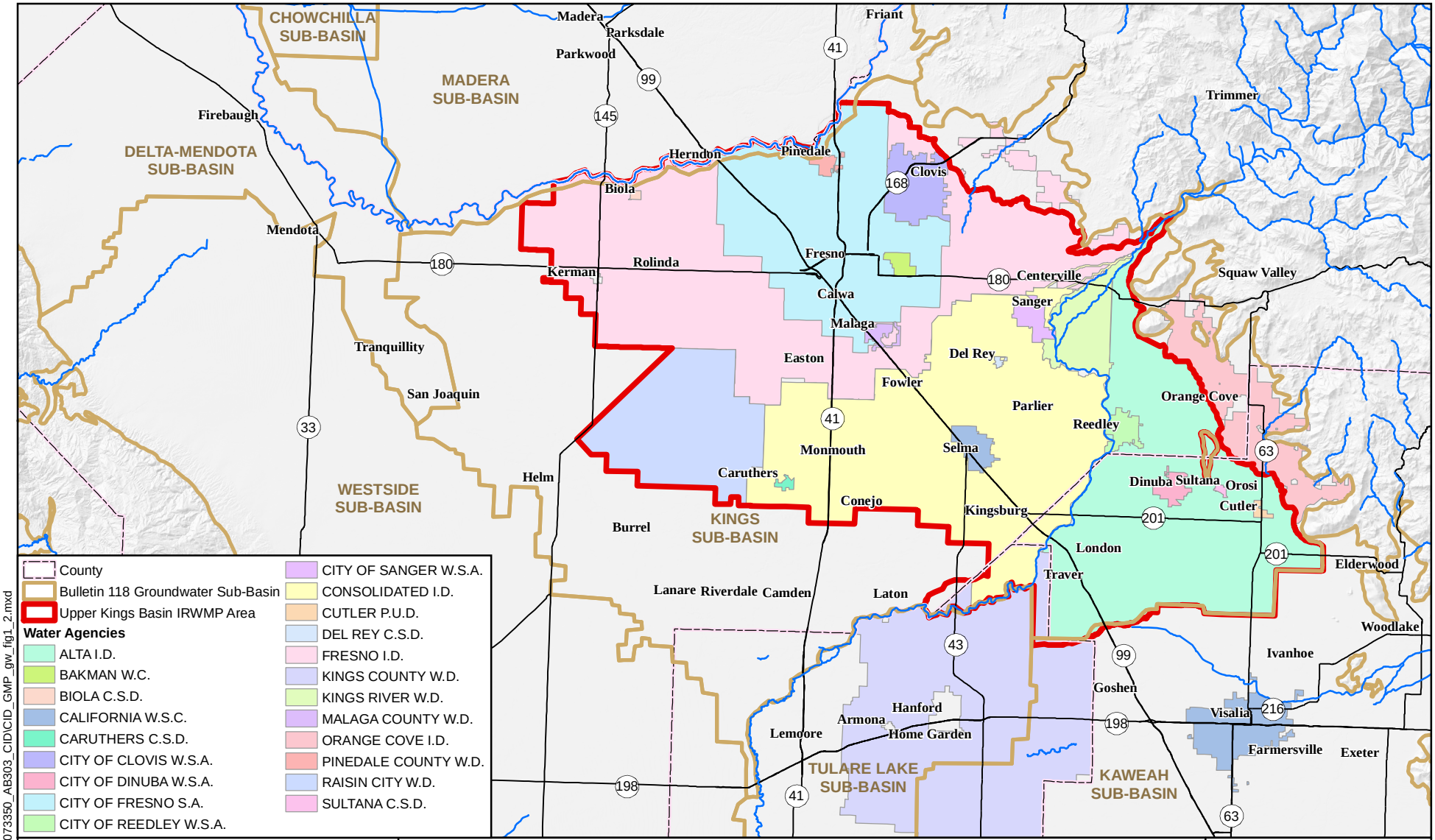
Consolidated Irrigation District
Groundwater Management Plan
CID Boundaries and Facilities
May 2008
Figure 1.1



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Consolidated Irrigation District Groundwater Management Plan

Institutional and Planning Boundaries

May 2008

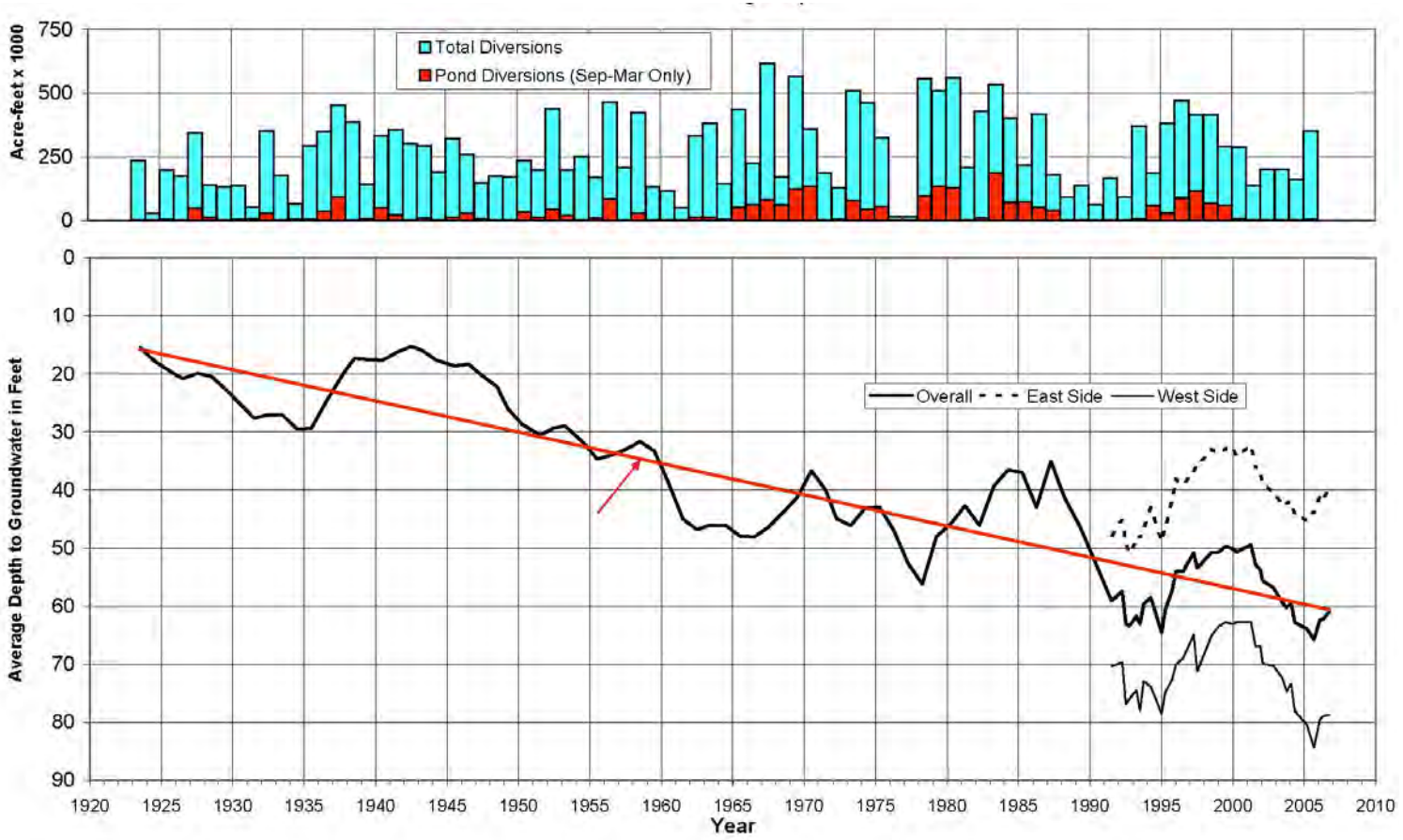
Figure 1.2

Part of the surface water applied to agricultural, specifically that not consumed by the crops, percolates downward and recharges the groundwater basin. The intentional use of surface water in lieu of groundwater pumping is part of the CID conjunctive use operations.

CID has water rights to the flow of the Kings River and storage rights in Pine Flat Reservoir. Surface water is stored in Pine Flat and diverted by CID from the Kings River for distribution through 350 miles of canals. Water flowing down the canals also recharges the groundwater basin. Part of the diverted surface water is delivered to 1,300 acres of recharge ponds located throughout the District. The average annual surface water supply is approximately 238,000 acre-feet, but can vary from the low of 13,500 acre-feet in 1976, to a high of 616,000 acre-feet in 1967. Average pond recharge is approximately 30,000 acre-feet, ranging from zero in the direst of years, to a maximum of 187,000 acre-feet. While CID is comprised of 145,000 acres, diverted water is used for surface irrigation on approximately 95,000 acres. The remaining areas of CID, including the cities and unincorporated communities, rely exclusively on groundwater. Figure 1.3 shows historic surface water diversions and the averaged decline in the water table underlying the District.

Despite the active management of Kings River water by CID and the other overlying water districts, **groundwater overdraft** is occurring in the Kings Basin on an average annual basis. This means that, while in some years more water is recharged than removed and groundwater levels rise, on average, more groundwater is removed than is recharged. This is evidenced by the long-term decline in groundwater levels depicted in Figure 1.3. Based on measured groundwater level declines since 1923 and geologic properties of the underlying aquifer, CID estimates the annual average overdraft within its boundaries to be approximately 13,500 acre-feet. In addition, and as discussed further in this report, the Kings Basin Integrated Groundwater and Surface Water Model (Kings IGSM) was used to evaluate the regional water budget and to quantify overdraft for the more recent period of 1964 to 2004. Based on the Kings IGSM, the average annual overdraft within CID for the 40 year period was approximately 24,000 acre-feet. The entire Kings River Basin was overdrafted by approximately 160,000 acre-feet per year during the same time period.

Long-term overdraft is not sustainable and has the potential to result in conflicts between competing water users. Other potential effects of overdraft include land subsidence, increased pumping costs, migration of poor quality water, and reduced economic activity in both agricultural and urban sectors, including disadvantaged communities.



GEI Consultants	**Consolidated Irrigation District Groundwater Management Plan** Surface Water Diversions vs. Average Depth to Groundwater	**May 2008** **Figure 1.3**

1.2 Authority to Prepare Groundwater Management Plan

CID has the authority to manage the groundwater resources within its service area through California Water Code, Division 6, Part 2.75 (Sections 10750 et seq.). It is the primary agency responsible for this GWMP, and it provides for management of the groundwater basin within its political boundary. CID has prepared this GWMP and has invited the cities of Sanger, Selma, Fowler, Kingsburg, and Parlier; Kings River Conservation District; and other water agencies to participate in its development. This GWMP is consistent with the provisions of California Water Code, Sections 10750 et seq., as amended January 1, 2003.

1.3 Related Groundwater and Water Management Activities

1.3.1 CID 1995 Groundwater Management Plan

The 1995 Groundwater Management Plan was prepared in accordance with state requirements in place at that time. The 1995 plan documented the groundwater management activities that the District has implemented throughout its existence and provided a framework for expanding groundwater management within CID. The California State Legislature subsequently amended the parts of the California Water Code related to local agency management of groundwater (CWC § 10750 *et seq.*). The new requirements were defined in Senate Bill (SB) 1938.

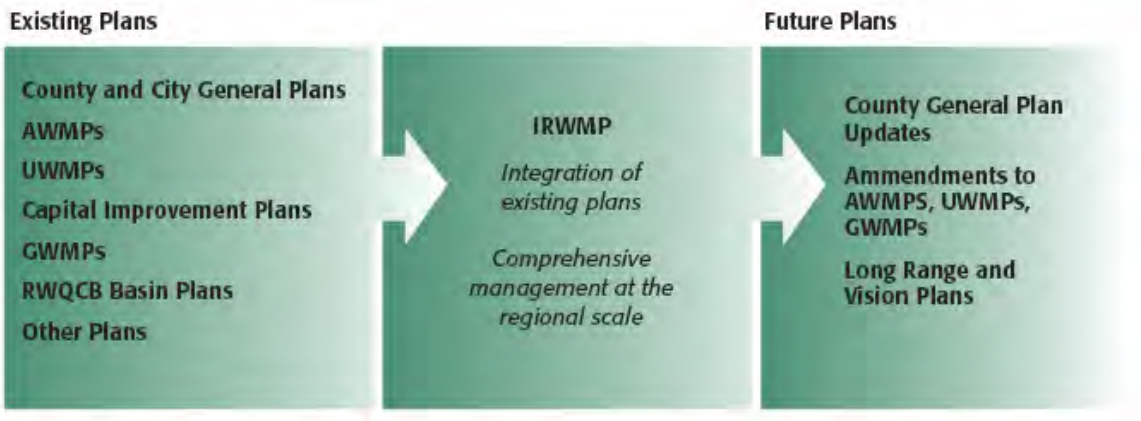
To help implement recommendations in the 1995 CID GWMP, CID and other local districts initiated a process of regional cooperation in 2001 to address the overdraft problem and develop practical solutions. CID, Kings River Conservation District (KRCD), Alta Irrigation District (AID), and Fresno Irrigation District (FID) formed a Basin Advisory Panel (BAP); sought technical, facilitation, and financial support from the California Department of Water Resources (DWR); and signed a Memorandum of Understanding (MOU) that defined how they would work together to manage existing supplies and develop new supplies for the Upper Kings Region. This water management group was formed pursuant to the IRWMP standards and guidelines (DWR, 2004a).

1.3.2 Upper Kings Basin Integrated Regional Water Management Plan

CID and the BAP made significant progress by working together to define the water resources problems, but realized that the involvement of other stakeholders in the basin would be necessary if regional solutions were to be developed. Recognizing that the Kings Basin is an interconnected hydrologic system; CID, AID, and FID initiated a larger regional planning effort in 2003. As a result of these early efforts, CID and other water districts solicited wider stakeholder participation and the Upper Kings Water Forum (Water Forum) was formed in 2004 to coordinate water resources planning in the Region. The Water Forum has provided a diverse range of perspectives from cities, counties, irrigation districts,

environmental interests, and other stakeholders regarding the long-term strategies needed to manage available water supplies.

Figure 1.4 IRWMP and GWMP Linkages



CID has participated in the stakeholder process that was used to develop the IRWMP and will follow a process for update of the GWMP that is consistent with the IRWMP and Water Code requirements defined in §10750. The Upper Kings IRWMP has integrated groundwater management activities within the Upper Kings Basin and is intended to support the independent water districts in updating their GWMPs as needed to be responsive to the unique operational, infrastructure, and institutional environments within their jurisdictional areas. The Upper Kings IRWMP is incorporated by reference into this CID GWMP (Figure 1.4).

One of the primary goals of the Upper Kings IRWMP is to reduce overdraft through conjunctive use and groundwater management using both structural projects (direct/in-lieu recharge) and non-structure management measures (monitoring; integration of land use and water supply plans; adaptive management; etc.).

The Upper Kings IRWMP defined the Regional Conjunctive Use Program (RCUP) to reduce overdraft. CID will implement RCUP concepts through the Groundwater Management Plan.

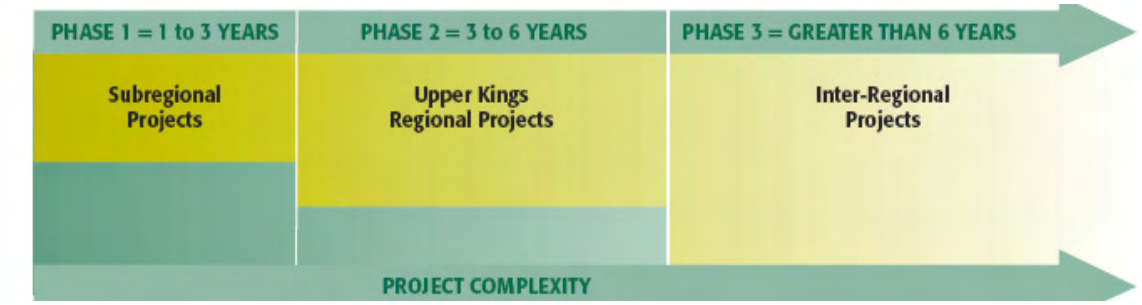
The Water Forum made a finding that groundwater management is critical to the Upper Kings Region and the success of any conjunctive use program, and recommended that each of the overlying water districts in the Upper Kings Region work with stakeholders in their respective jurisdictions to update and implement their individual groundwater management plans. Within one year of the adoption of the IRWMP, all of the irrigation districts were to be in compliance with the Groundwater Management Plan (SB 1938) requirements.

The Upper Kings IRWMP integrated the existing GWMPs of the irrigation districts; defined a **Regional Conjunctive Use Program (RCUP)**; and provided a basis for the local irrigation

districts to cost effectively update their GWMPs as needed to meet the revised SB 1938 requirements.

The RCUP includes multiple projects in the overall program and will be further developed and integrated by CID and the Water Forum in three phases and three geographic project scales. The Upper Kings IRWMP substantively meets many of the SB 1938 requirements, including definition of specific **Basin Management Objectives (BMOs)**. One of the recommendations in the Upper Kings IRWMP was for CID to work with the cities and stakeholders in the CID jurisdiction to update the GWMP plan to be consistent with the SB 1938 requirements and implement the overall upper Kings Basin RCUP at the local level (Figure 1.5).

Figure 1.5 RCUP Phases and Geographic Scales



In recognition of the water management responsibilities and engineering expertise of the irrigation districts, the Water Forum recommended that each district further implement the RCUP at the local level. As part of the GWMP, CID is proposing to develop Phase 1, "near-term" (one to three years) direct recharge projects. This includes 200 to 300 acres of direct recharge facilities to percolate CID water from the Kings River; unregulated Kings River flood flows; and Central Valley Project, Friant Unit 215 flood waters and yield an average of 10,000 to 14,000 acre-feet per year. The purpose of the proposed facilities is to reduce overdraft associated with existing municipal and agricultural uses and provide water to mitigate for the increased groundwater pumping from new urban developments.

In recognition of the powers and authorities of the local cities for managing land use, the Water Forum also recommended that cities and the irrigation districts work together to better integrate land use and water supply plans and the planning process; as well as work to ensure that new development has a secure and reliable water supply.

1.3.3 Other GWMPs in the Kings Basin and Surrounding Areas

Within the Upper Kings Basin, the FID has an SB 1938 compliant groundwater management plan (FID, 2005), and the AID has an older GWMP that needs to be updated. The KRCD has worked with the irrigation districts and overlying landowners in the western part of the

Kings Basin to produce the Lower Kings Basin Groundwater Management Plan (KRCD, 2005). This plan also covered areas to the south of the Kings Groundwater Basin in the Tulare Lake Basin.

1.3.4 Other Historic CID Groundwater Management Activities

In the early 1980's CID and the five cities within the overall boundary of the District executed individual cooperative agreements. Among other things, the agreements allowed cities to construct hydraulic connections between CID's canals and city storm water basins for the purpose of delivering additional recharge water to the city ponds. The cooperative agreements are currently being renegotiated with a greater emphasis on mitigating groundwater impacts caused by urban development.

1.4 GWMP Components

In addition to the Upper Kings IRWMP RCUP components that are integrated into the 2009 CID GWMP, there are three additional components intended to ensure compliance with the water code. These include seven (7) mandatory components from SB 1938, twelve (12) voluntary components of AB 3030 and SB 1938, and seven (7) suggested components identified in DWR Bulletin 118 (DWR, 2003).Table 1-1 lists the required and recommended components and identifies the specific location within this GWMP where the information can be found.

Table 1-1. Guide to How the GWMP Meets State Standards

Description (ALL CH 5 REFERENCES NEED UPDATING)	Chapter, Figures, Section
SB 1938 Mandatory Components	
1. Documentation of public involvement statement	Appendix D
2. Basin Management Objectives (BMOs)	3.2
3. Monitoring and management of groundwater elevations, groundwater quality, inelastic land subsidence, and changes in surface water flows and quality that directly affect groundwater levels or quality or are caused by pumping	5.1, 5.2, 5.6
4. Plan to involve other agencies located in the groundwater basin	1,3.3, 2.1.3, & 6
5. Adoption of monitoring protocols	5.6
6. Map of groundwater basin boundary, as delineated by DWR Bulletin 118, with agency boundaries that are subject to GMP	1.1; Figure 1.2
7. For agencies not overlying groundwater basins, prepare the GMP using appropriate geologic and hydrogeologic principles	1.1, Figure 1.2, 3.3, & 4
AB 3030 and SB 1938 Voluntary Components	
1. Control of saline water intrusion	5.5.1
2. Identify and manage well protection and recharge areas	5.5.2; 5.5.3
3. Regulate the migration of contaminated groundwater	5.5.4
4. Administer well abandonment and destruction program	5.5.5
5. Control and mitigate groundwater overdraft	5.1, 5.2, 7
6. Replenish groundwater	5.1, 5.2, 7
7. Monitor groundwater levels	5.6
8. Develop and operate conjunctive use projects	5.1, 5.2, 7
9. Identify well-construction policies	5.3.6
10. Develop and operate groundwater contamination cleanup, recharge, storage, conservation, water recycling, and extraction projects	5.5.7, 5.2.1
11. Develop relationships with state and federal regulatory agencies	5.3.11
12. Review land use plans and coordinate with land use planning agencies to assess activities that create reasonable risk of groundwater contamination	2.1.3, 5.2.2
DWR Bulletin 118 Suggested Components	
1. Manage with guidance of advisory committee	5.4.1, 6
2. Describe area to be managed under GMP	1.1, 4
3. Create links between BMOs and goals and actions of GMP	3
4. Describe GMP monitoring programs	5.6
5. Describe integrated water management planning efforts	1.3.3, 2.1.3, 3.3
6. Report of implementation of GMP	7.3
7. Evaluate GMP periodically	7.3

1.5 Report Content

The following provides a description of each section and appendix included in this GWMP:

- **Section 1 Introduction:** Background information and context for the GWMP.
- **Section 2 Purpose and Need for Groundwater Management Planning:** Provides information regarding the legislative background for groundwater planning.
- **Section 3 Goals and Objectives:** Discusses GWMP goals and general objectives. Specific, measurable Basin Management Objectives (BMOs) have been developed to help quantify and track progress in meeting the goals and more general objectives.
- **Section 4 Water Resources Settings:** Defines the water supply and management problems to be addressed in the GWMP, describes the baseline conditions, and presents the information that was used to establish GWMP goals and objectives. The water budget is presented. It also provides an overview of the engineered, or as-built environment; and the physical setting, including the climate, soils, and geology that present both the planning opportunities and constraints. Current and future land use, water demands, water sources, existing water supply facilities, groundwater conditions, and water quality are presented.
- **Section 5 Alternative Water Management Strategies:** This section describes the water management strategies that were considered, the current activities within CID, constraints to implementation and the actions to be implemented. The action statements are also used to define CID policy with regards to the management actions.
- **Section 6 Stakeholder Involvement:** Provides the framework for public involvement in the preparation and implementation of the GWMP, for involvement and coordination with other water agencies, for developing relationships with state and federal agencies, and for developing a dispute resolution process.
- **Section 7 Program Description and Plan Implementation:** Provides information regarding the plan components and how the plan will be managed and implemented, including the work plans, schedules, and budgets.
- **Section 8 References**

1.6 Technical References and Attachments

There are a number of Technical Attachments incorporated by reference that are contained on the CD enclosed in this document.

- Technical Attachment A, Kings River IGSM Model Development and Calibration Report.
- Technical Attachment B, Memorandum, Floodwater Availability for CID from the Kings River.

- Technical Attachment C, Technical Memorandum, Analysis of Water Supplies in the Kings Basin, Phase 1, Task 4.
- Technical Attachment D, Memorandum, Kings Basin Conjunctive Use Feasibility Analysis.
- Technical Attachment E, Draft Technical Memorandum- Review of City and County General Plans.
- Technical Attachment F, Technical Memorandum, Analysis of Water Demand in the Kings Basin. Phase 1, Task 3.
- Technical Attachment G, Draft Engineer's Report, Urban Impacts Study, Summers Engineering.
- Technical Attachment H, Technical Memorandum, Water Quality Standards, Conditions, and Constraints. WRIME, 2007.
- Technical Attachment I, Memorandum, 2005 Existing Conditions and 2030 Baseline Conditions and Assumptions. WRIME, 2006.

2 Purpose and Need for Groundwater Management Planning

The CID GWMP will help the Board of Directors work with the community to plot a course of action to address overdraft and other related water management issues, and to gain a consensus on project solutions and funding.

Historically, the management of the groundwater resources in the Kings Basin has been limited to independent operations by overlying local water agencies and individual water users. Piecemeal planning constrains the potential for solutions to the area's most pressing issues and increases the potential for competition and conflict over the available water supplies. The CID Board has recognized that CID, acting independently, cannot address overdraft by working alone. Regional, multi-participant efforts are required. The CID Board of Directors also recognizes that continued groundwater overdraft and the urban growth pressure call for improved water resources management in CID and in the overall Kings Basin.

There is both a physical and policy basis for the CID GWMP. The physical basis is associated with the overdraft of the groundwater basin. The policy basis is related to the need for CID and CID cities to: a) qualify for state funding; and b) streamline decision making and comply with updates to the water code and other planning related statutes that require improved coordination between water agencies and land use agencies during the discretionary review of proposed projects. The latter point, streamline decision making and interagency coordination, is necessary when projects will increase water demands or have the potential to impact existing water users, water rights, or water supplies.

2.1 Overdraft

Understanding the available groundwater resources allows for informed decisions regarding resolution of historical problems and for selecting definitive projects to meet future water needs. There is substantial, widely recognized evidence that overdraft of the Kings Basin is occurring. Historical, current, and expected groundwater conditions have been documented in the Upper Kings Basin Integrated Regional Water Management Plan, the Kings Basin IGSM Model Development and Calibration Report (WRIME, 2007), and Technical Memorandum Phase 1, Task 15 Baseline Conditions (WRIME, 2006). These are summarized in Section 4 of this GWMP. The DWR also has declared the Kings Basin to be in a critical state of overdraft (DWR, 2003). There is substantial evidence to document groundwater overdraft.

Historical data (Figure 1.3) and the Kings IGSM document overdraft in the Kings Basin and CID area. The Upper Kings IRWMP documents historical and future water budgets as simulated by the Kings Basin Integrated Groundwater and Surface Water Model (Kings IGSM). The analyses of future build-out conditions indicate that new development will contribute to overdraft and decrease groundwater levels in the area where pumping will increase. CID has also evaluated the nexus between new development and impacts to groundwater, and has concluded that increased groundwater pumping to meet the water demands of new development will contribute to overdraft and should be mitigated (Summers, 2007).

Other negative consequences of overdraft include the potential for land subsidence that could result in structural damage to existing infrastructure and permanent loss of groundwater storage space. Overdraft can change the rate and direction of groundwater flow, result in migration of poor quality water into the area, or an increased loss of stream flow and related negative effects. Overdraft may create conflicts between overlying land owners; between different types of water users; or between existing and new users that are all reliant on the common groundwater supplies.

The worst case scenario is that the overdraft would spawn conflicts that result in litigation over the rights and entitlements to groundwater. Adjudication by the courts represents a loss of local control. Adjudication can be initiated by an individual land owner or by the State Water Resources Control Board if there is a direct impairment to water quality as a result of the overdraft. Adjudication in other basins in the State demonstrates that such a process involves high costs for attorneys, engineers, and experts; and may take many years and millions of dollars to resolve. Ultimately the court ordains a "physical solution" in a stipulated judgment that may include cut-backs on existing users, limitations on new uses of water, defined capital projects, appointment of a water master, mandatory funding guidelines, and a timeline for compliance with mandated requirements. During the proceedings, the uncertainty can stifle economic development and affect the local economy.

A locally-driven planning process that includes key stakeholders in the basin and is based on communication, cooperation, and collaboration is preferred. Such a process is designed to develop the same type of physical solutions and can significantly reduce or eliminate overdraft without litigation.

2.2 Legislative Requirements for GWMPs and IRWMP

Groundwater management is planned and coordinated locally to ensure a sustainable groundwater basin to meet future water supply needs. At present, the State seeks to preserve local control of groundwater by encouraging local entities to adopt GWMPs and by providing funding for studies and project construction. With the passage of AB 3030 in

1992, local water agencies were provided a systematic way of formulating GWMPs (California Water Code, Sections 10750 et seq.). AB 3030 also encouraged coordination between local entities through joint power authorities or MOUs.

The California Water Code was amended in 2002 with the passage of The Groundwater Management and Planning Act of 2002 (SB 1938). The act amends existing law related to groundwater management by local agencies. The law requires any public agency seeking State funds administered through DWR for the construction of groundwater projects or groundwater quality projects to prepare and implement a GWMP with certain specified components. New requirements include establishing BMOs, preparing a plan to involve other local agencies in a cooperative planning effort, and adopting monitoring protocols that promote efficient and effective groundwater management. Local entities seeking bond funds under Propositions 50 and 84 need to have adopted IRWMP and GWMPs if they are to qualify for funding under part of the proposed statutes. The legislative intent is clear, and it is anticipated that future bonds that may provide funding for groundwater management projects will include similar requirements.

2.3 Requirements for Integrating Land Use and Water Supply Planning

In the past, many project and policy decisions surrounding land use and water supplies were made independently. Court precedents and legislative decisions have changed the procedural and informational requirements for land use and water agencies. As part of the GWMP development, a briefing was prepared that discussed changes to the Water and Government Codes and the policy "drivers" that influence the GWMP development and implementation. Appendix A presents this briefing.

Changes to the Government Code and the Water Code created procedural requirements for local governments and water agencies to consult when determining whether there will be enough water to supply a proposed development project. The changes also increased the requirements related to the information that must be produced and used when making findings and discretionary project decisions. Government land use agencies must now use more highly detailed and complete evidence to make critical land and water resources decisions.

The key policy and statutory requirements are briefly discussed below and are related to:

- General Plans
- Urban Water Management Planning Act and Senate Bills 610 and 221
- Crotese-Hertzberg-Knox Local Government Reorganization Act
- California Environmental Quality Act

2.3.1 General Plans

The city and county general plans were reviewed as part of the Upper Kings IRWMP (WRIME, February 2007). Under California law, the management of land use is the responsibility of local government. City and county general plans and the associated goals, policies, objectives, and programs define land use planning requirements for each jurisdiction. By law, general plans guide land use decisions at the city and county level, and by their very nature, are comprehensive and integrated across the full spectrum of land, water, and natural resources management elements. The breadth of the general plans may result in less detailed or comprehensive review of regional water issues. The city and county general plans, and the land use planning process, provide local government with an opportunity to integrate land use and water supply decisions and meet the goals of the cities and counties.

In general, it was found that the county general plans, being regional in nature, acknowledged overdraft and other water supply problems and proposed goals, policies, and objectives to address the issues. The CID area is contiguous with the unincorporated Fresno County. The CID GWMP seeks to be consistent with the Fresno County General Plan. Specifically, the GWMP will be consistent with, and help realize, the following Fresno County General Plan policies:

- Policy PF-A: Ensure the timely development of public facilities and to maintain an adequate level of service to meet the needs of existing and future development.
- Policy PF-C: Ensure the availability of an adequate water supply for domestic and agricultural consumption.
- Policy PF-C.1: Engage in and support efforts of others to retain existing water supplies.
- Policy PF-C.2: Support the efforts of others to import flood, surplus, and other available waters.
- Policy PF-C.3: Reduce the demand on county's groundwater resources and encourage the use of surface water.
- Policy PF-C.4: Support the efforts to expand groundwater and/or surface water storage.
- Policy PF-C.6: Support water banking.

When CID cities annex lands, they detach from CID. The City General Plans apply to these annexed lands. The CID Cities' general plans identify groundwater as the sole source of supply. CID does not purvey surface water to any of the cities. In general, CID Cities' general plans do not recognize groundwater overdraft in the Kings Basin, and therefore do not contain goals, policies, objectives or programs that address the regional water supply issues. Since CID Cities' general plans do not recognize the limitation of the groundwater supply source, they do not define how cities will mitigate groundwater supply impacts of

new development or document how the cities will provide a sustainable, reliable water supply. The State of California General Plan Guidelines, updated by the Office of Planning and Research (OPR) 2003, recommends that local governments consider preparing an optional Water Element in their general plans. The OPR Guidelines seek to be consistent with other State requirements intended to improve the coordination between water supply and land use planning processes at the local level. The CID GWMP provides information that could help CID Cities when they update their general plans and or Urban Water Management Plan (UWMPs) prepared pursuant to State law.

The CID GWMP will provide a mechanism for CID Cities to define projects to mitigate groundwater impacts of future development; and document a long-term, sustainable water supply for proposed projects and current municipal users. If CID Cities choose to participate and fund CID GWMP projects, these supplies could be factored into the cities' updated general plan and UWMP, and this could support CID Cities in making the necessary findings when adopting annexations to the city or approving new development consistent with the requirements of California Environmental Quality Act (CEQA) and the California Water Code.

2.3.2 Urban Water Management Planning Act and Senate Bills 610 and 221

Senate Bills (SB) 610 and 221 significantly elevated the planning function of UWMPs by creating water supply assessments and verification requirements. SB 610 and SB 221 amended state law, effective January 1, 2002, to improve the link between information on water supply availability and certain land use decisions made by cities and counties. SB 610 and SB 221 are companion measures which seek to promote more collaborative planning between local water suppliers and cities and counties. The State statutes dictate information requirements and procedural requirements for land use and water supply agencies to follow when making discretionary decisions and approving projects. They also increase the burden of proof for documenting findings related to water supplies. In general, CID Cities' UWMP does not recognize or address overdraft or document solutions for increasing the water supply reliability from groundwater sources.

The changes in the Water Code also require verification of sufficient water supplies as a condition of approval for development; compel urban water suppliers to provide more information on reliability; and require average and drought year conditions be addressed. Additional requirements to address groundwater sources were added. A supplier relying on groundwater to meet its customers' demands must provide detailed information regarding the limitations of that source, and to the extent available, the historical uses of the basin.

2.3.3 Cortese-Hertzberg-Knox Local Government Reorganization Act

Local Agency Formation Commissions (LAFCOs) are tasked with ensuring water supplies are available at the time when city or special district boundaries are to be amended. The Cortese-Hetzberg-Knox (CHK) Act passed in 2000 amended the Government Code. Proposals for reorganization are subject to the CHK and to review by the LAFCO, and LAFCOs are required by State law to review and make a determination of approval or denial of all annexations or other changes of organization to cities and special districts. LAFCOs serve as the legislature's watchdog, operating at the intersection of land use, services (including water), finance, and governance. Important changes and added responsibility include requirements to determine that there are timely and available water supplies; prepare comprehensive water services reviews; and assess firm yield water supply availability, reliability, and quality for annexations and extension of services. The legislature also tasked LAFCOs with considering water and wastewater management regionally, including evaluating the ability of public facilities to meet current and future service needs, or to extend services outside of existing boundaries.

The CHK defines the factors to be considered in the review of a proposal. This includes whether the city annexing land is able to provide the services needed, including the sufficiency of revenues for those services following the proposed boundary change, and the timely availability of water supplies adequate for projected needs. As such, CID Cities need to not only evaluate the water supplies available, but the source of supply to a project and how such new supplies will be financed. This is challenging given the overdraft in the Kings Basin.

The CHK further clarifies the legislative intent for ensuring that there be close coordination and consultation between water supply agencies and land use approval agencies to ensure that proper water supply planning occurs. The intent is to address projects that will result in increased demands on water supplies through a standardized process for determining the adequacy of existing and planned future water supplies to meet existing and planned future demands on these water supplies.

2.3.4 California Environmental Quality Act

As part of their CEQA reviews, CID Cities need to identify impacts and mitigate for the groundwater impacts of new development during the development review process. Without firm plans for developing and funding water supply projects and ensuring that water supplies are available to meet current and future water demands, CID Cities could have trouble making sufficiency determinations; complying with CEQA statutory requirements; and making findings related to mitigation of impacts to groundwater. As a result, land use decisions could be subject to successful legal challenge. Mitigating groundwater impacts could be done through demonstrating that the city is not contributing to overdraft (e.g.,

requiring the developer to procure a new water supply in lieu of using groundwater), or through some other appropriate project or agreements to mitigate for the increased groundwater consumption.

3 Goals, Objectives, and Intended Use of GWMP

This chapter defines the goals for the GWMP. Once the broad goals and general objectives were established, quantitative Basin Management Objectives (BMOs) were developed to help measure progress. The goals and objectives were used by the Board of Directors to define and prioritize GWMP actions, plans, and strategies to be implemented.

3.1 Goals and Objectives

The following goals and objectives for the CID GWMP were established by the CID Board and are consistent with the Upper Kings IRWMP:

- Halt and ultimately reverse overdraft and provide for sustainable management of surface water and groundwater.
- Increase the water supply reliability, enhance operational flexibility, and reduce system constraints.
- Improve and protect water quality.

The Upper Kings IRWMP included two goals supported by CID for the regional effort that are not as relevant to the GWMP. This includes the Upper Kings IRWMP goals to: (1) provide additional flood protection; and (2) protect and enhance aquatic ecosystems and wildlife habitat. Nothing in this GWMP would preclude or reduce the ability to meet the Upper Kings IRWMP goals and, where applicable, CID will seek to use the GWMP to meet the IRWMP goals. For example, GWMP projects will avoid impacts to ecosystem and wildlife habitat and will seek to improve ecosystem and wildlife habitat where possible. Further, the GWMP will seek to include opportunities to integrate flood retention and detention into recharge pond designs where possible and cost effective, and where such actions would be financially supported by other participants.

To be compatible with the Upper Kings IRWMP, the CID GWMP is also compatible with the following general objectives from the Upper Kings IRWMP:

- Define local and regional opportunities for groundwater recharge, water reuse/reclamation, and drinking water treatment.
- Develop large-scale regional conjunctive use projects and artificial recharge facilities to:
    - Enhance operational flexibility of existing water facilities, consistent with existing agreements, entitlements, and water rights.

- Improve the ability to store available sources of surface water in the groundwater basin.
- Capture storm water and floodwater currently lost in the region.
- Develop multipurpose groundwater recharge facilities that provide flood control, recreation, and ecosystem benefits.
- Integrate the fishery management plan.

- Negotiate and develop institutional arrangements and cost sharing for water banking, water exchange, water reclamation, and water treatment.

Additional GWMP general objectives adopted by CID are to:

- Support cities in streamlining project reviews.
- Provide a GWMP that will serve as a regional water supply assessment for purposes of evaluating proposed development.
- Through funding, adoption, and participation in the GWMP; provide CID Cities with a mechanism to verify a water supply for proposed projects and for mitigating groundwater supply impacts.
- Develop a standard practice by which CID can develop financing for land and water purchase; evaluate land for its recharge potential; and obtain environmental clearances to acquire property and water for purposes of recharge and overdraft reduction.
- Develop the necessary environmental documentation that would support the recharge programs.

3.2 Basin Management Objectives

The State advocates the concept of local BMOs that are quantitative and measurable so that progress toward achieving the objective can be tracked and monitored. The BMO concept was also developed to meet the groundwater management needs within a basin that has different groundwater users and/or overlapping jurisdictional agencies. The BMOs for CID are specific to the management and groundwater conditions found within the District. The BMOs provide the mechanism for measurement and evaluation of project performance.[1] In the future, the BMOs may be used by CID to initiate subsequent management actions or to respond to changing circumstances and new information. The BMOs are intended to:

[1] Upper Kings IRWMP Section 9.4.1 Regional Conjunctive Use Program Basin Management Objectives and Performance Measures.

- Provide a framework for assessment and evaluation of project performance.
- Determine whether the anticipated benefits of the GWMP are being achieved.
- Identify measures that can be used to monitor progress toward achieving goals.
- Provide metrics the can be used to pursue grant funding opportunities.
- Support planning of future projects.
- Maximize the return on public investments.

The BMOs for CID are specific to the management and groundwater conditions found within the District. These BMOs are listed and quantified in Table 3-1.

Table 3-1. Groundwater Management BMO

BMO Component	IRWMP/GWMP BMO
Reduce Overdraft	Immediate/Near-Term (within next 5 years) = 10,000 acre-feet per year Mid-Term (5 to 20 years) = 20,000 acre-feet per year Long-Term (20 to 40 years) = 50,000 acre-feet per year
Increase Total Recharge Pond Area in CID	Immediate/Near-Term = 100-200 acres Mid-Term = 200-400 acres Long-Term = 1,200 acres
Increase Instantaneous Recharge Capacity of CID System	Immediate/Near-Term = 150-300 cfs Mid-Term = 400 cfs Long-Term = Greater than 500 cfs

The quantities included in Table 3-1 are the results of engineering feasibility studies and preliminary designs;[2] historical operations of CID's existing 1,300 acres of recharge ponds; and base engineering judgments.

3.3 Potential Uses of the GWMP

Opportunities exist for CID and the land use agencies to integrate General Plan, UWMPs, and GWMP requirements to streamline the decision process; avoid conflicts; meet current and future demands; and sustain the local economy. CID is the regional water agency with appropriate powers and authorities to develop the GWMP for the region. CID intends to use the GWMP to define projects that ensure a reliable water supply is available.

[2] Technical Memorandum on Floodwater Availability for the CID from the Kings River (WRIME, 2007); Analysis of Water Supplies in the Kings Basin, Technical Memorandum, Phase 1, Task 4 (WRIME, 2006); Kings Basin Conjunctive Use Feasibility Analysis (WRIME, 2006)

The potential uses of the GWMP are as follows:

- Streamline development review process for CID Cities, water suppliers, and CID.
- Document regional water demand and supply sources to a level of detail such that the GWMP would serve as a regional water supply assessment for CID Cities when considering new development.
- Define projects (physical solutions) to reduce overdraft and provide mitigations for groundwater impacts related to new municipal, industrial or commercial development which increase groundwater demands.
- Provide the mechanism for CID Cities to verify water supply availability and adopt legally defensible findings of sufficiency.

4 Water Resource Settings

This section summarizes the water resources conditions present in the GWMP area. It describes the historical and baseline conditions of the water resources in CID and contains an overview of the physical setting, including the climate, soils, and geology and describes the major planning considerations related to those issues. This includes a discussion of the current and future land use and associated water demands, water supplies and sources, existing water supply facilities, groundwater levels, and water quality conditions.

4.1 Physical Setting

4.1.1 CID Geography and Water Use

CID is comprised of 145,000 acres, the majority of which is in agricultural production. Incorporated cities within the boundaries of CID include Fowler, Kingsburg, Parlier, Sanger, and Selma (CID Cities). Other smaller urban enclaves are found in the unincorporated areas and include Caruthers and Del Rey. Total urban demands are much smaller than the total agricultural demands, but the growing urbanized areas are reliant exclusively on groundwater. The majority of the water demand is to support the agricultural economy. Crop water requirements are met through irrigation application of both surface and groundwater. Surface water delivered to agriculture reduces the reliance on groundwater. Part of the surface water applied to agriculture, that water which is not consumed by the crops, percolates downward and recharges the groundwater basin. The intentional use of surface water in lieu of groundwater pumping is part of CID's conjunctive use operations.

CID has water rights to the flow of the Kings River and storage rights in Pine Flat Reservoir. Surface water is stored in Pine Flat and diverted from the Kings River for distribution through CID's canals. Water flowing down the canals also recharges the groundwater basin. The diverted water is used for surface irrigation on approximately 95,000 acres. Surface water irrigation must be supplemented with groundwater to meet the annual water demands of the crops. The remaining agricultural areas of CID rely exclusively on groundwater. Part of the diverted surface water is also delivered to recharge ponds located throughout the District. The average annual surface water supply is approximately 238,000 acre-feet, but can vary from the low of 13,500 acre-feet in 1976, to a high of 616,000 acre-feet in 1967. Average pond recharge is approximately 30,000 acre-feet, ranging from zero in the dry years, to a maximum of 187,000 acre-feet.

4.1.2 CID Facilities and Operations

Surface water deliveries are made through 350 miles of open channels that include constructed ditches and canals and channelized drains and sloughs. There are numerous lateral pipelines and piped portions of the main channels. The headwork of the water system is a diversion structure on the Kings River. Two main channels, the Fowler Switch and Centerville and Kingsburg Canals, branch out near this location and serve the majority of lateral channels and pipelines that fan out across CID. An additional main channel, the Lone Tree Canal, diverts water from Fresno Irrigation District. A portion of the water delivered through the Lone Tree system is categorized as "Church" water and carries a higher water reliability.

The District provides two types of water service to its members. The first service is surface water deliveries that are made through the CID water delivery system. The annual duration of water supply varies on the storage conditions in Pine Flat Reservoir and on runoff in the Kings River. Typically, surface water supplies are made available in April and end in August. During drier hydrologic conditions, the surface water supplies are provided over a shorter period of time.

The other service provided by CID is groundwater recharge. The recharge is provided through two methods: direct recharge and in-lieu recharge. The direct recharge occurs through seepage from the earthen channels when they are used for water delivery and in dedicated recharge basins. The types of soils throughout much of the District allow for relatively rapid infiltration and recharge to the groundwater surface. The dedicated recharge system includes over 50 dedicated recharge basins with a surface area of approximately 1,300 acres.

In-lieu recharge in CID occurs when growers use surface water instead of groundwater. By foregoing pumping, groundwater can remain in storage or it can be used by other growers that do not have access to surface water or by municipalities that cannot use untreated surface water.

CID maintains a system of approximately 80 groundwater monitoring wells located on a two mile square grid pattern throughout the District. The water levels in these wells have been measured and recorded by District staff since the inception of the District. Typically all wells were read on a monthly basis up until 2001. Since then readings have been taken no less than two times per year. As groundwater levels have fallen or surface conditions have changed, CID has repaired or replaced the monitoring wells to maintain the monitoring program. From the mid-1990s until 2003, CID replaced nearly half of its monitoring wells. New wells were constructed with 4-inch or 6-inch diameter perforated casings and guard posts and lockable caps at the surface. The well replacement program was funded with a

combination of District reserves and an AB303 State Grant. These efforts are an indication of CID's on-going commitment to groundwater management.

4.1.3 Surface Water Supply and Diversions

Figure 4.1 shows the surface water supply for CID. On average, CID received approximately 238,000 acre-feet per year (from 1964-2004). The surface water supply is based on pre-1914 and senior appropriative rights to the Kings River.

4.1.4 Groundwater Use

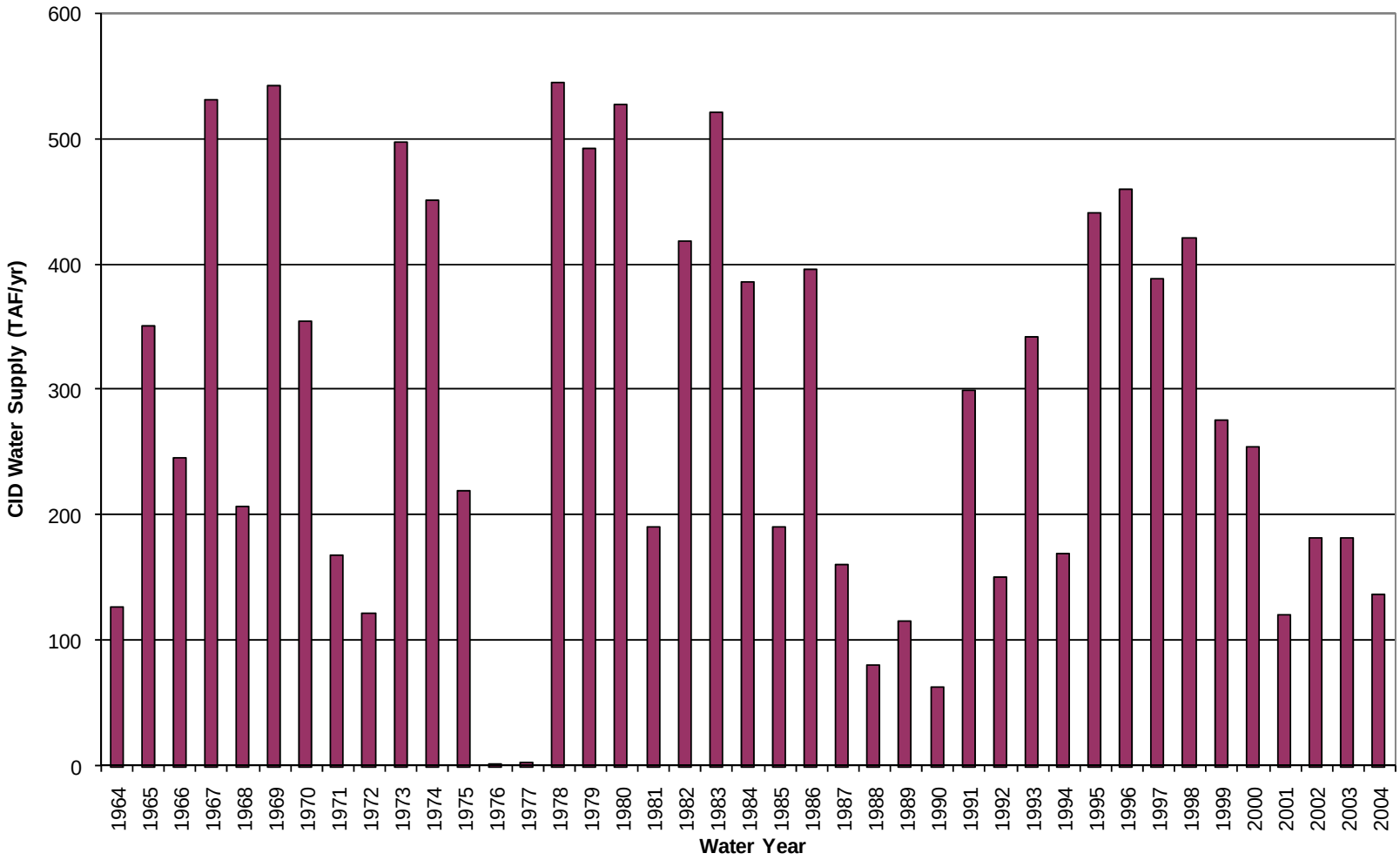
Groundwater pumping occurs throughout CID, with concentration occurring in and around the Cities of Sanger, Fowler, Selma, Kingsburg, Sanger, and Parlier and in agricultural areas that do not have access to surface water supplies. Agricultural areas with access to surface water pump groundwater to supplement surface water supplies.

4.1.5 Groundwater Basin

Consolidated Irrigation District lies within the Kings River Subbasin (DWR, Bulletin 118 basin number 5-22.08) in the San Joaquin Valley Hydrologic Region. The area of the subbasin is approximately 1,500 square miles. As shown in Figure 4.2, the subbasin is bounded on the north by the San Joaquin River, on the east by the Sierra Nevada foothills, on the west by the Westside and Delta-Mendota Subbasins, and on the South by the Kings River and Kaweah Subbasin.

4.1.6 Basin Topography

The Kings River Basin watershed drains 1,850 square miles of the Sierra Nevada and releases onto alluvial fans and plains of the Tulare Lake basin south of Fresno as shown in Figure 4.2. The water in the basin comes primarily from precipitation and snowmelt from the Sierras. The Kings River is within the Tulare Lake basin. (DWR, Bulletin 160-98) The upper portion of the fan near the foothills is highly dissected by the Kings River and tributaries, and the fan surface does not get inundated regularly by flood waters. (Page and LeBlanc, 1969) The lower reaches contain flood plain deposits of fine-grained materials as well as a series of sand dunes that vary in height from 5 to 20 feet. (Page and LeBlanc, 1969) The watershed ranges in elevation from 500 to 14,000 feet above mean sea level (msl) above the foothills and 150 to 500 feet msl below the foothills.



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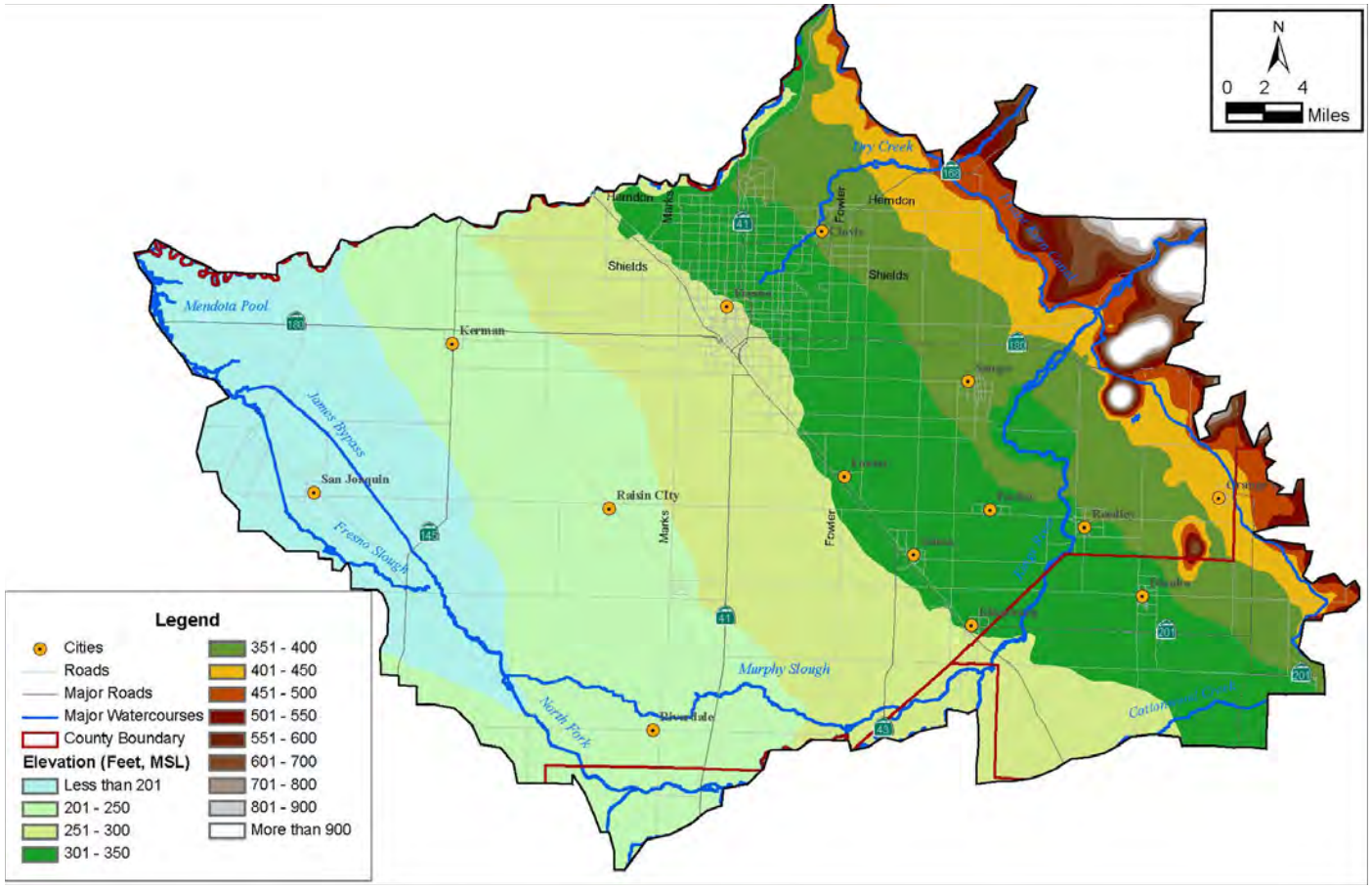
Consolidated Irrigation District
Groundwater Management Plan

CID Annual Water Supply

Source: Kings Basin Integrated Groundwater and Surface Model Development and Collaboration. Analysis of Water Supplies in Kings Basin, Phase 1, Task 4.

May 2008

Figure 4.1



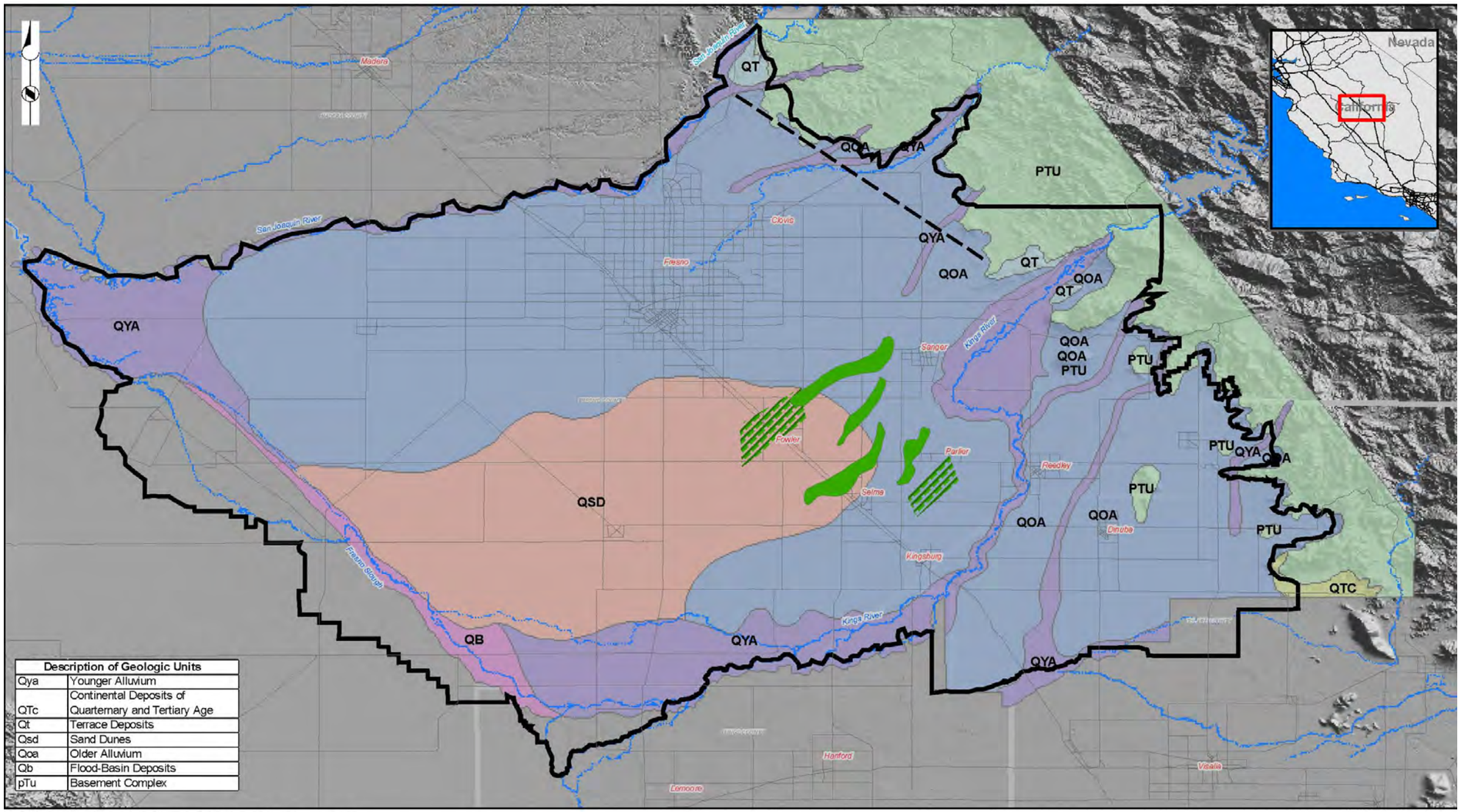
GEI Consultants	**Consolidated Irrigation District Groundwater Management Plan** Ground Surface Elevation Source: **Kings IGSM Model Development and Calibration Report, 2007**	**May 2008** **Figure 4.2**

4.1.7 Geology

CID is in a structural trough between the Sierra Nevada Batholith to the east and the folded and faulted coast range to the west. The valley is about 55 miles wide near the Kings River and consists primarily of Tertiary to Quaternary unconsolidated continental and alluvial deposits that are underlain by a basement complex of pre-tertiary metamorphic and igneous rocks associated with the Sierra Nevada. The alluvial fan deposited by the Kings River originates at the northeast corner of the Kings Groundwater Subbasin and radiates throughout the district. The alluvium consists of arkosic gravel, sands, silts, and clays with coarser sediments concentrated near the apex of the fan and near stream channels, and finer sediments at the lower elevations and on flood plains adjacent to river channels.

Geologic structures are mostly limited to the basement complex that has been faulted and jointed, and although the rock material is virtually impermeable, the joints provide small yields of groundwater. The complex is tilted to the southwest with the fault block of the Sierra Nevada. There is some minor folding and faulting within the sediments that overlie the basement, but these structures do not substantially affect the occurrence and movement of groundwater. (Page and LeBlanc, 1969) The structures that do affect groundwater flow within the alluvium are the shelf of the basement complex at the foothills and the gentle southwestward tilt of the sediments along the backslope of the Sierras (Page and LeBlanc, 1969).

The unconsolidated deposits are divided into older deposits of Tertiary and Quaternary age and younger deposits of quaternary age as shown on Figure 4.3. The Tertiary and Quaternary deposits are only present in the extreme southeastern part of the area, and are not significant to groundwater supply. The Quaternary deposits are divided into four units based on age and depositional environment. These units are Older Alluvium, Lacustrine and Marsh Deposits, Younger Alluvium, and Flood Basin Deposits. Figures 4.4 and 4.5 are conceptual cross-sections of the area. Figure 4.6 shows that confining layers associated with the Lacustrine and Marsh Deposits are only present west of CID. The alluvial deposits do not have laterally extensive confining layers that inhibit groundwater flow. The sand dunes do not inhibit groundwater flow and recharge potential. (Brown and Caldwell; WRIME, 2006)



SOURCE: GEOLOGIC MAP OF THE FRESNO AREA, SAN JOAQUIN VALLEY, CALIFORNIA; US GEOLOGICAL SURVEY, 1969 PAGE AND LABLANC (1969)

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EXPLANATION

- Incised Valley Fill (Weissman et al, 2002a)
- Incised Valley Fill (Cehrs et al, 1980)
- Inferred Fault
- Model Boundary

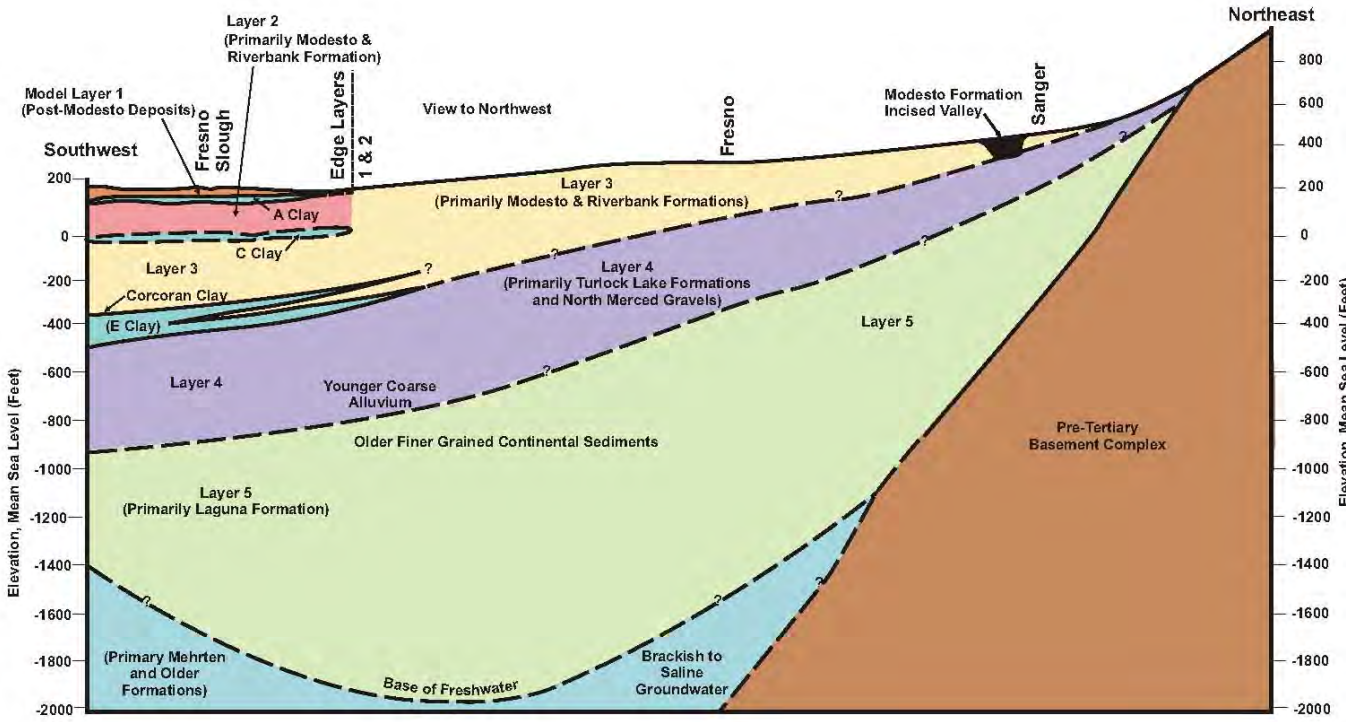
Consolidated Irrigation District Groundwater Management Plan

Kings Basin Geology

Source: Kings Basin Hydrogeology TM, 2006

May 2008

Figure 4.3



Primary Sources

Croft, 1969
Muir, 1977
Lettis, 1982
Page and LeBlanc, 1969
Cehrs, et. al. 1980
Wiseman, et. al; 2002b

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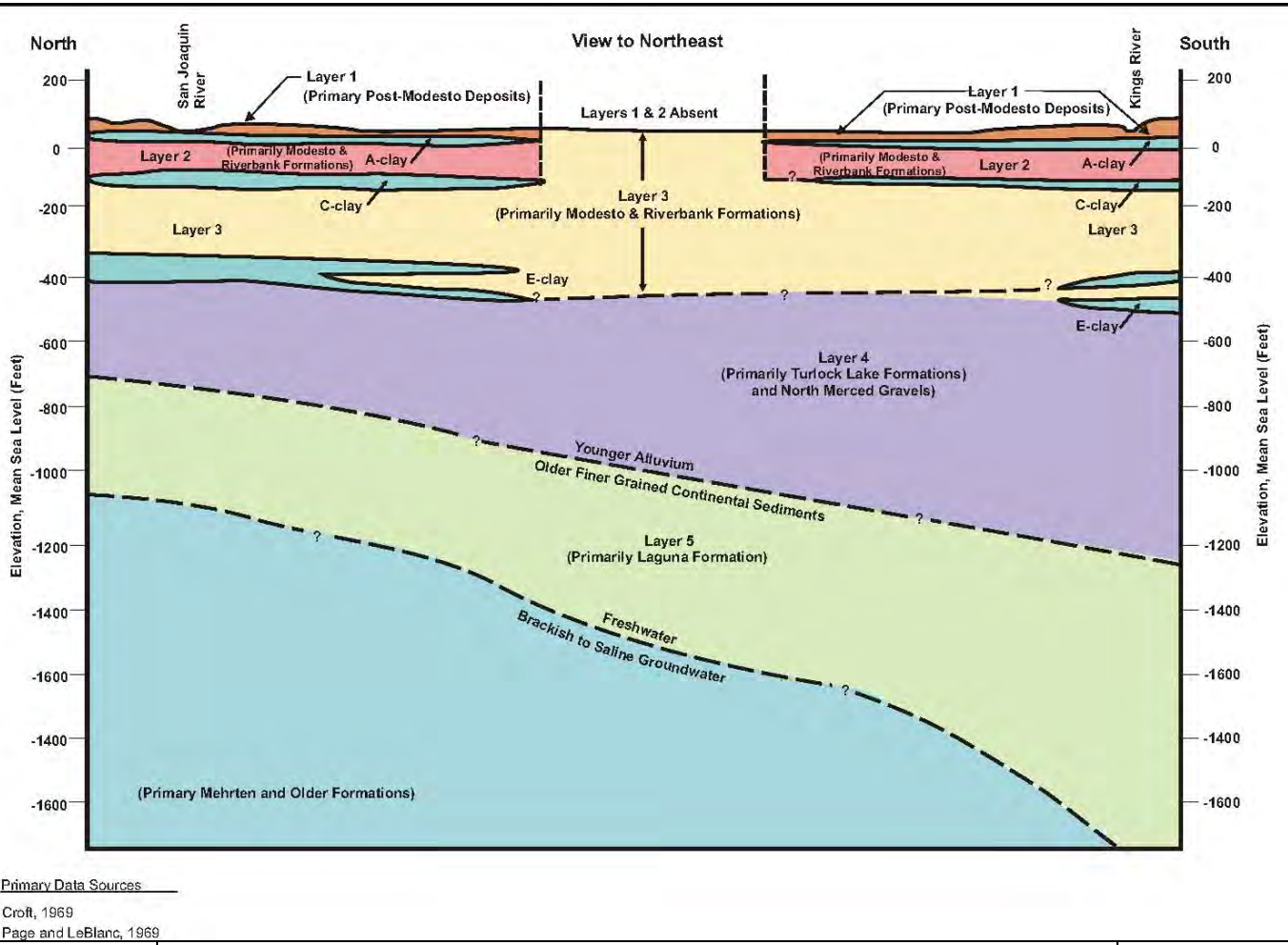
Groundwater Management Plan

Southwest – Northwest
Conceptual Hydrogeologic Cross Section

Source: Kings Basin Hydrogeology TM, 2006

May 2008

Figure 4.4

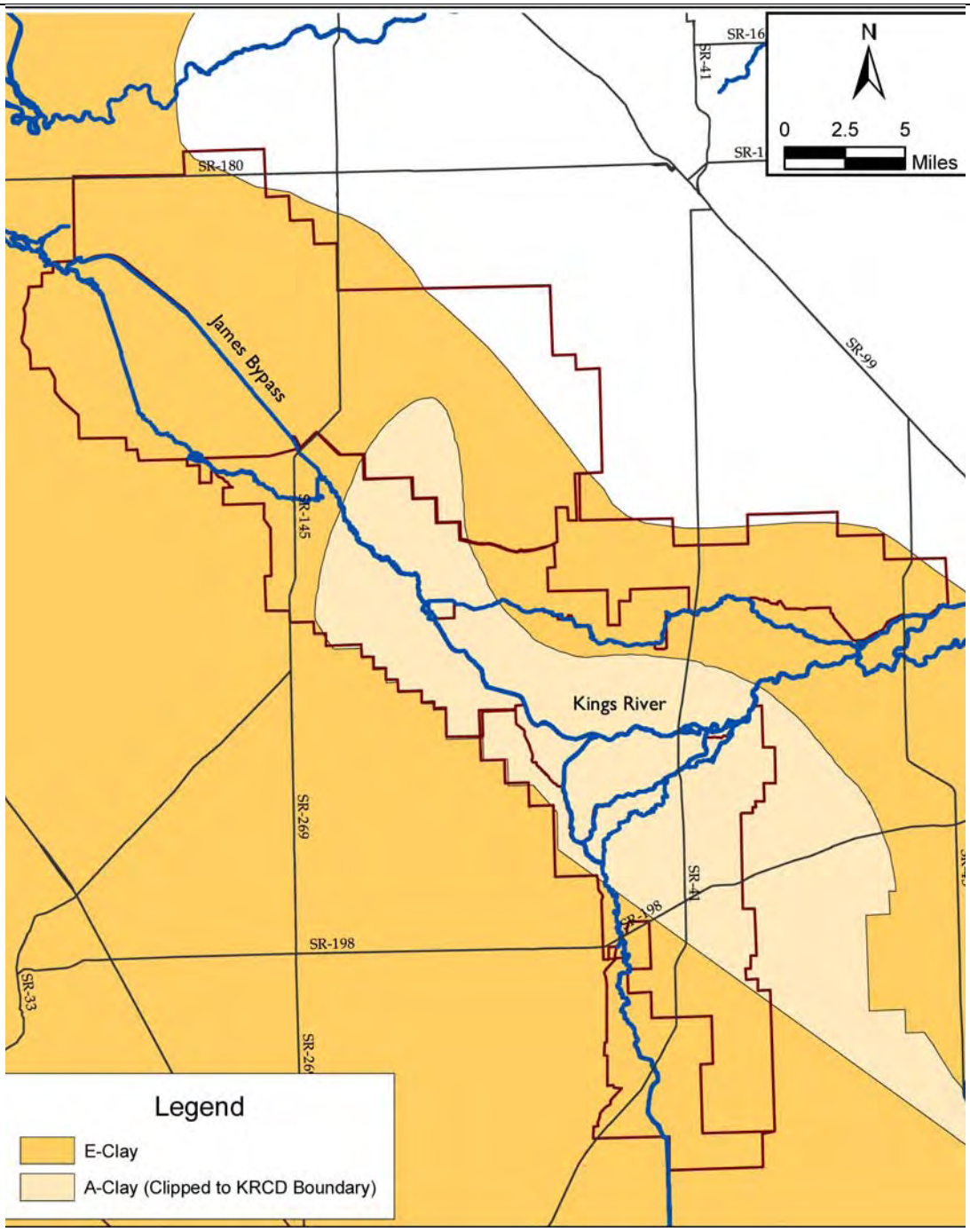


Primary Data Sources

Croft, 1969

Page and LeBlanc, 1969

GEI Consultants	**Consolidated Irrigation District Groundwater Management Plan** Northwest – Southwest Conceptual Hydrogeologic Cross Section Source: Kings Basin Hydrogeology TM, 2006	**May 2008** **Figure 4.5**



GEI Consultants	**Consolidated Irrigation District Groundwater Management Plan** Impermeable Clay Layers Source: **Lower Kings Basin GWMP Update, 2005**	**May 2008** **Figure 4.6**

4.1.8 Formations

4.1.8.1 Consolidated Formations

The consolidated rocks that underlie the Kings Groundwater Subbasin consist of the basement complex of pre-tertiary igneous and metamorphic rocks associated with the Sierra Nevada, but are overlain by marine and continental sedimentary rocks of Cretaceous and Tertiary ages. The basement complex is shallow near the eastern edge of the basin, but drop off to a maximum depth of 13,000 feet beneath the alluvium lower in the valley. The rocks are virtually impermeable, but with many weathered and jointed surfaces, small yields of groundwater have been obtained from these formations. (Page and LeBlanc, 1969) The consolidated marine and continental sedimentary rocks overlie the basement complex at great depth beneath the Fresno area. They do not crop out at the surface and are not of significant importance to groundwater resources.

4.1.8.2 Older Alluvium

The Older Alluvium is the most important water-bearing unit in the area. (Page and LeBlanc, 1969) It is exposed on the surface as terrace deposits near the foothills areas but continues toward the east to a maximum depth of about 300 feet below ground surface. It is more coarse-grained than underlying deposits, but is generally finer toward the west and coarser toward the east. It consists of interbedded lenses of arkosic clay, silt, sand, and some gravel. Water-bearing properties vary laterally depending on the proportion of fine and coarse material, but transmissivities are generally on the order of 52,000 to 160,000 gpd/ft.

4.1.8.3 Lacustrine and Marsh Deposits

In the Kings Subbasin, the Lacustrine and Marsh Deposits are primarily associated with virtually impermeable tongues of gypsiferous sand, silt, and clay that emanate from the plug beneath Tulare Lake (Croft and Gordon, 1968). These tongues are named informally as F to A, from oldest to youngest. Only clays E, C, and A are delineated in the Kings Subbasin, and Clay E is associated with the Corcoran Clay. The deposits are interbedded within the alluvium but only extend into the western end of the Kings groundwater subbasin to the western border of CID. The E Clay is much more extensive and important as hydrologic confining layers than the C and A clays that underlie only about 120 square miles west of CID as shown in Figure 4.6. (Page and LeBlanc, 1969)

4.1.8.4 Younger Alluvium

The Younger Alluvium was deposited in the Holocene, primarily near the current location of the Kings River and other channels as shown in Figure 4.3. It lies unconformable over the older alluvium and is difficult to distinguish since the arkosic lithology of the older and younger sediments is similar. It is estimated, however, that the thickness of the younger

alluvium ranges from 0 to 70 feet. It is interbedded with Lacustrine and Marsh Deposits, in the western portion of the District.

4.1.8.5 Flood Basin Deposits

Flood Basin Deposits occur in the western edge of the District along Fresno Slough. They consist of deposits of sand, silt, and clay.

4.1.9 Aquifer Definition

The groundwater system within CID is primarily an unconfined aquifer. The aquifer is primarily comprised of the older and younger alluvium. There is a confined aquifer west of CID that is comprised of the older and younger alluvium overlain by the E, C, and A clays of the Lacustrine and Marsh Deposits.

4.1.10 Hydraulic Characteristics

The hydraulic characteristics of the unconfined aquifer are highly variable. Wells in the older alluvium produce 20 to 3500 gpm, averaging about 900 gpm; however, pumping test data are limited. The transmissivity in the older alluvium ranges between 52,000 to 160,000 gallons per day per foot (gpd/ft). Where thicker sequences of sand are present, the transmissivity may be higher. The specific yield can range between 0.2 percent and 36 percent.

4.1.11 Groundwater Levels and Flow Direction

Groundwater levels fluctuate in response to rates of recharge, discharge, and extraction. Much of the fluctuation can be attributed to natural variability in yearly precipitation and hydrologic conditions of surface waters, especially the Kings River. However, long-term changes are attributed primarily to rates of groundwater extraction.

Groundwater levels have been monitored for many years by CID and others in the Kings Basin. Figure 1.3 in Chapter 1 showed the long-term average groundwater level in CID area is declining. Individual well hydrographs and historical groundwater level contours were used extensively in developing the Kings Basin Integrated Groundwater Surface Water Model (Kings IGSM). Groundwater level contour maps have also been prepared by CID, KRCD and others to help explain the regional variations in groundwater levels and explain the reasons for the changes.

Figures 4.7 and 4.8 are groundwater contour maps that show the water levels and direction of groundwater flow in 1950 and 2000, respectively. The groundwater flow direction is typically 90 degrees to the groundwater contour. Flow in CID is generally from the east and north to the west and south following the gentle dip of the alluvium that follows the

backslope of the Sierra Nevada Mountains. Flow directions within CID have not changed substantially, although the gradient has steepened. The most recent water level contour map was produced by KRCD in 2006 and is shown in Figure 4.9.

Groundwater level difference contours shown in Figure 4.10 indicate changes in water surface elevation in this same time period of at least 150 feet west of CID, with less severe changes in water levels in the eastern portion of CID.

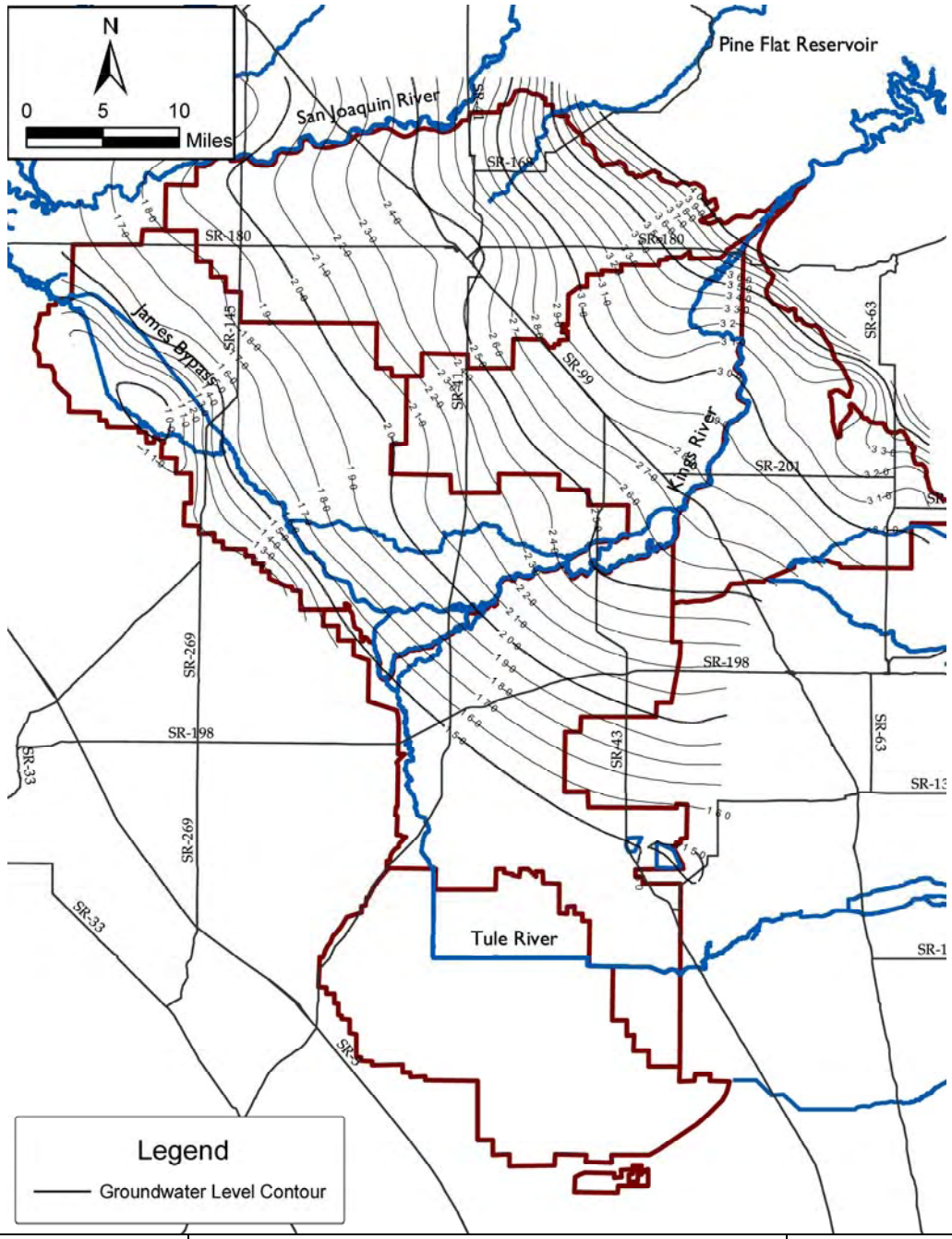
Groundwater levels in CID have been strongly influenced by the groundwater management activities in CID and surrounding areas. Groundwater levels from 52 representative wells in the lower Kings River Basin, primarily west of CID, were analyzed as part of the Lower Kings Groundwater Management Plan. As is observed in Figure 4.11, groundwater levels have dropped an average of over 100 feet between 1950 and 2000.

Figure 4.12 shows the color-shaded contours from the year 1964. This year was chosen for purposes of comparison because KRWA finalized operating agreements for Pine Flat Reservoir. Figure 4.13 shows the color shaded contour map for fall 2004.

The Kings IGSM was used to evaluate what groundwater levels would be at the end of the 40 year period, assuming that current 2005 land uses continued over the planning horizon, that future water conditions could be represented by the 1964 to 2004 hydrologic period, and that no other management actions were taken. The water level contours that would be observed at the end of the 40 year simulation period are shown in Figure 4.14, also showing the location of a profile of the water table.

Figure 4.15 shows a water table profile, comparing the gradient that existed in 1964, 2004, and at the end of the 40 year projection. The profile shows that the gradient and direction of flow is from east to west, and that this gradient has steepened over time. A steeper gradient indicates that more water would be moving from east to west in 2004 than would have occurred in 1964. The Kings IGSM water budgets also indicated that this was the case.

The area to the west of CID is reliant exclusively on groundwater. Pumping in this area creates a steep groundwater gradient from east to west, resulting in the movement of water from CID towards the trough in the lower part of the Kings Basin. Throughout the central and western portions of CID, the westward gradient has steepened and groundwater levels have dropped as much as 80 to 100 feet. The steepened gradient and the trend for declining water levels are likely to continue into the future.



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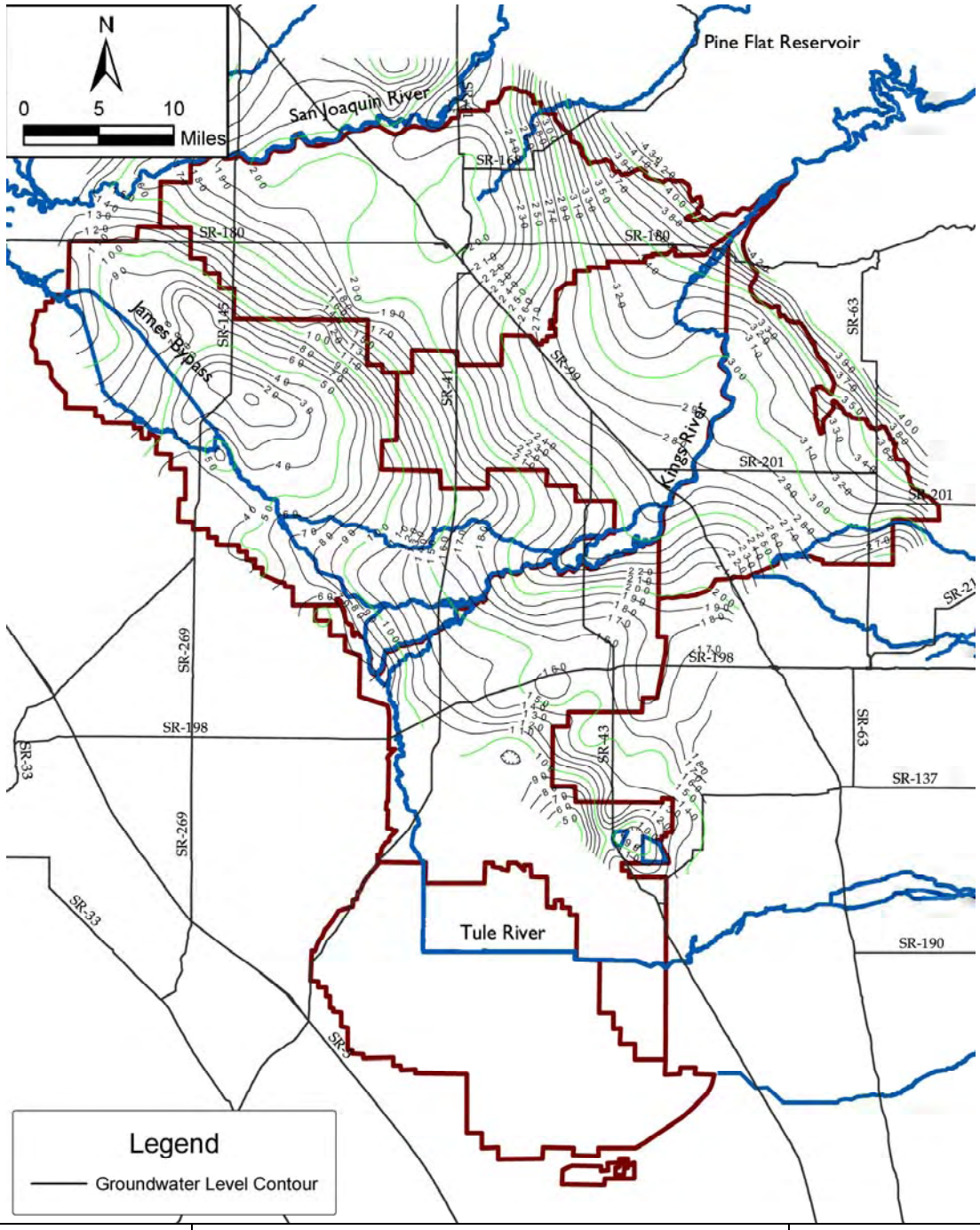
Groundwater Management Plan

Groundwater Level Contours
Spring 1950

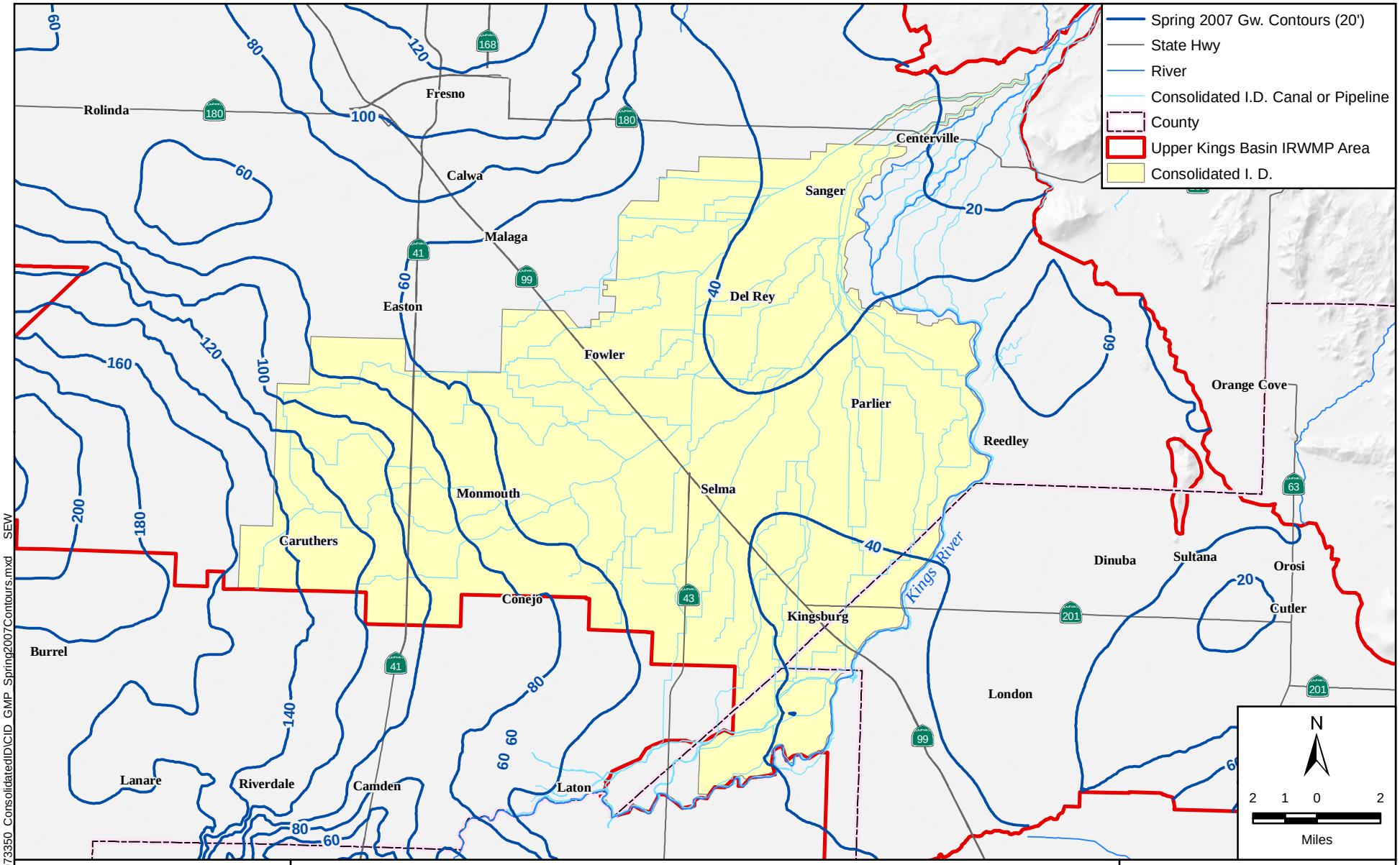
Source: Lower Kings Basin GWMP Update, 2005

May 2008

Figure 4.7



GEI Consultants	**Consolidated Irrigation District Groundwater Management Plan** Groundwater Level Contours Spring 2000 Source: Lower Kings Basin GWMP Update, 2005	**May 2008** **Figure 4.8**



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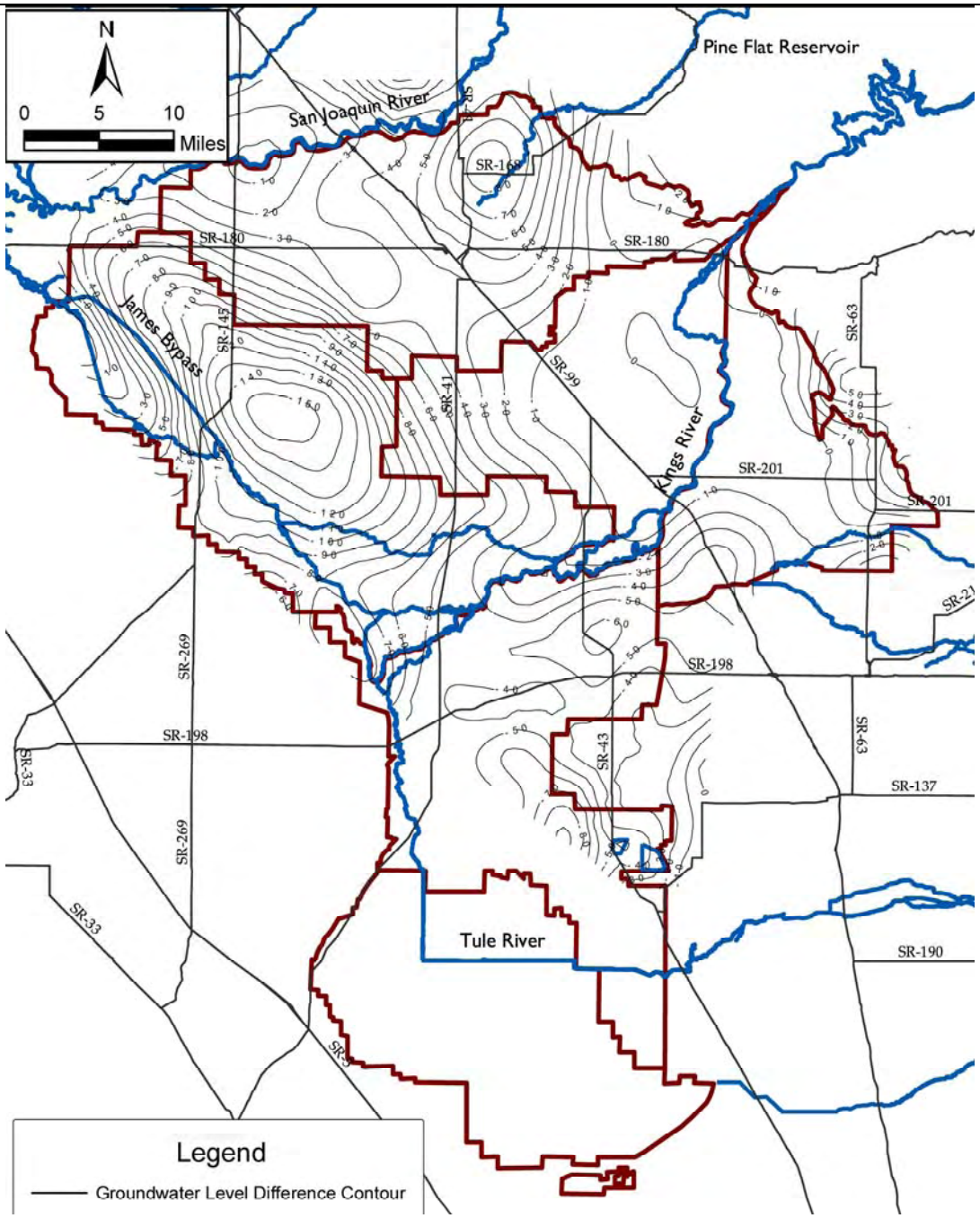
Consolidated Irrigation District
Groundwater Management Plan

Spring 2007 Groundwater Contours

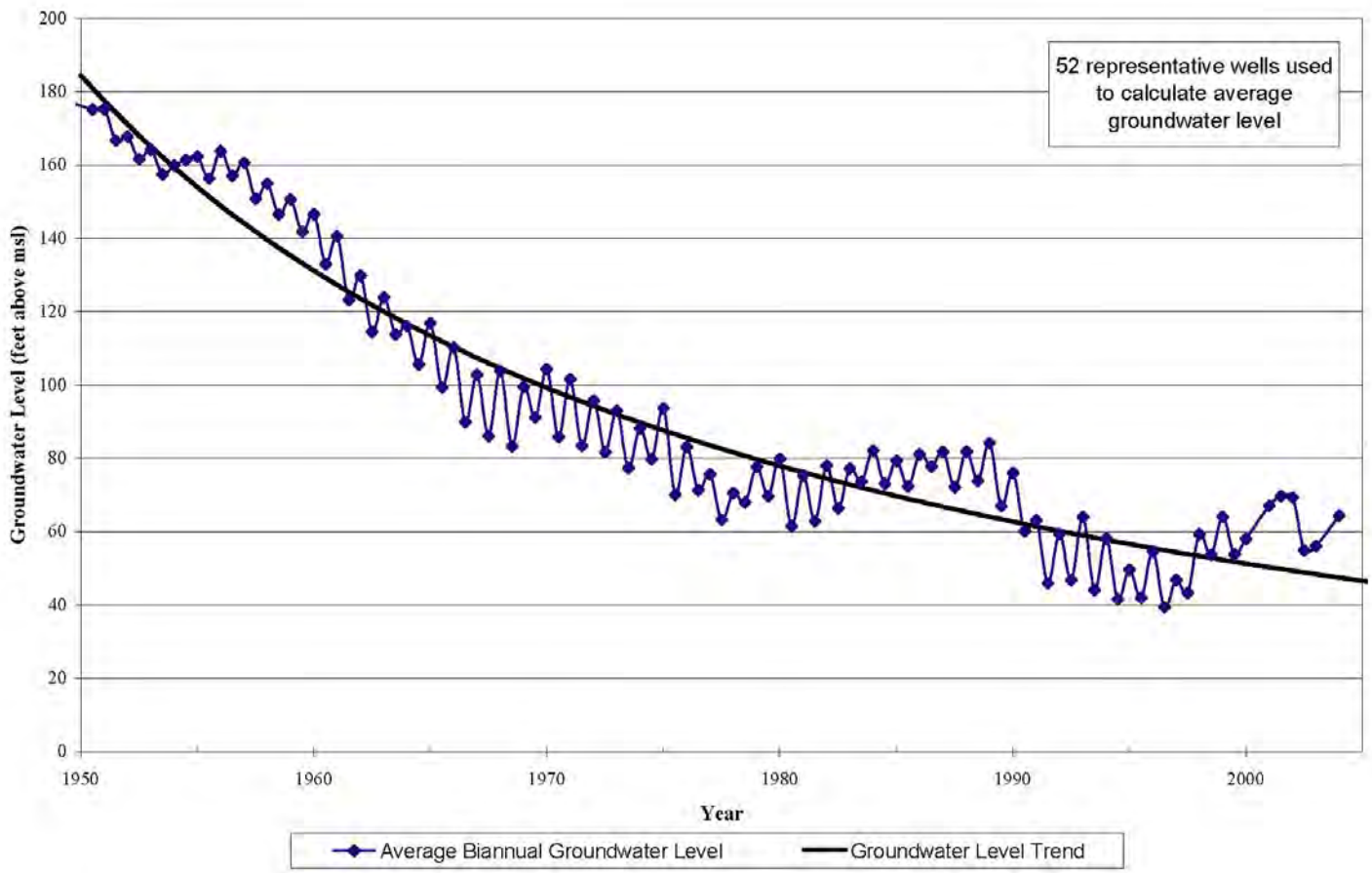
SOURCE: Kings River Conservation District

May 2008

Figure 4.9



GEI Consultants	**Consolidated Irrigation District Groundwater Management Plan** Change in Groundwater Levels Between Spring 2000 and Spring 1950 Source: Lower Kings Basin GWMP Update, 2005	**May 2008** **Figure 4.10**



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Consolidated Irrigation District
Groundwater Management Plan

Groundwater Trends in Western CID

Source: Lower Kings Basin GWMP Update, 2005

May 2008

Figure 4.11

Figure 4.12 Groundwater Table in Fall 1964

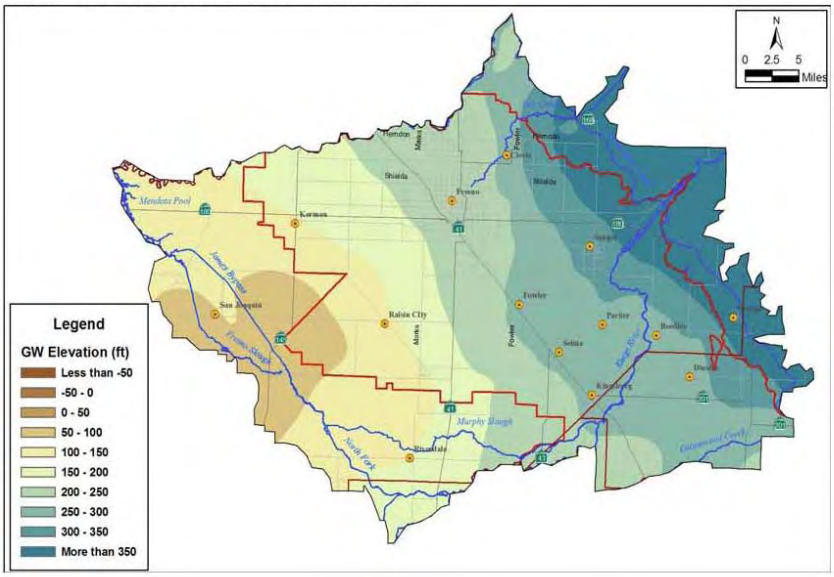


Figure 4.13 Groundwater Table in Fall 2004

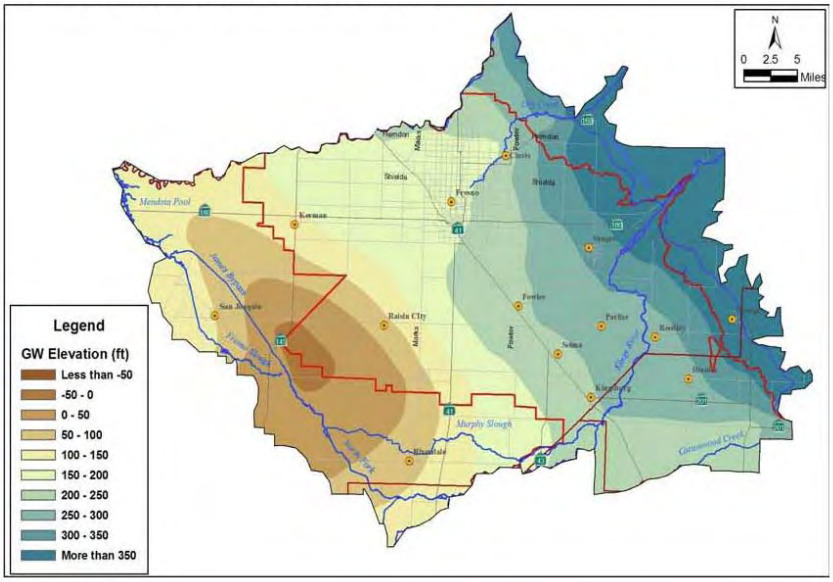


Figure 4.14 Groundwater Table, 40-Year Projection with Existing 2005 Land Use Conditions

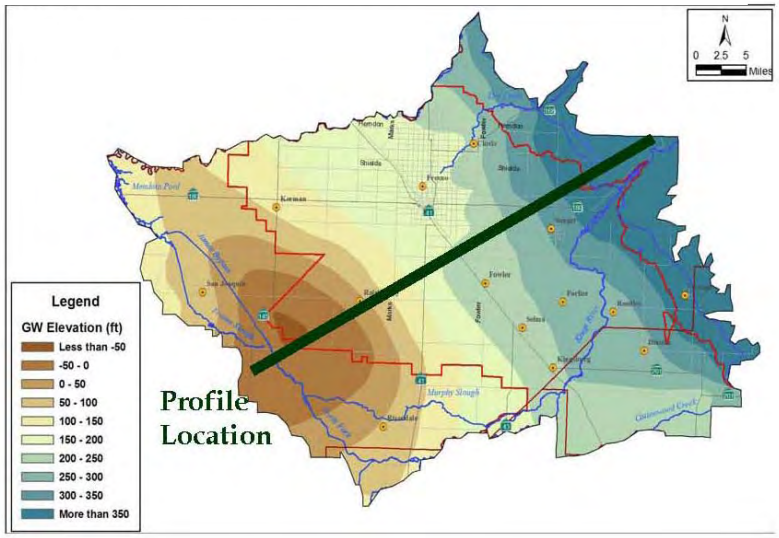
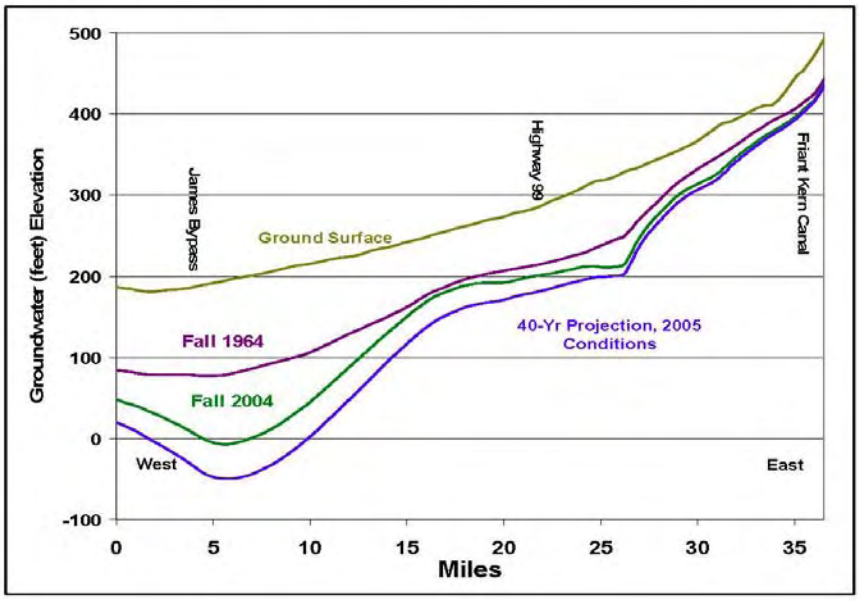


Figure 4.15 Groundwater Table Profiles for 1964, 2004, and 40-Year Projection with Existing 2005 Land Use Conditions



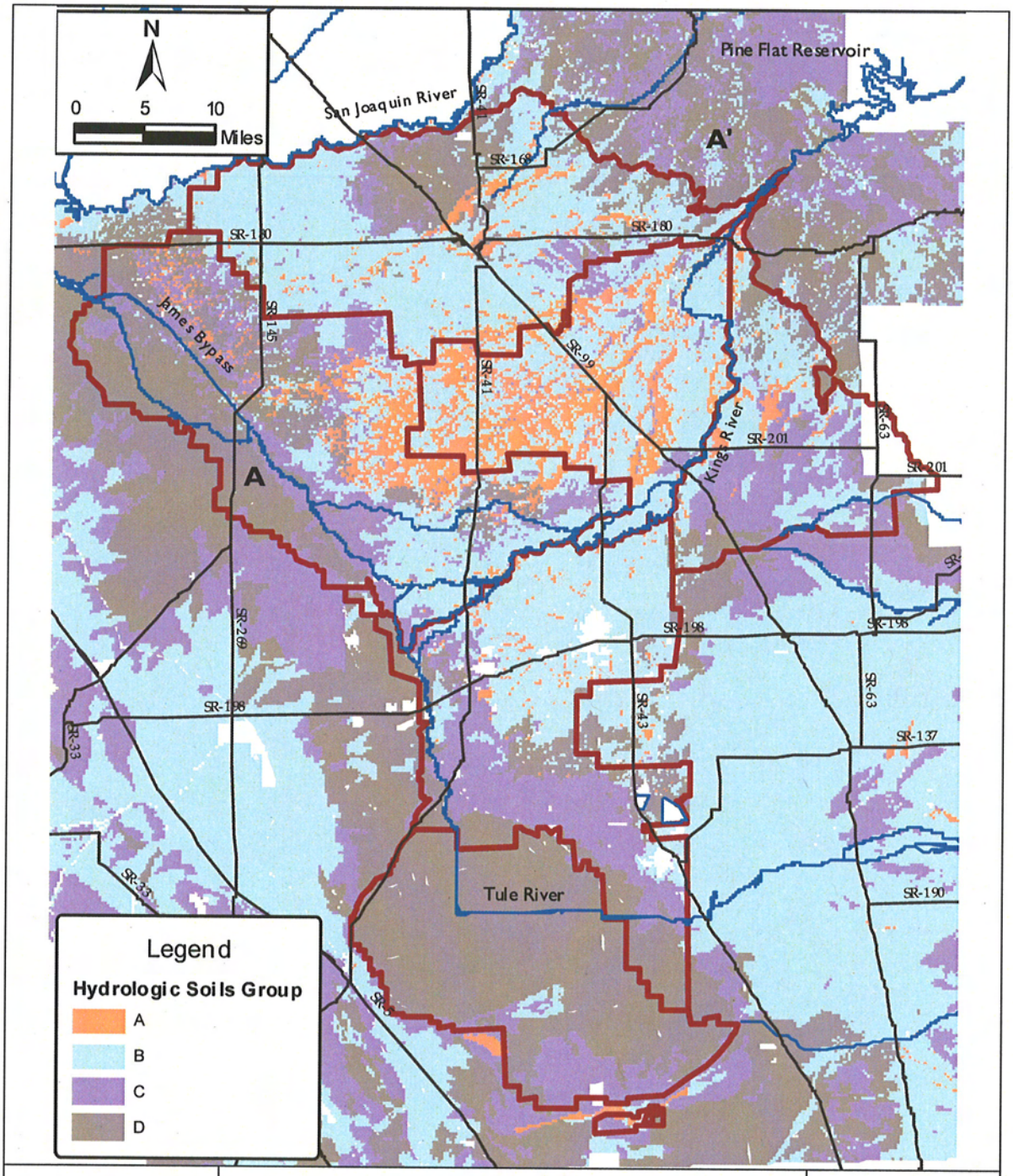
4.1.12 Groundwater Recharge and Discharge Areas

Groundwater recharge in the unconfined aquifer occurs from rainfall, applied water, and infiltration by the rivers and creeks. Figure 4.16 shows surface recharge potential based on hydrologic soil groups from the Natural Resources Conservation Service (NRCS), Hydrologic soil groups are classified according to their ability to infiltrate water and affect runoff. The soils are grouped according to the amount of water infiltration when the soils are thoroughly wet and receive additional precipitation. The four hydrologic soil groups are:

- **Group A**: Soils having a high infiltration rate (low runoff potential) when thoroughly wet
- **Group B**: Soils having a moderate infiltration rate when thoroughly wet
- **Group C**: Soils having a slow infiltration rate when thoroughly wet
- **Group D**: Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet

Figure 4.16 shows the hydrologic soil groups in CID. The area associated with soils with the highest infiltration rate (Group A) and Group B soils are present throughout CID with Group B as the predominate hydrologic soil type. The remaining soil types (slow and very slow infiltration rates) are primarily located along sloughs, canals, and rivers. The underlying older and younger alluvium do not have laterally extensive layers of fine sediment that would prohibit infiltration.

Recharge from rainfall and applied water occurs throughout the District. The most significant source of recharge, however, is likely from the Kings River occurring primarily in the eastern portion of the District and moving through the subsurface toward the west and south as indicated by the groundwater contours in Figure 4.8. Water is extracted from the ground for agricultural uses throughout the District, significant groundwater is pumped by the cities and much groundwater flows out of the western boundary of the District toward the groundwater depression near the James Bypass.



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Consolidated Irrigation District Groundwater Management Plan

Hydrologic Soils Group

Source: Lower Kings Basin GWMP Update, 2005

May 2008

Figure 4.16

4.1.13 Groundwater Quality

Groundwater in CID is, for the most part, of good quality. Source water from the Sierras is very clean and has low TDS concentrations. TDS concentrations generally increase from east to west and also with depth. The base of fresh groundwater is considered to be where the TDS concentration exceeds 2000 mg/l and is located at a depth of about 1200 to 1800 feet. (Page and Leblanc, 1969) However, high TDS concentrations are not generally a problem for most extraction wells in CID. There are some chemicals that have had concentrations above their MCL (maximum contaminant level), including DBCP, EDB, Gross Alpha, Nitrate, and Uranium. The following sections discuss these problem constituents, their probable source, and the extent of contamination. Identification of these problem constituents is based on the WRIME (2007) study that identified wells that exceeded MCLs at any time between January 1999 and September 2006.

4.1.13.1 Arsenic

Arsenic is a naturally occurring element in some rock formations, but can also enter the groundwater aquifer from agricultural or industrial practices. Arsenic is not a problem throughout most of CID, except for several wells in the southwestern portion of CID where the levels have exceeded the MCL of 10 ug/L.

4.1.13.2 DBCP and EDB

Dibromochloropropane (DBCP) and Ethylene dibromide (EDB) contamination in CID comes from pesticides used for agriculture. MCLs for these constituents are 0.2 ug/l and 0.05 ug/l respectively and were exceeded in locations near Sanger, Parlier, north of Selma, and in the southwest corner of CID.

4.1.13.3 Gross Alpha

Gross alpha is naturally occurring radiation emitted from minerals. High gross alpha measurements appear to be seasonal and could possibly be controlled by management of well operations. Emissions above the MCL (15 PC/L) were detected at several wells throughout the western portion of CID.

4.1.13.4 Nitrate

Sources of Nitrate to groundwater come from agriculture fertilizer application and wastewater treatment infiltration. Nitrate is not a significant problem throughout most of CID. Detections in excess of the MCL (45 mg/L) have occurred in the south end of Fresno and in the southwest corner of CID.

4.1.13.5 Uranium

Uranium is a naturally occurring, radioactive element that occurs in low concentrations in earth materials. As with gross alpha concentrations, high Uranium concentrations appear to be seasonal. Concentrations above the MCL (20 pCi/L) occur in several wells scattered throughout CID.

4.2 Land and Water Uses within Plan Area

Water demands vary by land use and crop type. This section summarizes current and future land and water demands. Current land use and water demands were analyzed using the most recent land use surveys (2004 Kings County, 2000 Fresno County, 1999 Tulare County) completed by the California Department of Water Resources. Future land use and water demand were developed using estimates of expected land use at the current sphere of influence (SOI) for the cities of Sanger, Fowler, Selma, Kingsburg, and Parlier.

4.2.1 Existing and Build-Out Land and Water Use

Figure 4.17 shows the generalized existing land use conditions in CID. The figure includes delineation of urban areas as they currently exist and the projected SOI for the cities. Table 4-1 estimates the total water demand, which is met by a combination of groundwater and surface water supplies for this land use distribution. The water demand was estimated by applying water duty factors to each type of land use and specific crop type found in CID.

Table 4-1. Summary of Land Use and Demand

	Area			**Water Demand (AF)**
	Agriculture (acres)	*Undeveloped (acres)*	*Urban (acres)*	
Existing Conditions	144,700	4,300	9,800	477,000
2030 Build-Out Conditions	130,500	4,300	24,000	456,000

For existing conditions, agricultural land use in CID totaled approximately 91 percent of the area, with about 6 percent in urban use. The remaining three percent of land area is undeveloped. Agricultural water demand in CID was estimated to be 459,000 acre-feet with urban water demand estimated in the groundwater model at about 18,000 acre-feet in 2004. More recent data from updated 2007 surveys indicate that the total pumping from the five cities totaled 24,561 acre-feet, indicating that the model estimates may have underestimated urban uses. Agricultural water demand represents approximately 96 percent of total water demand within CID.

The effects of the urbanization of agricultural land on regional groundwater levels were analyzed by preparing groundwater level contours, as simulated by the King Basin IGSM, for

the 2005 Existing Conditions. The groundwater elevation at the end of model simulation for the 2005 Existing Conditions is shown in Figure 4.18.

4.2.2 2030 Build-Out Land and Water Use

Projected land use and water demand data were developed for build-out conditions for the cities within CID. The primary change in land use is the conversion of agricultural and native lands to urban development near or adjacent to the cities. The projected land use was based on information obtained from the Local Agency Formation Commission (LAFCO) for Fresno, Kings, and Tulare Counties. LAFCOs work with the cities in CID and with departments in the county governments to develop SOIs that define boundaries for urban growth. Using the LAFCO data, it is expected that urban areas will expand by 14,200 acres from existing conditions and agricultural acreage will be reduced by an equal amount. The land use is based on the cities' sphere of influence (SOI). It is assumed that the cities will reach build-out conditions by 2030 and will not expand beyond their SOI (Figure 4.19).

The change in land use represents a 10 percent reduction in total agricultural area and a 144 percent increase in urban development from current conditions. There is a corresponding change in water demand with the changes in land use. The current crop mix is assumed to remain unchanged so future agricultural water demand will be 10 percent less than it is currently.

Assuming future urban water demand per acre is similar to 2005 conditions; urban water demand will increase 144 percent. It is important to note that although the total water demand indicated in Table 4-1 is projected to go down, the total pumping will actually increase. This transformation occurs because much of the acreage that will go out of production currently uses imported surface water for irrigation, but all of the urban land replacing it will use groundwater only. This is discussed in greater detail in the next section.

Figure 4.20 shows the groundwater elevation for the 2030 Baseline Conditions at the end of the King Basin IGSM simulation. The water level contours were then used to calculate the difference in water levels at the end of the simulation period between the 2005 Existing Conditions and the 2030 Baseline Conditions as shown in Figure 4.21. The figure shows the amount of additional decline that would be attributed to the increased land use at build-out conditions in 2030. The areas that show a decline in the groundwater level are related to the changes in land use from agricultural to urban. The areas in the northern boundaries of CID and the Highway 99 corridor show a reduction in groundwater elevation of 5 to 9 feet. The "impacted" areas due to urbanization extends from the north west of CID to the south into Kingsburg, and to the northeast into Sanger, as shown by the contour range indicating a decline in groundwater elevation of 0 to 4 feet.

4.2.3 Comparison of Groundwater Pumping

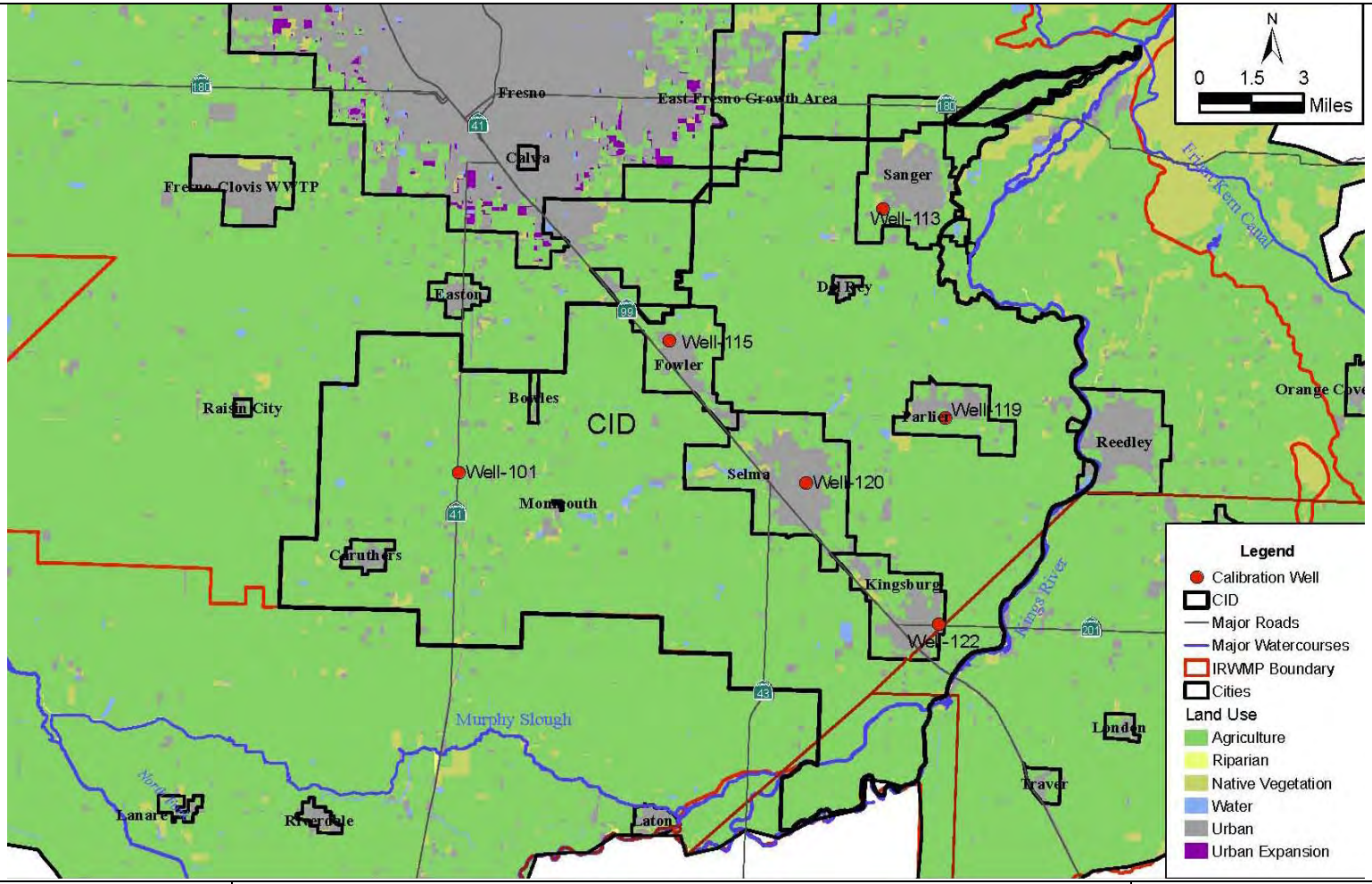
The Kings IGSM model was used to calculate the total groundwater pumping needed to meet the water demands from agricultural and urban land use within the cities' SOI. Water use outside the cities' SOI will remain approximately the same. Table 4-2 is a summary of the water demand met by groundwater. The agricultural water demand (Ag Demand) is calculated by the King IGSM model based on crop acreage within the SOI and crop specific water duty values. For the 2005 conditions the average annual Ag Demand is 51.5 TAF, which is met by both delivered surface water and groundwater pumping. The Ag Demand is reduced to zero within the SOI for the 2030 conditions because of the assumption that the cities are fully developed. The urban water demand is assumed to be met entirely by groundwater and thus is equal to the water demand.

Table 4-2. Comparison of Groundwater Pumping Between 2005 Existing Conditions and 2030 Baseline

	Agricultural Demand (TAF)	Agricultural Demand Met by Groundwater (TAF)	Urban Demand Met by Groundwater (TAF)	Total Groundwater Pumping (TAF)
2005 Existing Conditions	51.5	4.7	18.7	23.4
2030 Projected Conditions	0	0	43	43
Difference	-51.5	-4.7	24.3	19.6

The sum of the columns (urban and agricultural demand that is met by using groundwater) is representative of the total groundwater pumping that occurs within the SOI. Urban demand for groundwater is 18.7 TAF (2005 Existing Conditions) and 43.0 TAF (2030 Projected Conditions). This is an increase in groundwater demand of 24.3 TAF. Total groundwater pumping is 23.4 TAF (2005 Existing Conditions) and 43.0 TAF (2030 Projected Condition). This projected increase in groundwater pumping of 19.6 TAF is due to the increased urbanization that will occur within CID.

For the 2005 Existing Condition, surface water is used to meet much of the agricultural demand. The difference between the total Ag Demand of 51.5 TAF and the 4.7 TAF of Ag Demand Met by groundwater is 46.8 TAF, which is the amount of surface water applied. This application of surface water is discontinued when agricultural land is converted for urban purposes. The amount of Ag Demand drops to zero in 2030, and as a result the amount of surface water supplied to the area is also decreased by 46.8 TAF. Therefore, the impact on groundwater is caused not only by the increase in urban groundwater pumping, but also by the decrease in the amount of surface water applied. Assuming an irrigation efficiency of 75 percent, the net reduction of groundwater recharge from the applied irrigation water is approximately 11.7 TAF (25 percent of 46.8 TAF).



GEI Consultants

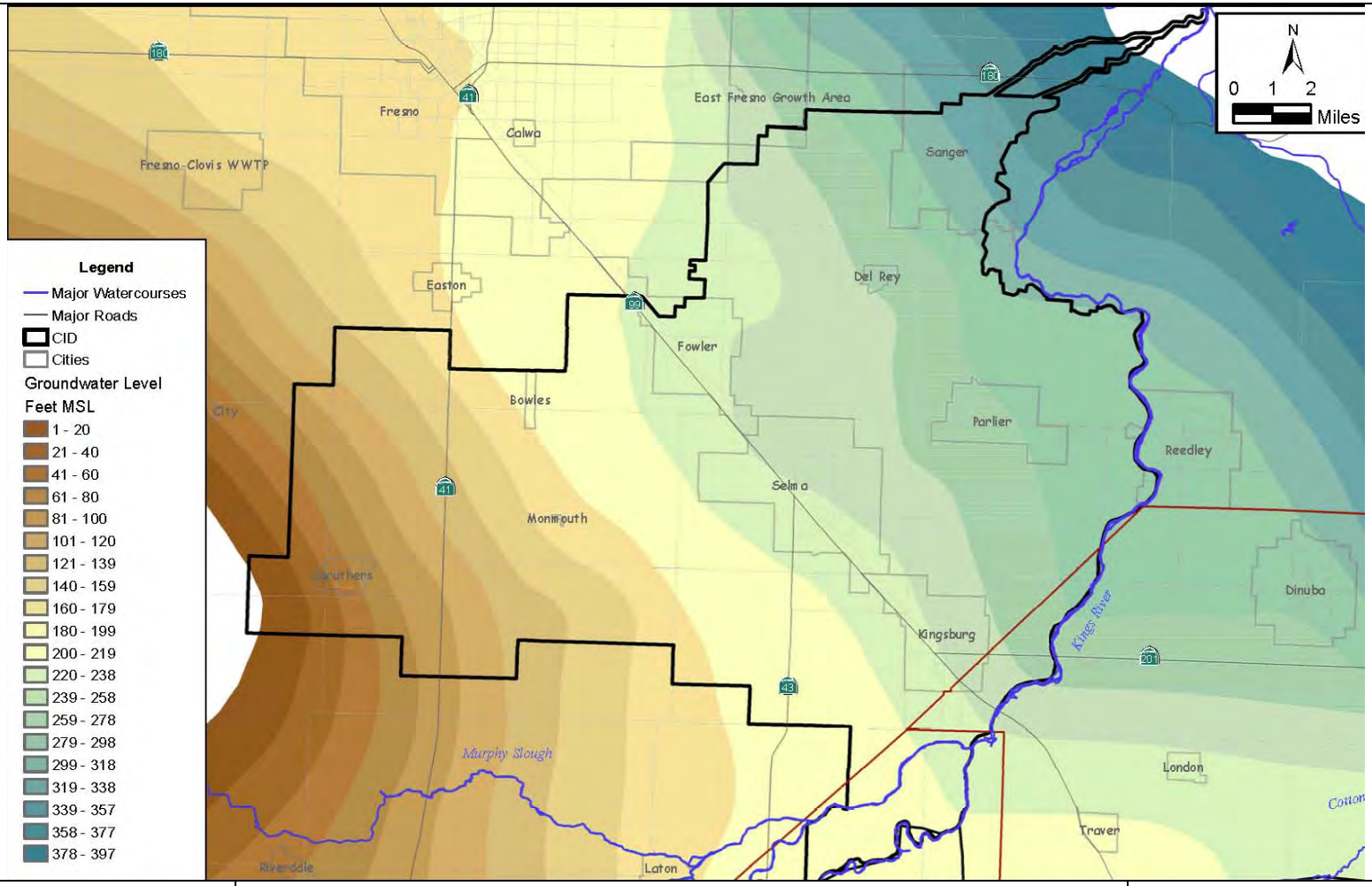
Consolidated Irrigation District
Groundwater Management Plan

Land Use for 2005 Existing Conditions

Source: CID Groundwater Impact Analysis Memorandum, 2007

May 2008

Figure 4.17



GEI Consultants

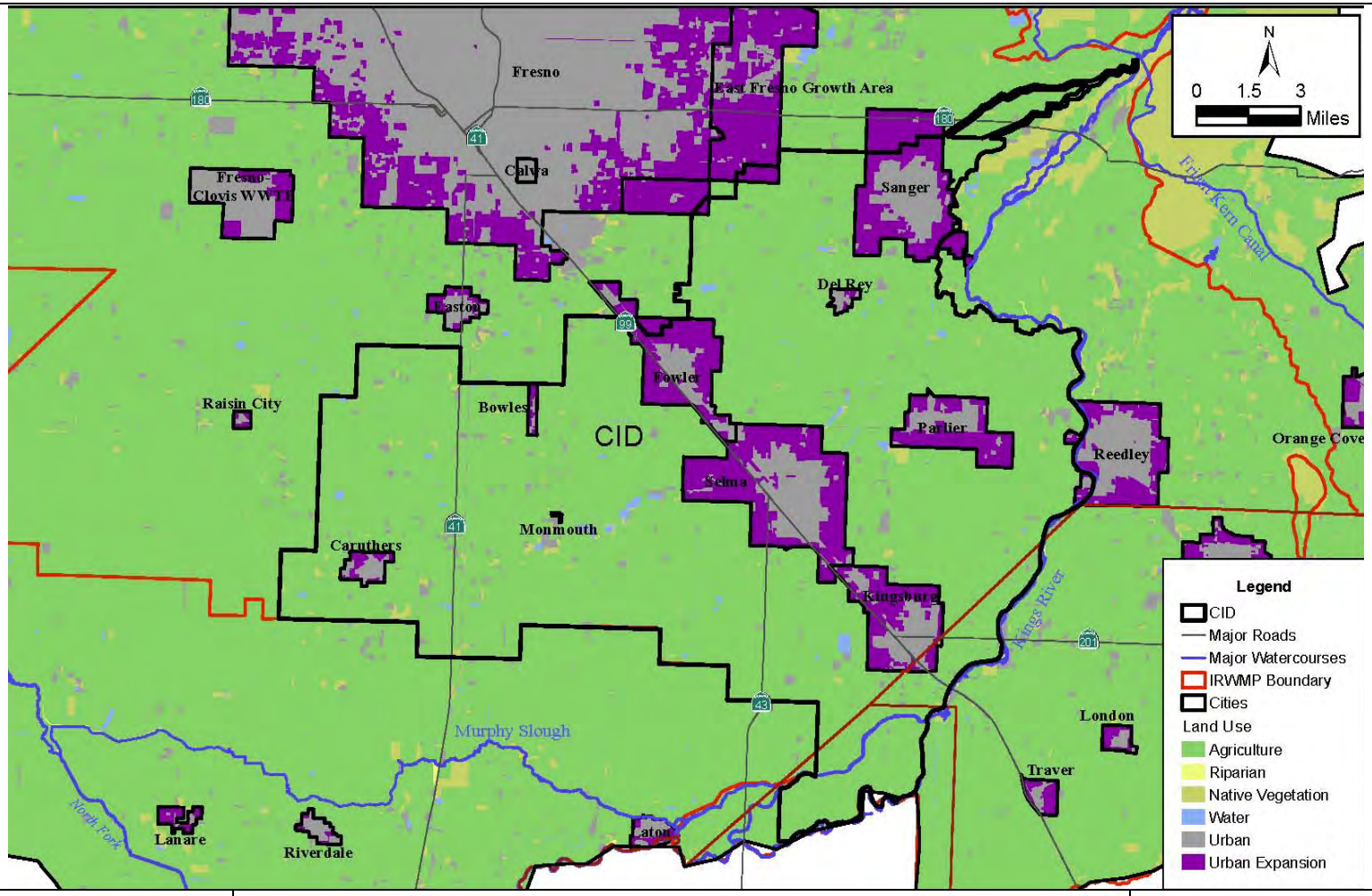
Consolidated Irrigation District
Groundwater Management Plan

End of Simulation: Existing Conditions

Source: CID Groundwater Impact Analysis Memorandum, 2007

May 2008

Figure 4.18



GEI Consultants

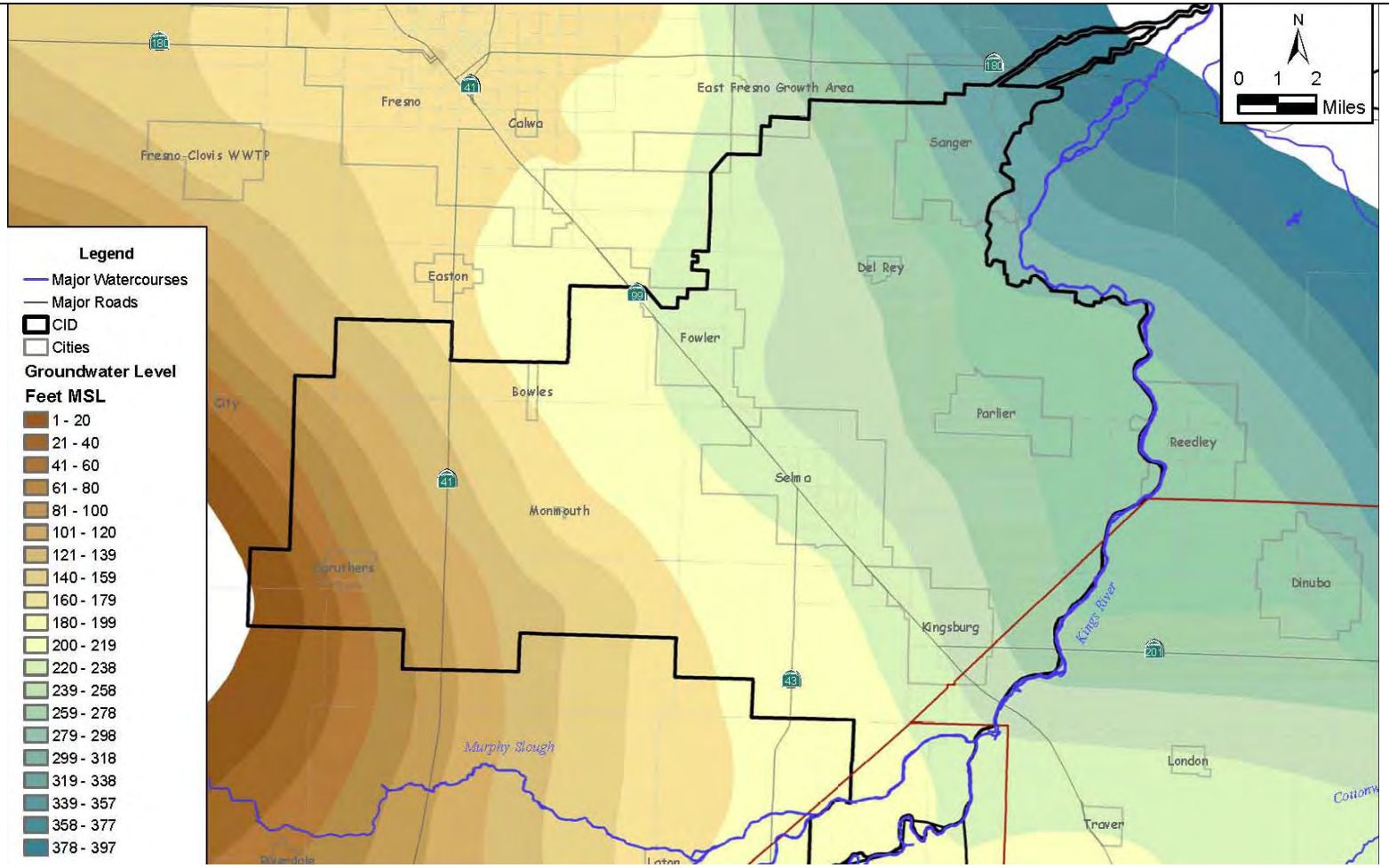
Consolidated Irrigation District
Groundwater Management Plan

Land Use: 2030 Baseline Conditions

Source: CID Groundwater Impact Analysis Memorandum, 2007

May 2008

Figure 4.19



GEI Consultants

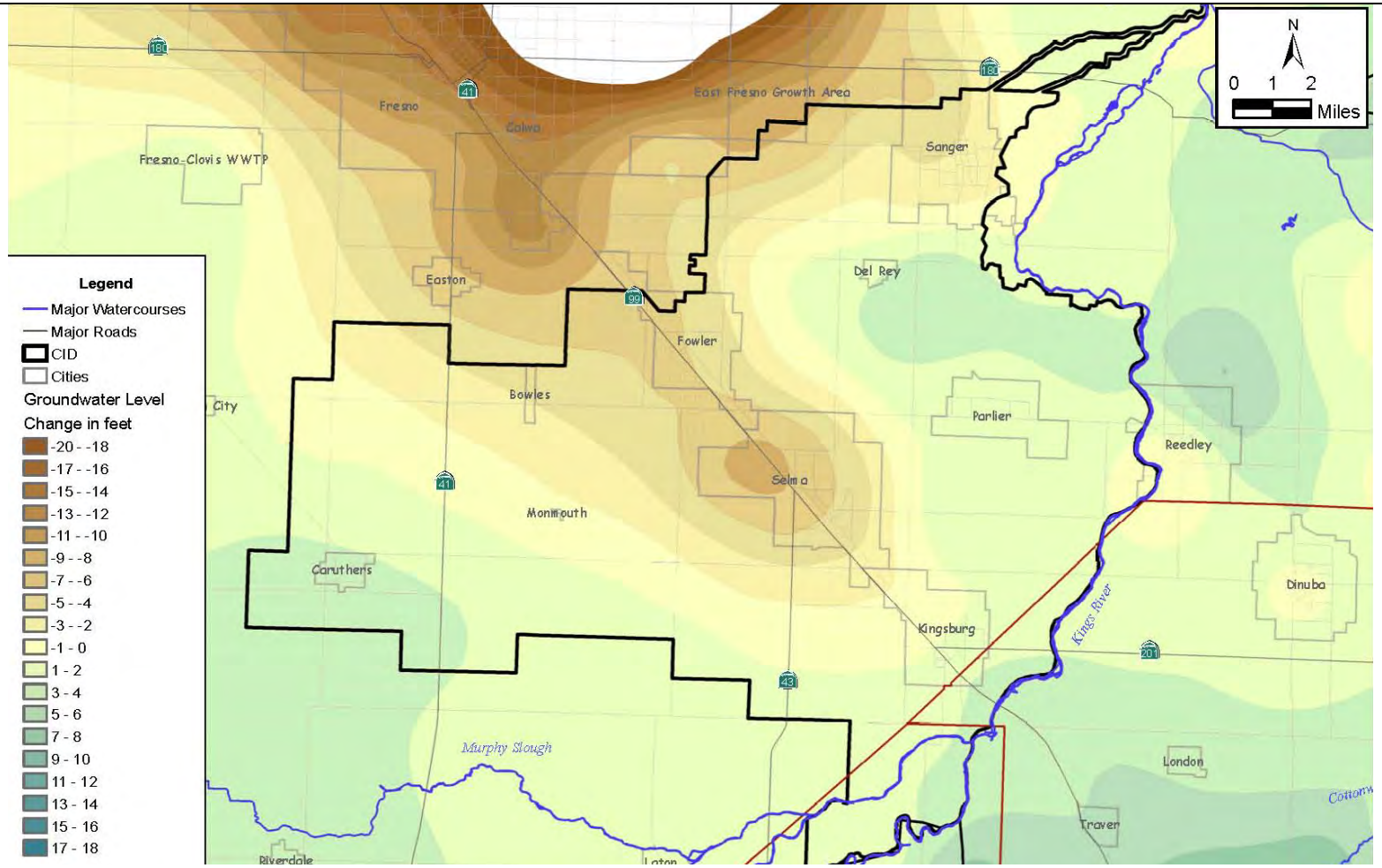
Consolidated Irrigation District
Groundwater Management Plan

End of Simulation: Baseline 2030

Source: CID Groundwater Impact Analysis Memorandum, 2007

May 2008

Figure 4.20



GEI Consultants

Consolidated Irrigation District
Groundwater Management Plan

End of Simulation: Baseline 2030 minus Existing Conditions

Source: CID Groundwater Impact Analysis Memorandum, 2007

May 2008

Figure 4.21

4.3 1964-2004 Water Budget

Components that comprise a water budget are categorized into recharge components and discharge components. For a groundwater budget, the difference between discharge and recharge is referred to as overdraft if discharge is larger than recharge. Table 4-3 shows the components of the groundwater budget and the resulting values for CID.

Table 4-3. Average Annual CID Groundwater Budget from 1964 to 2004

Budget Component	Recharge (TAF)	Discharge (TAF)
Percolation from rainfall and irrigation	187	0
Recharge from streams and canals	25	0
Recharge from ponds	90	0
Groundwater pumping – Agricultural	0	231
Groundwater pumping – Urban	0	15
Groundwater flow out of CID	0	80
Overdraft	24	

Source: Upper Kings Basin IGSM

From Table 4-3, the average annual overdraft for CID is 24 TAF per year. The entire Kings River Basin experienced overdraft of approximately 162 TAF acre-feet per year during the same time period.

4.4 Conclusions

The evaluation of the basin water budget using the Kings IGSM indicates that the average annual overdraft within the CID area during the 1964-2004 period was approximately 24 TAF per year. Overdraft for the entire King River Basin was approximately 162 TAF per year over the same time period. The groundwater pumping to support urban development was about 18 TAF per year in 2004 at the end of the simulated modeling period. More recent reporting of pumping for the CID Cities indicates pumping is in the order of 24 TAF. The amount of urban pumping is projected to increase to 43 TAF under future conditions. Urban development is solely reliant on groundwater for water supply. This development will result in a decrease in recharge to groundwater storage within the urbanized areas from the loss of applied surface water for irrigation and rainfall of approximately 15 TAF per year. Both the increase in pumping and decrease in irrigation of applied surface water result in changes in groundwater elevations and storage.

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5 Alternative Water Management Strategies

This chapter reviews the overall groundwater management strategy and the alternative water management strategies that were considered for inclusion in the CID GWMP, including those that are mandatory components pursuant to SB 1938, those which were considered voluntary under AB 3030 and SB 1938, and those that are recommended by DWR. Many of the programs identified by DWR for consideration in the GWMP have been addressed in the Upper Kings IRWMP, and CID will meet some of the GWMP requirements through the continued participation in the Water Forum and through implementation of the Upper Kings IRWMP. For a comprehensive review of the wide array of water management strategies, the reader is referred to the Upper Kings IRWMP and supporting materials (WRIME, 2006e and 2007f).

The overall CID groundwater management strategy is discussed first. This is followed by discussion of the alternative water management concepts that were evaluated for inclusion in the CID GWMP. The alternative strategies are described along with the current status of programs in CID, discussion of constraints, and the final recommended actions to be part of the GWMP.

5.1 Overall Approach to Groundwater Management

Within the Kings Basin there is no integrated system to manage groundwater to ensure equity, efficiently allocate resources, and solve overdraft. The Kings River Water Association (KRWA) has a mature surface water management program and institutional arrangements, but there is no similar organization or set of agreements to manage and protect groundwater.

The CID GWMP and the Upper Kings IRWMP will be used to increase the collaboration across boundaries to solve overdraft, develop and implement projects, and create the management system that will increase the yield of the Kings Basin. The Upper Kings IRWMP identifies cost effective approaches for avoiding redundant or duplicative efforts, such as sharing monitoring costs and data, developing analysis tools, and managing and reporting of groundwater data.

5.1.1 Methods for Groundwater Management

DWR has identified six methods of groundwater management in California (DWR, 2003) and identified the management authority and the responsible entity (listed in parentheses) in the chronological order in which they have been developed:

- Overlying Property Rights (property owner)
- Statutory Authority (legislatively defined local agency or district)
- Groundwater Management Districts or Agencies (legislatively defined local agency or district)
- Groundwater Management Plans (local agency or district)
- Adjudicated Groundwater Basins (groundwater basin, water master, or court)
- City and County Ordinances (city or county)

These methods provide a framework for discussing the overall approach to groundwater management in CID. In the past, the overlying property owners and CID managed groundwater through the conjunctive use and groundwater recharge program. The overlying property owners formed CID and paid assessments to build and maintain projects. CID recharged groundwater for the benefit of overlying users in CID.

CID founding legislation does grant the agency specific statutory authority to manage groundwater. CID adopted the original GWMP in 1995 to begin to develop programs to better manage groundwater and preserve local control. As an irrigation district, CID can adopt a GWMP and expand its ability to manage groundwater pursuant to the Water Code.

The courts have not adjudicated the Kings Basin. Adjudication is the process of quantifying and perfecting the rights and entitlements of overlying users to groundwater in a basin and is initiated by overlying users. The process is expensive and time consuming.

Fresno County has used police powers and authorities to adopt local groundwater ordinances and require permits for groundwater export. The purpose of the ordinance is to hold project proponents accountable for impacts that may occur as a result of proposed export projects. Neither Kings nor Tulare Counties have adopted a groundwater ordinance.

5.1.2 Groundwater Management Concepts

A number of key concepts are defined for purposes of the CID Board development and implementation of the GWMP.

Conjunctive Use. The coordinated and planned management of both surface and groundwater resources in order to maximize the efficient use of the resource; that is, the planned and managed operation of a groundwater basin and a surface water storage system combined through a coordinated conveyance infrastructure. Water is stored in the groundwater basin for later and planned use by intentionally recharging the basin during years of above-average surface water supply.

Groundwater Storage. Groundwater storage is the intentional or artificial recharge of surface water and an important part of CID's conjunctive use program. CID intentionally recharges water for groundwater storage either by direct or in-lieu recharge actions, including

diverting water down the canal networks; putting surface water into constructed spreading basins; and delivery of irrigation water to agricultural lands in-lieu of groundwater pumping. In-lieu recharge includes the volume of applied water that is in excess of the crop consumptive use requirements and percolates downward to groundwater storage.

Overdraft. The condition of a groundwater basin where the amount of water withdrawn by pumping exceeds the amount of water that recharges the basin over a period of years during which water supply conditions approximate average conditions. The CID Board and the Upper Kings Basin Water Forum have found that the Kings Basin is in overdraft. This is distinguished from "Critical Conditions of Overdraft," which is a basin where continuation of present practices would probably result in significant adverse overdraft-related environmental, social, or economic impacts. The definition was created after an extensive public input process during the development of the Bulletin 118-80 report. DWR has declared the Kings Basin, including those portions underlying CID, to be in a critical state of overdraft.

Groundwater Storage Capacity. The volume of a groundwater basin that is unsaturated and capable of storing groundwater within CID jurisdictional boundaries, or within the Kings Basin, that could be utilized for purposes of storage and management of CID waters.

Groundwater Banking. Like groundwater recharge, groundwater banking is a water management tool designed to increase water supply reliability. Like CIDs historical groundwater recharge activities, groundwater banking would use dewatered aquifer space to store water during wet years (years when there is abundant rainfall and surplus water available), so that it can be pumped and used during normal and dry years. The difference between groundwater storage is that groundwater banking includes greater accounting of the water that is intentionally stored in the groundwater basin. Groundwater banking would include accounting for the benefits associated with the incremental increase in the yield of the groundwater basin that would be a direct result of the management actions and projects implemented by CID. The CID Board defines groundwater banking to include use of existing or new facilities and operations that would:

- Result in an increase in the operational yield of the Kings Basin.
- Make use of and manage the available Kings Basin groundwater storage capacity.
- Provide a net reduction in historical overdraft or avoid future, incremental contributions to overdraft that would be the result of water consumed by a proposed project.
- Improve reliability and ensure a long-term, sustainable water supply to partners that participate in the program and provide funding through agreements with CID.

5.1.3 Constraints to Groundwater Management

New urban water users are not currently required to mitigate for impacts to groundwater. Cities and other land owners overlying the groundwater basin do not have "ownership" of the overdraft problem and do not recognize the need for physical solutions. Funding is a constraint to further development of projects, policies, and programs to improve groundwater management.

The institutional constraints to changes in the groundwater management regime were discussed in the Upper Kings IRWMP and include:

- Inability of local and regional water management governance entities to build trust, resolve internal and external differences, and share control.
- Inability to match benefits and funding burdens in ways that are acceptable to all parties, including third parties.
- Lack of sufficient federal, state, and regional financial incentives to encourage groundwater conjunctive use to meet statewide water needs.
- Legal constraints regarding storage rights, basin judgments, area of origin, water rights, and indemnification.
- Inability to address quality difference in "put" versus "take" water; standards for injection, export, and reclaimed water; and unforeseeable future groundwater degradation.
- Risk that water stored cannot be extracted when needed because of infrastructure, water quality or water level, politics, and institutional or contractual provisions.
- Lack of assurances to prevent third-party impacts and increase willingness of local citizens to participate.
- Lack of creativity in developing lasting "win-win" conjunctive use programs and agreements.
- Different roles and expectations of supplemental suppliers and water managers in relation to conjunctive use.

5.1.4 Findings and Actions for Groundwater Management

5.1.4.1 Findings

- Overdraft requires a response. CID has the appropriate facilities, engineering expertise, and authority to combat overdraft, develop additional conjunctive use opportunities, and develop groundwater recharge and banking projects.
- CID supports local control and management of groundwater through locally adopted and supported GWMPs, and through participation of both CID and CID Cities in the Upper Kings IRWMP.

- CID believes that adjudication should be avoided since it is a complex and confrontational legal process that would redirect resources; both money and time, to court proceedings and expensive studies, and that these resources would be better allocated to developing consensus, designing projects, and implementing the GWMP actions.
- Groundwater banking programs cannot have third party or environmental impacts that are not mitigated in accordance with local, state, and federal requirements.

5.1.4.2 Actions

CID actions identified in the CID GWMP are intended to help overcome constraints and create opportunities. CID will:

- Continue to reach out to the community in order to:
  - Build trust, resolve internal and external differences, and share responsibility for groundwater management.
  - Coordinate economic analysis and equitably match benefits and funding burdens in ways that are acceptable to all parties.
  - Create awareness and understanding regarding overdraft and the problems and opportunities for water management.
- Use the CID GWMP as a guide to define, fund, and implement a Groundwater Mitigation and Banking Program that will include capital facilities projects, programs, and policies to manage available groundwater storage capacity and provide mitigations to groundwater impacts of new urban development.
- Identify federal, state, and regional funding opportunities and seek grants and low interest loans to encourage conjunctive use and groundwater banking.
- Protect overlying groundwater rights and CID rights to the water that is intentionally recharged for the benefits of landowners and rate payers within CID.
- Work with the cities to develop the institutional arrangements and agreements that provide for local control and management of groundwater and establish funding for recharge facilities with tangible yields that provide a long-term, sustainable water supply for new development.

Other primary groundwater management actions include:

- Continue to support the development and maintenance of the Kings Basin Integrated Groundwater Surface Water Model (IGSM) since this is a valuable tool for understanding the regional water budget and how the basin operates (IRWMP Foundational Action No. 16).

- Participate in the Upper Kings Water Forum to evaluate and implement integrated regional projects and solutions.

5.2 Conjunctive Use, Groundwater Recharge, and Banking

Conjunctive use is an important water management strategy recommended by DWR for inclusion in a groundwater management plan.[3] Since overdraft has a potential to cause conflicts within CID and throughout the Kings River Basin, both the CID Board of Directors and the Kings Basin Water Forum have established a priority to develop and implement conjunctive use projects. Development of conjunctive use facilities for groundwater recharge and banking is a primary objective of the CID GWMP.

Conjunctive management of surface and groundwater will improve water supply reliability and reduce groundwater overdraft. Through conjunctive use, CID recharges surface water to increase groundwater storage in the underlying aquifer. Groundwater recharge can be accomplished in two ways: (1) direct recharge by allowing water to infiltrate through recharge ponds or by injecting water into the aquifer using wells, and (2) in-lieu, or indirect recharge which involves providing surface water for irrigation or other uses to replace groundwater pumping. In-lieu recharge leaves groundwater in storage for later use. Surface water can be provided to agriculture without treatment, whereas municipal use of surface water would require construction of water treatment plants. Urban areas cannot use surface water directly unless it is treated, but can benefit from recharge with surface water for subsequent extraction by municipal supply wells.

CID has not developed a groundwater banking program where the benefits of recharged water are specifically accounted for against a specific use or set of users. The historical overdraft and anticipated increases in urban groundwater demands make it appropriate to increase accountability and improve groundwater management through banking.

CID currently does not own or operate wells or other extraction. CID may develop groundwater extraction wells to remove water that it has intentionally stored in the groundwater basin for distribution and use within the service area.

To increase conjunctive use and develop additional groundwater recharge operations, there are three primary considerations; (1) identifying a source of water, (2) defining conveyance to move water to the place of use, and (3) acquiring access to land for construction of recharge facilities.

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[3] Conjunctive use, control and mitigate groundwater overdraft, and replenish groundwater are all voluntary components that must be considered for inclusion in the groundwater management plan pursuant to state legislation.

CID surface water sources include its water rights to the Kings River; unregulated flood releases and other local storm water; flood water from the Central Valley Project (CVP) ("215 floodwater"); and imported water from outside the Kings Basin obtained through purchase, exchange, or transfer. Although the Kings River is fully appropriated, there is unregulated floodwater that flows out of the Kings Basin that can be captured and managed for groundwater recharge.

CID conveyance canals are used to deliver surface water for in-lieu or direct recharge. Changes in current operations, expansion of existing conveyance facilities, and/or new facilities will be needed to fully realize the conjunctive use potential within CID.

Land for recharge is needed (through easement or purchase) to construct and operate recharge facilities. Land adjacent or near CID conveyance facilities could be acquired to develop recharge facilities.

5.2.1 Constraints to Conjunctive Use, Groundwater Recharge and Banking

Use of flood flows and other water for recharge and groundwater banking is constrained by conveyance capacity and pond space available for recharge. During the irrigation season, canal capacity to convey flood water is limited. On the canal system that serves the western portion of the District, there is disproportionately greater ponding area and canal capacity has historically been the factor that constrains recharge. On the canal system that serves the eastern part of the District, ponding area is much more limited and is the factor that constrains recharge. Outside of the irrigation season, use of available flood water is constrained by ponding capacity on both systems.

CID's canal system has two main arterials, the Fowler Switch and C&K Canals. Most of the District's recharge ponds are located along the Fowler Switch Canal and its laterals and therefore these ponds can only receive water deliveries through the Fowler Switch. When flood water is available from the Kings River, the Fowler Switch is typically operated near its capacity to deliver recharge water. There are much fewer and smaller recharge ponds located along the C&K Canal. Typically there is capacity available in the C&K when flood water is available from the Kings River, but there are not enough recharge ponds to optimize the available flood water with the capacity of the C&K.

The same can be true of the CVP 215 floodwater from the San Joaquin River, which may be available at the same time that the District's recharge system is operating at full capacity to deliver Kings River flood water. Water imported through transfer or exchange for purposes of recharge and overdraft reduction may be available when CID's canals are not being used for irrigation or flood water diversions, but the price would be high. There is likely to be increased competition and subsequent market prices for Kings River flood water in the future as other entities in the Kings Basin seek to develop this supply.

Previously, there was not accounting of the recharge water that was applied. Creating systems for increased accountability is likely to encounter resistance from those that previously received benefits without charge.

Access to land has been the biggest constraint to the development of new recharge basins. Land acquisition has been constrained by lack of ready cash to respond when land is on the market, and time delays associated with environmental review by public agencies when purchasing land for a specific project. A specific land acquisition program to overcome the constraints is discussed in the next section. Funding limitations and lack of political support from urban interests constrain implementation of physical solutions.

5.2.2 Findings and Actions for Conjunctive Use, Groundwater Recharge and Banking

5.2.2.1 Findings

- Based on evaluations conducted as part of the Upper Kings IRWMP (WRIME, 2006f, 2007b, 2007d;), the CID Board finds that:

    - There is surface water available to CID for recharge.
    - There is available capacity within CID facilities to convey water, though some conveyance facilities may need to be modified or expanded to fully realize the conjunctive use and groundwater banking opportunities.
    - There is land within CID that has appropriate hydrogeologic conditions for additional recharge ponds and that is located near useable CID conveyance facilities.

- The Upper Kings IRWMP provided guidelines for the Integrated Regional Conjunctive Use Program. The guidelines have been, and will be, used by the CID Board to formulate projects to be included in the CID GWMP and groundwater mitigation and banking program.
- Groundwater mitigation and banking projects developed as part of the conjunctive use program will cost effectively meet the goals and objectives of the CID GWMP and Upper Kings IRWMP, while also avoiding environmental impacts, when the following design guidelines are followed.

    - All projects considered must have a tangible, measurable yield in terms of reducing overdraft, increasing regional water supplies, and contributing to overall reliability and the basin's ability to withstand drought.
    - Recharge, flood retention, recreation, and habitat benefits should be integrated as project features where feasible and cost effective.

- Recharge facilities should be located up-gradient of urban areas in order for clean Kings River or imported waters to percolate into the groundwater basin and flow toward municipal well fields.
- Retention ponds may also be located down-slope of developing areas to provide multipurpose storm water and recharge benefits.
- Combined recharge and operational/regulatory storage must be designed into existing irrigation distribution facilities to optimize delivery, improve and protect water quality, and provide environmental benefits where cost effective.
- When possible, incorporate environmental design concepts as recommended by the Water Forum Environmental Work Group.
- Land in critical recharge zones needs to be managed, protected, or acquired.
- Urban expansion should mitigate for loss of recharge from applied surface water irrigation on lands converted from agricultural to urban uses.
- Water stored and banked in the groundwater basin must be recoverable by those that participated and funded development of facilities.
- Recharge operations must not result in migration of any known contaminant plume that would impair water quality for municipal or agricultural uses.
- Groundwater levels will not be allowed to rise to the point where they would affect crops or agriculture productivity.
- The long-term, unmitigated export of native groundwater is prohibited.
- Third party and environmental impacts must be mitigated.
- Those who receive benefits from the project should pay a proportionate share of the costs.
- The benefits of any groundwater banking operation must be clearly identified and measured.
- Any groundwater banking program using imported water will be required to leave a portion of the water in the groundwater basin to benefit the Kings Basin.

5.2.2.2 Actions

Near Term Actions include:

- Expanding the Groundwater Recharge and Banking Program by:
  - Aggressively pursuing new in-lieu or direct recharge projects using available surface water and flood water.
  - Improving and protecting canal conveyance capacity.
  - Developing agreements and funding mechanisms in cooperation with CID Cities.

- Acquiring additional lands for purposes of developing additional recharge capabilities.

- Seek state and federal grant funding or low interest loans to acquire property, design projects, and build facilities in the CID area that are needed to meet BMOs.
- Evaluate maintenance and operations at existing recharge ponds to identify opportunities to increase recharge rates.
- Evaluate the feasibility and opportunity to construct extraction facilities to improve the distribution of recharged and banked water.
- Work with local cities and growers to develop stable funding and financial resources to acquire land and water; provide a local match for state and federal grants; and to design, permit, and build groundwater mitigation, recharge, and banking facilities.
- Evaluate bonding potential for CID.

Longer Term actions include:

- Coordinating with other Kings Basin Water Forum members to aggressively pursue development of additional regional facilities for conjunctive use.
- Using the Water Forum and Upper Kings IRWMP to establish priorities and develop regional conjunctive use facilities.
- Working with CID Cities to evaluate long-term water supply needs.

There is no current imperative to develop municipal surface water treatment plants in CID Cities, but this may be necessary in the future. If urban lands continue to develop and rely exclusively on groundwater, and if recharge facilities are not developed to help meet future urban demands, treatment of surface water for municipal use in lieu of groundwater may be needed. The Upper Kings IRWMP reviews how the cities of Clovis and Fresno have developed surface water treatment facilities to address overdraft in the northern part of the Kings Basin.

5.3 Land Acquisition and Protection of Recharge Areas

Land could be acquired or reserved through a dedicated land acquisition program. In addition to providing water supply benefits, land set aside for recharge or storm water management can also provide multiple benefits for open space, recreation, and habitat. Acquiring the land is the best way to protect vital recharge areas needed to develop projects. Recharge areas can be protected to allow for natural recharge, development of groundwater recharge facilities, and to mitigate the effects of land conversion and urban development. Local city and county land use agencies could apply their land use authorities and develop policies to protect recharge areas or require mitigation for groundwater impacts associated with new development.

5.3.1 Constraints for Land Acquisition

Development pressure in urbanizing areas can result in increased land values, loss of prime recharge areas, and increases in impervious surfaces which results in reduced recharge. The principal constraints to land acquisition are increasing land costs, lack of readily available capital, and inability to rapidly act when willing sellers put land on the market. CID does not have the financial capacity or reserves to take action when viable properties come on the market. As a public agency, CID needs environmental clearance pursuant to the California Environmental Quality Act (CEQA) to acquire property for a specific project purpose such as developing recharge facilities, and this can significantly delay purchase or result in loss of opportunities to purchase property.

5.3.2 Findings and Actions for Land Acquisition for Recharge Purposes

5.3.2.1 Findings

- A cooperative program between CID and the cities is needed to generate revenues to acquire lands when they are available for multiple purposes.
- The CEQA process for recharge projects should be streamlined as much as possible to minimize the evaluation time prior to acquiring the land.
- Eminent domain should not be used except to acquire property for recharge projects. It should be avoided unless there are no other feasible alternatives.

5.3.2.2 Actions

CID will:

- Work with CID Cities and Fresno County to acquire land for multiple benefits including flood control, recharge, open space, and recreation purposes.
- Develop and implement a land acquisition process for acquiring lands through purchase (for direct recharge facilities) or easement (for spreading).
- Streamline the environmental review process to allow a more rapid response to property acquisition opportunities.
- Pursue funding mechanisms to build capital reserves that can be used to acquire property or purchase water for groundwater mitigation and banking purposes.

5.4 Conveyance and Extraction Facilities

CID conveyance facilities move water from the Kings River to agricultural water users and recharge facilities. The conveyance facilities include natural channels and constructed facilities, such as canals, pipelines, and diversion structures. Groundwater aquifers also convey water from recharge areas to areas of pumping. Improvements to the existing conveyance system could provide more flexibility to move water from the available supply

sources to existing, improved, or new groundwater recharge facilities. Improved conveyance facilities might also allow surface water to be delivered to a larger irrigation service area within CID in lieu of groundwater pumping. In general, it is believed that adding recharge ponds to the eastern part of the District would be more economically feasible and would provide greater benefits to groundwater than conveyance improvements. Current CID conveyance facilities are also used to provide incidental storm water conveyance benefits. CID currently does not have facilities for extracting groundwater that is intentionally recharged. Such facilities, coupled with the existing conveyance system, could be used to improve operational flexibility and increase the yield. Additional operational constraints are related to the closure of CID canal outlets to the Kings River that were closed as part of the agricultural waivers program. This affects water deliveries and has the potential to limit the full utilization of the canal systems.

5.4.1 Constraints to Conveyance Systems and Extractions

CID does not have funding to construct improvements to its conveyance system. Capital reserves and additional revenue streams would be needed to improve, operate, and maintain conveyance facilities to meet multiple purposes for conjunctive use and storm water conveyance. CID would need to work with cities to resolve funding of conveyance improvements for the purpose of mitigating groundwater impacts. Also, canal recharge is an important part of CID water budget, but recharge rates in existing canals are not well defined, and the benefits of this recharge are hard to document given the limited water measurement capabilities of the District. Extracting and redistributing groundwater for purposes of increasing the operational flexibility and yield could garner resistance from land owners near the extraction location(s).

5.4.2 Findings and Actions for Managing Conveyance Systems

5.4.2.1 Finding

- There is a backlog of deferred maintenance on CID facilities and a need to modernize some components of the existing system.
- There are likely to be conveyance constraints that have not been fully identified that could limit the full utilization of the systems for both storm water and water supply purposes.
- CID Cities currently derive uncompensated benefits from use of the irrigation canals and conveyance facilities for both groundwater recharge and storm water disposal.
- CID needs to work with the cities to protect, preserve, or improve existing capacities in developing areas.

5.4.2.2 Actions

CID will:

- Conduct a study to evaluate conveyance systems constraints and opportunities; identify systems deficiencies and the backlog of deferred maintenance; define priorities; establish costs; and develop a canal improvements plan to meet both supply distribution and storm water conveyance needs.
- Develop a Supervisory Control and Automated Data Acquisition (SCADA) system to improve the monitoring and management of surface water delivered to growers and to recharge facilities, and quantify the benefits. (Consistent with Upper Kings IRWMP Monitoring, Measurement, and Reporting Action 7 – SCADA).
- Work cooperatively with the cities to develop mitigation of impacts to CID facilities associated with new development, increased conveyance of flood waters from the Kings River, and integration of storm water and conjunctive use operations.

In regards to developing a SCADA system, CID recently received grant funding from DWR as part of the DWR's Water Use Efficiency program as discussed further below in the conservation section. CID will begin purchasing equipment to measure and remotely monitor canal operations and report information back to CID headquarters. The program will also result in a plan for further automation to modernize the canal monitoring system, automate operations, and improve District wide water use efficiency and effectiveness.

5.5 Coordinate with Land Use Planning Agencies

Under California law, the management of land use is the responsibility of local government. City and county general plans and the associated goals, policies, objectives, and programs define land use planning requirements for each jurisdiction. General plans guide land use decisions at the city and county level regarding land, water, and natural resources. General plans typically do not provide detailed and comprehensive analysis of water issues since this has been the purview of the water agencies or districts. The city and county general plans and the land use planning process provide local government with an opportunity to integrate land use and water supply decisions. The CID GWMP and IRWMP provide water districts that opportunity to resolve land use and water supply related issues. Changes to state legislation and recent court decisions have increased the informational and procedural requirements regarding consultation between the water management agencies and cities. Appendix A presents a briefing prepared for the CID Board to help evaluate land use and water supply plan integration opportunities.

The Water Forum and IRWMP process provided an opportunity to discuss how to integrate land and water supply plans in order to meet current and future water needs, streamline subsequent project reviews, and avoid potential legal challenges and project delays (WRIME,

2007a). The approach for the IRWMP analysis of land use and water supply integration opportunities was to evaluate how the IRWMP could serve as a tool to further support the city and county general plans goals and objectives. The evaluation was also conducted to identify areas where the general plans could be complemented by the greater detail and emphasis on regional water resources issues available through the Upper Kings IRWMP and the GWMPs for each of the irrigation districts.

5.5.1 Constraints Integrating Land Use and Water Supply Planning

CID Cities' general plans tend to focus on capacity of water and wastewater utilities, and do not recognize the groundwater issues or overdraft. Long-term plans and strategies to mitigate overdraft are not included in CID city general plans or UWMP. City environmental reviews have not recognized overdraft, identified cumulative impacts to groundwater in the Kings Basin, nor identified mitigations for developments which increase groundwater pumping. When new developments are approved, there have not been conditions or requirements to mitigate for groundwater impacts. The Fresno LAFCO has taken an active role in seeking to address groundwater issues prior to permitting annexations.

Development pressure in urbanizing areas can result in increased land values, loss of prime recharge areas, and increases in impervious surfaces that result in reduced recharge. Municipal development in CID relies exclusively on groundwater pumping to meet water demand, whereas agricultural uses prior to development relied generally on surface water to meet water demand. The reduction in applied water upon conversion from agriculture to urban uses reduces incidental groundwater recharge from agricultural irrigation water.

5.5.2 Findings and Actions for Land Use and Water Supply Planning

5.5.2.1 Findings

- City general plans and UWMPs do not recognize overdraft or the limitation of the groundwater source, nor do they define how cities will mitigate water supply impacts of new development by providing a sustainable water supply and defining what projects are planned to meet the total projects' water use.
- Without firm plans for developing and funding water supply projects and ensuring that water supplies are available to meet current and future water demands, the cities will have trouble making sufficiency determinations and complying with statutory requirements; land use decisions may be subject to legal challenge; and economic development could be affected.
- CID Cities need to mitigate for the groundwater impacts of new development as part of the development review process. This can be done through demonstrating that the city is not contributing to overdraft (e.g., requiring the developer or city to procure a new water supply in lieu of using groundwater.

5.5.2.2 Actions

CID will:

- Act as responsible agency and actively engage in the development review process of CID Cities and Fresno County to integrate land use and water supply planning; and ensure impacts to groundwater and CID facilities are mitigated.
- Make findings and adopt policies to be used by staff and the cities such that groundwater impacts are recognized and mitigated during the development review or CEQA review process.
- Encourage CID Cities to use the GWMP as a regional water supply assessment for purposes of complying with SB 610 and 221, but only when such cities have adopted the GWMP and developed plans and funding strategies.
- Work with the developers or water purveyors to provide groundwater mitigations and banking solutions where cities have not mitigated groundwater impacts of new development.
- Continue to work with Fresno County LAFCO to ensure that CID Cities are responsive to CID, acting as a special District, and that the development review process and annexation process are used to effectively mitigate groundwater impacts and impacts to CID facilities, and that approvals of development proposals are conditioned such that impacts are mitigated and funded to the satisfaction of CID.

CID will consider groundwater impact and mitigation fees on urban development, but only in such instances where CID has not developed alternative agreements and funding strategies with CID Cities.

5.6 Groundwater and Related Monitoring

SB 1938 requires that a GWMP describe actions to monitoring and management of groundwater elevations, groundwater quality, inelastic land subsidence, and changes in surface water flows and quality that directly affect groundwater levels or quality or are caused by pumping; and to adopt monitoring protocols. The AB 3030 and SB 1938 voluntary components also recommend monitoring groundwater levels.

The purpose of monitoring is to provide the data needed to identify problems; define and evaluate alternatives; reduce uncertainty when making important resources decisions; measure and document progress in meeting basin management objectives; and to provide data to demonstrate that the anticipated benefits of proposed projects and programs are being realized.

5.6.1 Current Program Efforts

5.6.1.1 Groundwater levels

CID has been monitoring groundwater levels since the 1920s and has well-established quality control and assurance procedures. The current groundwater monitoring program consists of about 80 wells spaced on a 2-mile grid throughout the District. These data are submitted to both KRCD and DWR and are compatible with the formats and requirements for submission to DWR for the Groundwater Ambient Monitoring and Assessment (GAMA) Program.

Figure 5.1 shows the location of the wells in the current network. Figure 1.3 presented in Chapter 1 provided a summary of the long-term groundwater trends based on an average of these wells. Individual well hydrographs can be provided at the specific well locations that are included in the program. In addition, the well data can be used to prepare water level contour maps for specific time periods. Chapter 4 provided examples of regional water level maps and how they are used to help create understanding of the groundwater conditions and storage changes over the region.

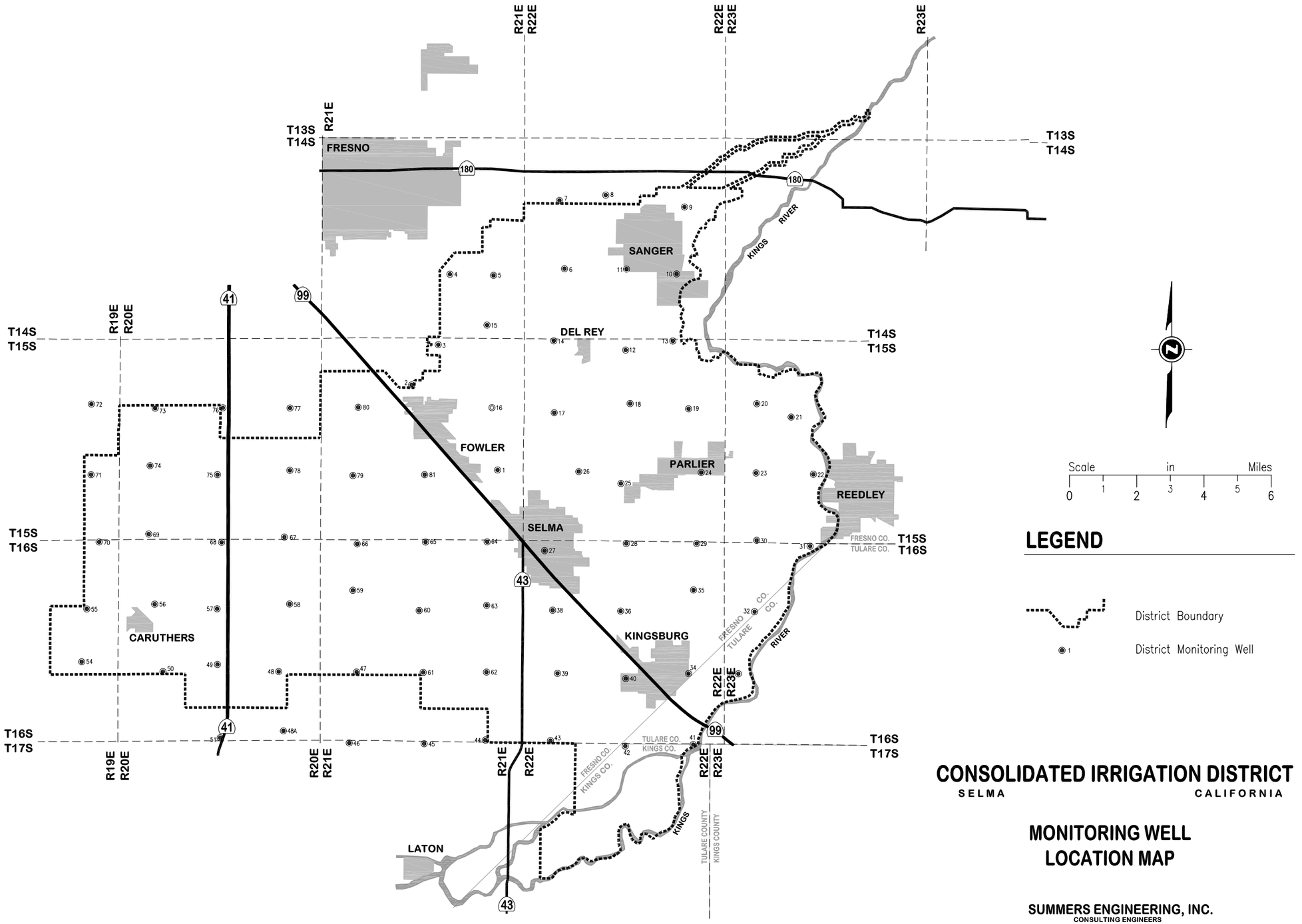
5.6.1.2 Groundwater Quality

As part of the Upper Kings IRWMP, the report "Water Quality Standards, Conditions, and Constraints" (WRIME, 2007c) was produced to document regional water quality conditions. It explained the sources of surface and groundwater quality information, reviewed the historical and current groundwater and surface water conditions, identified data gaps, and evaluated the groundwater and surface water effects for purposes of recharge project development. It further documented a monitoring program intended to qualify sites for recharge, support environmental compliance, and document post-project benefits. The report provided a first step in defining pre- and post-project monitoring approaches to be implemented as part of the recharge project development process.

There is no regional, ambient groundwater quality monitoring network. CID does not monitor groundwater quality. CID Cities monitor water quality at municipal wells to ensure compliance with drinking water standards and this data is available through Department of Health Services (DHS).

There are a large number of groundwater monitoring sites related to ongoing remediation and groundwater clean-up operations. Some of this data may be available for multiple years and could have value in evaluating sites for recharge projects.

CID's well replacement program, which was discussed earlier, includes the use of larger (4" or 6") diameter well casings for all new wells to accommodate pumping and sampling for water quality data.



CONSOLIDATED IRRIGATION DISTRICT

SELMA CALIFORNIA

MONITORING WELL LOCATION MAP

SUMMERS ENGINEERING, INC.

HANFORD CONSULTING ENGINEERS CALIFORNIA

DECEMBER 2008

Figure 5.1

5.6.1.3 Inelastic Land Subsidence

There is currently no local or regional program to monitor land subsidence in the Upper Kings River area. Such a program was recommended for development as part of the Upper Kings IRWMP.

5.6.1.4 Surface Water Flows and Quality

Surface water flows are regularly monitored by the USGS. In addition, KRWA collects diversion and flow data and maintains an extensive database on the releases from Pine Flat Reservoir. More recently, KRCD monitors surface conditions and fishery health as part of the Fishery Management Program.

There is limited long-term surface water quality data available for most of the water bodies in the San Joaquin and Tulare Lake region, including the Kings River. There has been no long-term comprehensive ambient monitoring or assessment program, although recent efforts by the South San Joaquin Valley Water Quality Coalition (SSJVWQC) have resulted in monitoring of sites on the Kings River since 2004 under the Regional Water Quality Control Board's (RWQCB) Irrigated Lands Conditional Waiver Program. This effort is coordinated by KRCD in the Upper Kings Region.

5.6.1.5 Data Management and Reporting

CID maintains its own groundwater level and surface water diversion data sets. Collected data is managed in spreadsheets by CID. The data is also provided to KRCD and DWR for inclusion in the monitoring and reporting program for the entire Upper Kings Region. In the past, CID has supported KRCD in developing regional reports of the groundwater conditions. The USGS gauged flows are available on line. KRWA annually reports surface water diversions from the Kings River. Surface water and groundwater quality data are contained in a host of local, state, and federal databases. DWR and KRCD are working to develop regional data management tools that can be used to access both surface water and groundwater data via the internet.

5.6.1.6 Special Studies and Investigations

There have been a host of studies with specific and limited objectives and these provide valuable insights in terms of pre- project planning and feasibility study. The IRWMP technical reports should be referenced for further information. These reports may be used to explain background conditions, support environmental determinations, focus feasibility studies, and design efforts for CID proposed projects.

5.6.1.7 Recommended Upper Kings Monitoring Program

In order to increase the cost effectiveness and utility of the various data collection efforts in the Upper Kings Region, the Upper Kings IRWMP included monitoring, measuring, and reporting (MMR) and Data Management (DM) Actions. These include:

- MMR Action 1 - Upper Kings IRWMP Annual Reporting.
- MMR Action 2 - Groundwater Level, Quality, and Flow Monitoring of Recharge Facilities.
- MMR Action 3 - Conduct data network evaluation and design regional monitoring plan.
- MMR Action 4 - Develop regional monitoring wells.
- MMR Action 5 - Fishery monitoring program.
- MMR Action 7 - Supervisory Control and Automated Data Acquisition for Irrigation Systems.
- MMR Action 6 - Water Quality Monitoring.
- DM Action 1 - Develop and Implement Regional Data Management System.
- DM Action 2 - Expand Regional Data Management System and Connect to Statewide System.

The monitoring network evaluation will more firmly establish procedures, locations, and frequencies for measurements or samples to be taken, and will seek to build upon the work of the GAMA program. The DMS is intended to facilitate transfer and reporting not only locally but also to the Surface Water Ambient Monitoring Program (SWAMP) and GAMA Program. The results of the existing and expanded program will be reported annually to the Forum and used to track progress in meeting the BMOs and to change and reprioritize actions as part of the adaptive management strategy included in the IRWMP. The resulting data and reporting will also support the community affairs and outreach program and be used to gain support for further groundwater management actions and capital projects, including use of the information when preparing engineering reports and informing the public when seeking to gain voter approvals as required by Proposition 218. All projects will collect data to monitor individual project performance to demonstrate any required mitigations are implemented and the anticipated benefits are being realized. Monitoring will address the following issues and lead to efficient and effective management.

- Groundwater quality degradation; changes in surface flow and surface water quality. The IRWMP report, Water Quality Standards, Conditions, and Constraints Technical Memorandum (2006), documented baseline water quality conditions and provides a yardstick from which to compare future changes under “with” and “without” project conditions.
- Inelastic land surface subsidence. The need for monitoring to evaluate subsidence is to be evaluated as part of the data network evaluation.

- Groundwater levels, availability, water in storage, and/or beneficial uses. Each project is subject to monitoring requirements under a specific quality assurance plan. An annual report prepared by KRCD with support from CID will be used to evaluate project implementation benefits and trigger subsequent actions.

5.6.2 Constraints to Regional Monitoring

There are limited financial resources to support regional monitoring or to conduct specific studies of current conditions. The general lack of data and the limited accessibility presents a challenge to clearly documenting existing water quality conditions. Available water quality data is in both hard copy and digital formats and widely dispersed with many agencies. Hard copy data are not readily accessible, and electronic data are in multiple formats that complicate capture, comparison, and evaluation. There was limited continuous data to document changes over time or evaluate seasonal cycles that can affect water quality and recharge operations. Groundwater data was also spatially limited and did not represent the entire CID or IRWMP geographic area or all of the possible depths where water is pumped. Significant information was available for the area near cities such as Fresno and Clovis and in depth ranges typically utilized for water supply while limited information was available for more agricultural portions of the Upper Kings IRWMP Region and for aquifers above or below typical water supply aquifers.

5.6.3 Findings and Actions for Monitoring

5.6.3.1 Findings

- CID has a comprehensive groundwater level monitoring program in place, which utilizes an existing grid of District-owned and maintained monitoring wells.

- Water quality conditions and available data in the Kings Basin indicate that:

    - The water released from Pine Flat is of excellent quality suitable for agricultural uses and groundwater recharge.
    - Kings River water or water imported from the San Joaquin River through the Friant Kern Canal may also be suitable for municipal use with moderate levels of treatment.
    - Available data for inorganic, trace element, and organic water quality constituents did not show major design or regulatory compliance issues or constraints with surface water sources available to the Upper Kings Region.
    - Groundwater is generally clean and meets water quality standards in most areas, though there have been some problems in meeting requirements at a number of drinking water wells.

- Recharge of high quality Kings River surface water will provide a net benefit to groundwater quality.

- Participation by CID and the cities within CID in the Upper Kings proposed monitoring will decrease the overall cost and increase the overall information content and should be supported.

5.6.3.2 Actions

CID will:

- Continue, and may expand, its current groundwater level monitoring program; including its monitoring and maintenance and replacement efforts.
- Adopt pre- and post-project monitoring protocols to support project development and to document project benefits.
- Conduct Phase I Environmental Assessments for all potential recharge sites.
- Consider participation and co-sponsor in a regional monitoring program to evaluate subsidence should such a multi-participant program be developed.
- Produce an annual water resources report that:
  - Describes water resources and groundwater conditions; including groundwater levels hydrographs, groundwater contours, diversions, recharge estimates, and change in storage. This report could also include a summary of hydrologic conditions in the Kings Basin.
  - Describes the progress made in implementing management activities and the effects of these activities on meeting basin-wide and local management area BMOs; present details of implementation activities and describe developments in the basin that are not part of the groundwater management plan implementation, but that impact groundwater conditions in the basin (e.g., level of development, siting of new industrial facilities, newly identified contaminant plumes, and trends on water quality).

- Continue to participate in and support KRCD Groundwater Levels Monitoring and Annual Reporting program as defined in the Upper Kings IRWMP implementation plan (Upper Kings IRWMP Foundational Action No. 15 and No. 17).
- Support KRCD in implementing a Water Resources Data Base Management Enhancement Program as defined in the Upper Kings IRWMP implementation plan (IRWMP Foundational Action No. 14).

5.7 Other AB 3030 and SB 1938 Voluntary Components of the GWMP

This section briefly discusses each of the management measures that are voluntary components of a GWMP and were considered by the Board.

5.7.1 Conservation

5.7.1.1 Urban

Urban water suppliers are required by the Urban Water Management Planning Act to update their UWMP and submit a complete plan to DWR every five years. An UWMP is required in order for a water supplier to be eligible for DWR administered State grants and loans and drought assistance. An UWMP is considered to be a source of information for Water Supply Assessments (Senate Bill 610) Water Code §10613 et seq. (Added by Stats. 2001, c. 643), and Written Verifications of Water Supply (SB 221) Water Code §66473.7 (Added by Stats. 2001, c. 642).

A UWMP should serve as a long-range planning document for water supply, a source of data for development of a regional water plan like the Upper Kings IRWMP and CID GWMP, and a source document for cities and counties as they update General Plans. CID and the Water Forum used the UWMPs of cities and their general plans to prepare the historical and future water budgets and apply the Kings IGSM. The Kings IGSM water budgets documented overdraft and the information is part of the Upper Kings IRWMP and CID GWMP (Chapter 4). CID recommends that the cities incorporate the regional water budget information into the updates of their UWMP.

Since CID Cities are 100 percent reliant on groundwater, they should also anticipate including a copy of the CID GWMP into their UWMP (Water Code section 10631). This will also meet UWMP requirements to provide a description of any groundwater basin from which the urban water supplier pumps groundwater. The UWMP will need to note that DWR has identified the Kings Basin as being overdrafted and reference the technical studies from the Upper Kings IRWMP which provide substantial evidence of overdraft. Pursuant to State law, CID Cities, or the utility serving the city, must provide a detailed description of the efforts being undertaken to eliminate the long-term overdraft condition.

Projects being included in the GWMP could help CID Cities identify water supply that could be included in the cities' UWMP and help the cities document that there is a long- term, sustainable water supply available in normal, dry, and multiple dry years over the 20 year planning horizon.

CID encourages CID Cities to implement the water conservation best management practices into their UWMP as recommended by the California Urban Water Conservation Council and DWR (DWR, 2005).

5.7.1.2 Agricultural

Through the conjunctive use operations, CID makes best use of available natural runoff and manages the Kings River water rights as efficiently as possible. District wide efficiency is measured by the amount of water diverted versus the amount of water that is delivered to independent farming operations or that is recharged to the groundwater basin. District wide efficiency within CID is very high since there are virtually no return flows to the Kings River and very little water is lost within the system. Non-evaporative conveyance losses in CID's unlined canals benefit the groundwater basin through deep percolation. Likewise, applied irrigation that is not consumed through evapotranspiration provides benefits to the groundwater basin as a result of deep percolation. CID also advocates efficient on-farm practices through the publication of its periodic newsletter.

The Agricultural Water Management Council works with agricultural water districts like CID to define Efficient Water Management Practices (EWMPs). The status of EWMP in CID is briefly discussed below.

- **Preparing and adopting water management plans**. CID is not required to adopt an agricultural water management plan since it is not a federal water contractor. CID works with growers, KRCD and other irrigation districts in the Kings Basin to implement EWMPs.

- **Supporting water management services**. KRCD is designated as a water conservation coordinator in the Upper Kings Region and provides Mobile Irrigation Laboratory services to CID. KRCD also provides pump efficiency testing as part of the integrated water and energy conservation program supported by CID.

- **Improving communication and cooperation.** Both KRCD and KRWA work to improve communications and cooperation regarding agricultural water conservation and conservation of the King River. The Water Forum, along with the existing KRCD and KRWA communications channels, will continue to be used by CID.

- **Evaluating the need, if any, for changes in policies of the institutions**. The greatest opportunities for further conserving CID Kings River water is through the GWMP and expansion of the District's historic conjunctive use and banking program. As discussed in other parts of the GWMP, development and implementation of

projects may imply some changes in CID policies and institutional arrangements for funding, land use planning, and working with CID Cities and Fresno LAFCO.

The following are conditionally approved EWMPs that are subject to net benefit analysis.

- **Facilitating alternative land use.** Within the Upper Kings Region, crop usage is the purview of the landowners, which decide the appropriate crop mix and type. Local government at the city and county level is responsible for general land use and zoning decisions. The Upper Kings IRWMP and CID GWMP seek to define policies and actions to integrate land and water use plans and decision-making, protect recharge areas, and provide multiple benefits.

- **Facilitating financing of capital improvements for on-farm irrigation systems**. Currently there are no local programs to finance on-farm improvements. The most cost-effective improvements with conservation benefits are related to capital investments in existing or new facilities, and improvements like the proposed SCADA system.

- **Facilitating voluntary water transfers that do not unreasonably affect water users, water suppliers, the environment, or third parties.** CID works to facilitate voluntary water transfers that do not unreasonably affect water users in their districts or others in the KRWA. Transfers have historically occurred with the KRWA family under the specific policies and procedures that govern transfers of Kings River water between KRWA members or other entities. Transfers between districts can also provide for additional groundwater storage in wet years. If a district with soils not well suited for percolation transfers their water to a district with highly permeable soils, that water may stay in the basin rather than being lost through the James Bypass. Fresno County also has policies to prevent any transfers of water that would have impacts to a third party and specifically prohibits the transfer of water out of the county. CID may enter into contracts to transfer surface water to municipal entities as part of the program to reduce groundwater use and provide direct or "in lieu" surface water.

- **Lining or piping ditches and canals**. Lining and piping ditches within CID to conserve water only makes sense in specific conditions. Water "lost" during conveyance from the point of diversion to the point of use is a "gain" to the groundwater basin and an important part of the conjunctive use and groundwater recharge program. CID lines or pipes ditches when necessary to improve delivery

efficiency to their customers or at times when new urban development would affect operations or increase liability. CID may also line canals due to high water tables or seepage areas that are impacting permanent crops. Otherwise, unlined canals and ditches are consciously used as part of the conjunctive use operations of existing facilities and provide additional groundwater recharge within the basin.

- **Increasing flexibility in water ordering.** CID has a well-defined system for ordering and delivery.

- **Constructing and operating water supplier spill and tailwater recovery systems.** CID connections to the Kings River that historically allowed operational spills back to the river have been closed as part of the agricultural waivers program. As a result, there are no lost operational spills available for recovery and tailwater that is not beneficially used for agricultural purposes is recharged to the groundwater basin. The loss of connection to the Kings River has resulted in some operational inefficiencies and reduced the ability to make best use of some of the canals. This also has increased the need to incorporate operational storage into proposed recharge ponds along some of the canals.

- **Automating canal structures**. With a grant from DWR's water use efficiency program, CID is currently conducting an evaluation and pilot study for a canal level monitoring network that might eventually be expanded to a Supervisory Control and Automated Data System (SCADA). The study will also identify opportunities for further operational improvements, documenting groundwater recharge benefits, and improving water accounting.

- **Development of a regional groundwater model**. CID, as part of the Upper Kings Water Forum, participated in development of the Kings IGSM. The ability of this model to predict hydrologic response to management decisions will aid CID in planning for the future of the basin.

- **Development of a plan for basin-wide groundwater quality monitoring**. The development of a basin-wide groundwater quality monitoring program would assist in identification of groundwater contamination. CID would consider participating in a Kings Basin regional water quality monitoring program should one be developed for the Upper Kings Region.

5.7.1.3 Findings and Actions for CID for Water Conservation

5.7.1.3.1 Findings

The Water Forum adopted solutions for conservation that were included in the Agreements in Principle adopted by the elected bodies of the stakeholders. These have been adapted for inclusion in the CID GWMP:

- CID will support urban and agricultural water conservation.
- UWMPs should be developed by CID Cities as required by state law to guide public agency investments in water conservation within the region and to help consolidate water resource data for purposes of water resource planning.
- CID works with growers, irrigation districts, and KRCD to implement on-farm practices that are consistent with the guidelines and requirements of the Agricultural Water Conservation Council.
- CID area-wide efficiencies are relatively high and any delivery system losses are gains to the groundwater basin.
- On-farm efficiencies are high when the return flows to the groundwater basin from surface water applications are accounted for and recharge benefits are recognized.
- The benefits of on-farm or municipal conservation are primarily associated with the reductions in groundwater pumping that come with increased efficiency and result in water remaining in storage in the groundwater basin for use in a dry period.

5.7.1.3.2 Actions for Water Conservation

CID will:

- Work with the cities to:
    - Integrate the CID GWMP into the UWMP and to define capital facilities that could help CID Cities ensure a long-term, sustainable water supply.
    - Adopt Best Management Practices (BMPs) defined by the Urban Water Conservation Council.
- Work with the KRCD and other irrigation districts to investigate the feasibility of developing a program with low interest loans and grant funding from the state to assist growers in acquiring water saving technologies.
- Continue to promote the use of the KRCD mobile irrigation laboratory by growers within CID.
- Complete the canal monitoring and SCADA system study and continue to seek grants and funding to implement a canal modernization plan (See Upper Kings IRWMP Monitoring, Measuring, and Reporting Action 7- SCADA).

- Implement EWMP where they will lead to real water savings and are proven cost effective through net benefit analysis.
- Work with KRCD and the other Water Forum members to operate and maintain the Kings Integrated Groundwater Surface Water Model.

5.7.2 Recycling

The Upper Kings IRWMP contained an evaluation of the use of recycled water. The Upper Kings IRWMP found that use of recycled water in lieu of groundwater pumping for non-potable uses, including agriculture, would benefit the Kings Basin by allowing more water to remain in groundwater storage, but that the water budget benefits and yield of recycled or reclaimed water projects only accrue where the sources of wastewater are originally from surface water, and not from pumped groundwater. The Forum also found that wastewater treatment plant upgrades and 'purple' pipe distribution facilities are expensive and not cost effective when compared to currently permitted practices for disposal of wastewater in most areas of the Upper Kings Region. Specific recycled water opportunities that should be reviewed in greater detail include the Selma-Kingsburg-Fowler Sanitation District regional treatment plant.

To achieve that potential, CID and others in the Upper Kings Region would need to make substantial investments in additional treatment and distribution infrastructure. Within CID the Selma-Kingsburg-Fowler Regional Sanitation District and the other municipalities treat and dispose of wastewater under permit from the RWQCB. There is currently very little wastewater discharged directly to the Kings River, and therefore, very little wastewater currently is flowing out of the CID area. There is a potential to match treated water quality to appropriate uses (e.g., power generation, urban landscaping) as part of an In-Lieu Recharge Program.

5.7.2.1 Findings and Actions for Recycling

The current wastewater disposal practices result in recharge to the groundwater basin consistent with the current standards, permits and requirements of the RWQCB and actions to upgrade to higher levels of treatment to allow for direct reuse are not currently cost effective.

5.7.2.2 Actions for CID for Water Conservation

CID will work with cities and the SKF Regional Sanitation District to support the reclamation and reuse of reclaimed wastewater when determined to be cost effective and safe in comparison to other alternative supplies.

CID will encourage the use of reclaimed wastewater in-lieu of groundwater.

5.7.3 Identify Recharge Areas

Analysis conducted as part of the Upper Kings IRWMP resulted in regional characterization, identification, and mapping of areas with a potential for recharge. In the long term, loss of these recharge areas through urbanization could have significant impacts on the water budget of the basin. The areas using surface water for irrigation are a key component of the overall water budget and the conjunctive use operations in the Kings Basin. Areas using surface water reduce the reliance on groundwater.

5.7.3.1 Actions Related to Identifying and Managing Recharge Areas

CID will:

- Use the recharge potential maps to help evaluate potential sites for additional recharge facilities.
- Seek funding to conduct site specific investigations and hydrogeologic studies to further identify areas that should be protected from urban development or that could be used to expand the conjunctive use and groundwater banking program.
- Continue to participate in the land use planning process to seek mitigation of the effects of new development on the water budget.
- Work with CID Cities to protect recharge areas, including CID canal facilities, which provide recharge benefits. CID will provide information or encourage the cities to use existing information during the development review process and work to protect and manage recharge areas.

5.7.4 Identification and Management of Wellhead Protection Area

The purpose of wellhead protection is to protect the groundwater used as a public supply, thereby reducing the costly treatment otherwise needed to meet relevant drinking water quality standards. A Wellhead Protection Area (WHPA), as defined by the Federal Wellhead Protection Program established by Section 1428 of the Safe Drinking Water Act Amendment of 1986, is "…the surface and subsurface area surrounding a water well or wellfield supplying a public water system, through which contaminants are reasonably likely to move toward and reach such water well or wellfield." The WHPA may also be the recharge area that provides the water to a well or wellfield. Unlike surface watersheds that can be easily determined from topography, WHPAs can vary in size and shape depending on subsurface geologic conditions, the direction of groundwater flow, pumping rates, and aquifer characteristics. Identification of WHPAs is a component of the Drinking Water Source Assessment and Protection (DWSAP) Program administered by California Department of Health Services (DHS). DHS set a goal for all water systems statewide to complete Drinking Water Source Assessments by December 31, 2002. The Cities have completed their required assessments by performing the three major components required by DHS.

CID has not been an active participant in the process, but supports actions by municipal water purveyors and the state to protect water quality for municipal uses.

5.7.4.1 Actions Related to Regulating the Migration of Contaminated and Poor Quality Groundwater

CID is not a regulatory agency, but will continue to track and participate in the efforts of the county and state related to protection of water quality. CID has a vested interest in ensuring preservation and protection of water quality for agricultural and municipal beneficial uses. CID will:

- Continue to track RWQCB, the Department of Health Services, and other local regulatory efforts to identify impacts or benefits to CID programs.
- Consider water quality conditions and any potential effects to water quality when designing and evaluating recharge facilities and during the final environmental review of the proposed land acquisition program.
- Participate in regional monitoring and data sharing as part of the Upper Kings IRWMP.

5.7.5 Well Construction, Abandonment and Destruction Programs

The well construction and destruction program for the majority of CID is managed primarily by Fresno County. One of the primary concerns of local agencies is the groundwater contamination risk posed by unused wells that have not been properly destroyed.

The Fresno County Environmental Health Division (Fresno County EHD) administers the well permitting program within CID. The well construction standards implemented by EHD are consistent with those recommended in State Water Code Section 13801. This section of State Water Code requires counties, cities, and water agencies to adopt the State Model Well Ordinance as a minimum standard for well construction or a more rigorous standard if desired. These standards are delineated in *California Well Standards, Bulletin 74-81*, and all supplements for areas of the county. The Fresno County EHD staff also issue applications and review construction plans and specifications for wells drilled in the county. The EHD requires and maintains well logs and water well driller reports for constructed wells.

Operating permits for wells utilized for public drinking water are provided through either DHS or Fresno County EHD, depending on the number of service connections. The DHS has jurisdiction over public water system wells with over 200 service connections.

Well abandonment and destruction is part of Fresno County EHD's regulatory responsibility. It is believed that there are unknown, obsolete, or abandoned water supply wells within CID. These wells may provide potential locations as a source of contamination between aquifers or

from saline water sources at depth. Section 21 of DWR Bulletin 74-81 and revisions contained in Part II of Bulletin 74-90 allow classification of unused wells into two types: abandoned and inactive. An abandoned well is defined as one that has not been used for a period of one year and whose owner has declared the well will not be used again. If the well has not been used during the past year but the owner demonstrates his/her intention to use the well again for supplying water, the well is considered inactive. Four criteria must be met in order for a well to maintain an inactive rather than abandoned classification. These criteria include: the well has no defects; the well is securely covered; the well is clearly marked; and the surrounding area is kept clear of brush and debris.

Failure to meet these criteria could result in the well being classified as abandoned under current regulations. All abandoned wells, exploration or test holes, and monitoring wells must be destroyed as stated in Section 22 of Bulletin 74-81 and revisions contained in Bulletin 74-90.

An abandonment program should focus on those wells that pose the greatest threat to groundwater; however, numerous factors make the abandonment and destruction of wells difficult. These factors include lack of consistency in records regarding well construction, location, and use; cost of well destruction; and the defined classification for abandonment of wells. Recent records pertinent to construction and location of new wells are more complete than earlier records that are often inconsistent. The lack of financial incentive for well owners to declare a well as abandoned also reduces the effectiveness of the well abandonment program.

5.7.5.1 Actions for CID Participation in Well Abandonment and Destruction Programs

CID has an interest in protecting water quality and supports construction and destruction of wells in accordance with local laws and regulations. CID currently does not operate wells and has no role in regulating well construction.

CID will continue to monitor and track the actions of Fresno County EHD, State DHS and DWR for any changes to the existing local ordinances, state code, or well standards that could influence CID operations or which could adversely affect groundwater in the CID area.

5.7.6 Control of Saline Water Intrusion

Saline water intrusion is not an issue within CID. CID will continue monitoring groundwater conditions and will note changes in water quality. This management measure is not applicable to CID, and no further actions are anticipated or planned.

5.7.7 Regulate the Migration of Contaminated and Poor Quality Groundwater

Groundwater in CID is considered to be good quality. CID is committed to protecting the ambient water quality. The Regional Water Quality Control Board (Region 5, Central Valley Region), is primarily responsible for the regulation, management, and protection of water quality in the Kings Basin. Contamination issues are typically localized and relatively manageable.

5.7.8 Develop and Operate Groundwater Contamination Cleanup

CID is not actively engaged in any groundwater contamination or cleanup projects and defers to the RWQCB to hold responsible parties accountable for contamination incidents.

6 Stakeholder Involvement

Creating public awareness of the groundwater issues and opportunities in the Kings Basin and CID portion of the basin is for creating a consensus on a course of action. The Stakeholder involvement and effort has been a combination of activities conducted specifically within CID, but also as part of the larger effort to develop and adopt the Upper Kings IRWMP. Both of the outreach and stakeholder efforts have been an important part of the efforts to create a collaborative working environment to address overdraft compliance with provisions of the Groundwater Management Planning Act of 2002.

6.1 CID GWMP

CID has sought to engage the public, CID Cities, and other stakeholders in the area. Throughout the GWMP planning process, other interested agencies and entities were encouraged and invited to participate in developing the GWMP. The following outreach and stakeholder actions have occurred.

The CID Board held a publically noticed discussion of the GWMP during its regularly scheduled Board meeting on February 13, 2008. A copy of the PowerPoint for the public presentation used at the kick-off meeting for the GWMP is in Appendix B.

To increase participation and generate awareness regarding the GWMP, the CID Board hosted a "Groundwater Summit" on April 12, 2008, at the Spike and Rail conference facility in Selma. CID sent out invitations to members of the city council, city planning, and public works staff; developers; and business interests to inform the community regarding the planning process, schedule, GWMP content, and how the public could participate and provide comments. The purpose of the meeting was to obtain input from the community and to provide the CID Board an opportunity to inform the community on the conditions of the Kings Groundwater Basin, and the purpose and need for the CID GWMP. The meeting allowed various stakeholders to share their perspectives and expectations related to groundwater management within the CID planning area. The meeting notice and PowerPoint presentation of the staff, Board members, and CID consultant are presented in Appendix C. During this meeting persons were informed how the regular Board meetings would be used to provide additional opportunities to discuss the plan, and for staff and the consultant to appraise the Board of progress.

CID Board members and the public were then briefed at their regularly scheduled public board meetings to keep them informed of the progress of the GWMP.

CID board scheduled a hearing to discuss the draft GWMP to provide information to the public as to the content of the draft plan, and to receive comments. Instructions were provided to the public for the submission of written comments. CID obtained the name, phone number, and the address of any contact person who provided written comments. The CID then proceeded to prepare a final plan.

Upon the completion of the GWMP, a notice of intent was published in anticipation of the adoption of the plan. The notice included a summary of the plan and stated the means by which copies of the GWMP could be obtained, and a public hearing was conducted to receive comments. All necessary noticing, Board agendas, and documentation of Board actions are provided in Appendix D.

6.2 Upper Kings IRWMP and GWMP Public Process

The public process of the IRWMP and GWMP were closely interrelated by design, and the IRWMP efforts were fully intended to support groundwater management planning by the Districts.

The Water Forum was open to all stakeholders of the Kings Basin during the development of the IRWMP, and stakeholder involvement has been an important component of the success of the IRWMP and the subsequent updates to the more localized GWMPs. The Water Forum process started in 2004 and included sending open invitations to local water and land use agencies, regional agencies, cities, counties, and environmental groups to join the Water Forum. Throughout the planning process, the local, state, and federal resource and regulatory agencies; landowners; and the public were invited to Water Forum meetings in order to be inclusive and obtain a wide range of perspectives. The agencies and public have been provided the opportunity to review, address, comment upon, and provide input to the process.

Upper Kings Water Forum

- Kings River Conservation District
- Alta Irrigation District
- Consolidated Irrigation District
- Fresno Irrigation District
- Raisin City Water District
- County of Fresno
- County of Kings
- County of Tulare
- City of Clovis
- City of Dinuba
- City of Fresno
- City of Fowler
- City of Kerman
- City of Kingsburg
- City of Parlier
- City of Reedley
- City of Sanger
- City of Selma
- Fresno Audubon Society
- California Native Plant Society, Sequoia Chapter
- Kings River Fisheries Management Program Public Advisory Group
- El Rio Reyes Conservation Trust
- California Water Institute
- California Department of Water Resources
- California Department of Fish & Game
- Regional Water Quality Control Board
- Kings River Water Association
- Sierra Club

A Water Forum Technical Advisory Committee has been formed to oversee technical studies, provide peer review, support exchange of data, and inform the decision-makers at the Water Forum and policy level. The Technical Advisory Committee would be used to

provide review of CID GWMP, LGWA grant-funded projects and CID project related work products.

In 2005, with the support of the Education and Community Affairs Work Group, the Public Outreach and Community Affairs Strategy (KRCD, 2005b) was prepared to outline the stakeholder coordination process. The Upper Kings IRWMP, along with the Public Outreach and Community Affairs Strategy, are living documents to be coordinated by the Water Forum with support to be provided by KRCD.

The strategic objectives for public outreach were transformed into messages that were conveyed through appropriate tools and media. It was planned that the Water Forum's public outreach effort would utilize a combined approach of community relations and mixed media to reach the target audiences. The tools identified and applied included:

- Stakeholder meetings
- Speakers' bureau
- Community relations
- Editorial and media relations
- Long format video
- Website
- Printed materials

Most of the efforts made were geared toward decision-making audiences to assist the Water Forum with the adoption of resolutions and to provide support for funding requests.

In total, the Water Forum met 14 times with attendance ranging from 16 to 25 persons. Forum members informed the respective elected bodies at regularly noticed public meetings as incremental progress was made during development of the IRWMP. Special efforts were made in working to adopt the Principles-of-Agreement in support of the IRWMP. The general managers of each of the water districts attended meetings of the other stakeholder decision-making bodies to explain the need and purpose for the IRWMP and Principles-of-Agreement.

In accordance with the Outreach and Community Affairs Plan, numerous special meetings or workshops were conducted, and a host of work group or subcommittee meetings were used to address specific topics.

Numerous stakeholder meetings were conducted with elected and governmental officials along with group meetings with representatives from agricultural, urban, and environmental representatives. The following is a summary of other stakeholder and community affairs activities conducted.

- Subcommittees (total of 46 meetings, average number of attendees ranged from 4-30):
    - Planning and Steering Committee (15 meetings)
    - Technical Analysis and Data Work Group (9 meetings)
    - Water District General Managers Committee (10 meetings)
    - Environmental Stakeholders Work Group (3 meetings)
    - Land Use and Water Supply Committee (5 meetings)
    - Education Committee (4 meetings)
    - Workshops (total of 5 workshops with approximately 100 attendees):
    - Public Works Workshop on Water Quality and Infrastructure
    - Planners Workshop to Review General Plans and Integrate Land Use and Water Supply Planning
    - Public Meetings (one each in AID, CID, and FID service areas to orient the public and local decision-makers)

Presentations were made to governing boards, environmental groups, and rotaries as a total of 25 presentations were made.

Local newsletters were utilized to inform and educate residents, businesses, and elected officials about Water Forum activities. The following is a summary of those articles:

- KRCD News, Winter 2006/2007 Issue – "Water Forum Looking For Grant Funding"
- KRCD News, Fall 2006 Issue – "Upper Kings Basin Water Forum Progresses With regional Planning For Projects"
- KRCD Newsletter – mailed to over 8,500 residents within KRCD's service area

Key reporters for local papers were periodically updated about Water Forum activities resulting in several stories in the Fresno Bee.

- The Fresno Bee, Local and State section, "Group touts four water projects"
- The Fresno Bee, Local and State section, "Fresno Co. may catalog water supply" (Benjamin, 2005b)
- The Fresno Bee, Local and State section, "Agencies to tap sources for water" (Benjamin, 2005a)
- The Fresno Bee: Local and State section, "Group takes regional course" (Upper Kings Water Forum is formed) (Pollock, 2004)

Printed materials were developed to support educational efforts. Approximately 1,000 copies of the educational materials were distributed during speakers' bureaus, workshops, and other events.

- November 2005 – Hydrologic Modeling of the Kings Groundwater Basin /A White Paper (14-page book)
- August 2006 – Upper Kings Basin Water Forum and the Upper Kings Integrated Water Management Plan (2-page overview)
- October 2006 – Position Statement/Principles: Integrated Water Quality and Sustainable Infrastructure Program for Clean and Safe Water (6-page document)
- November 2006 – Upper Kings Basin Water Forum – Briefing Booklet (40-page book)

There is a commitment by CID and the Water Forum for ongoing public involvement in the implementation of the IRWMP, and the implementation plan recommends that KRCD revise the existing community affairs plan to continue the process and promote the IRWMP and GWMP efforts.

6.3 Developing Relationship with State and Federal Agencies

CID is currently working with KRWA, KRCD, a range of state and federal resources agencies, local fishery groups, and the other water districts on the Kings River Fishery Management Program. CID will continue to work cooperatively to avoid, minimize, and mitigate impacts to biological resources.

CID will seek to consult with state and federal regulatory agencies as needed early in the project development and planning process to seek input and guidance and avoid issues before they become problematic. This includes active engagement and early involvement in environmental review.

For the last several years, the water interests in CID have been working cooperatively with the USGS to study the geology and aquifers of the subbasin. CID and the USGS should consider entering into an agreement under the National Water-Quality Assessment Program to map the subsurface geology of the basin, and develop a data network.

6.4 Dispute Resolution Process

CID board meetings were used to identify and address water management issues in the basin. Discussion of issues in CID board meetings, in an open and transparent process, resulted in a cooperative relationship between water users of the basin. CID will continue to provide a forum for identification and discussion of groundwater issues in the basin.

The Fresno County LAFCO has initiated a mediation process with CID and CID Cities related to how they may better integrate land use and water supply plans and the planning process, and cooperatively develop funding and projects to resolve groundwater and storm water management issues. It is likely that this process will result in a standing group of CID

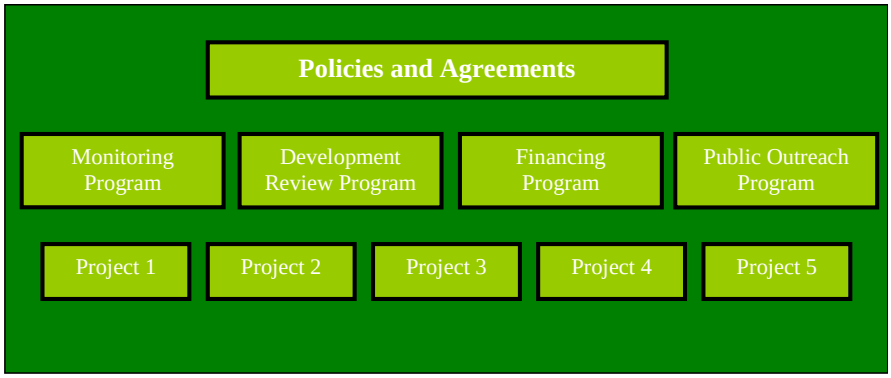
and City representatives that will be tasked with further developing projects, policies, and programs.

7 Program Description and Plan Implementation

7.1 Introduction

The Groundwater Mitigation and Banking Program (CID Program) is comprised of specific proposed projects and management actions (Figure 7.1). The management actions include the programs, policies, and agreements that are needed to be funded and implemented. CID is working with the community to finalize the projects, programs, policies, and agreements based on the findings and actions related to the overall Groundwater Mitigation Banking Program that were presented in Chapter 6.

Figure 7.1 Groundwater Mitigation and Banking Program



CID proposes to develop, own, operate, and maintain the groundwater banking facilities and manage the banked groundwater on behalf of overlying land owners in the district and participants in the bank.

7.1.1 Consistency with Basin Management Objectives

CID projects will meet the overall GWMP and Upper Kings IRWMP Basin Management Objectives (BMO). Consistent with near-term (1 to 3 years) BMOs, the CID Program is to design and develop up to 10,000 acre-feet per year of recharge project capacity on 100-200 acres with an instantaneous recharge rate of between 150-300 cfs. This will be accomplished throughout the CID system. These BMO quantities are the result of the engineering feasibility studies and preliminary designs; historical operations at the existing 1,300 acres of recharge ponds; and best engineering judgments.

7.1.2 Near Term Priorities, Synergies, and Linkages between Projects

The Upper Kings IRWMP defined the Regional Conjunctive Use Program (RCUP) for the Upper Kings Region (Region). The RCUP includes a range of projects concepts that are to be implemented by the members in the Upper Kings Water Forum (Water Forum). The CID Program is part of the RCUP Conjunctive Use Element.

A priority for CID is to develop recharge projects along the C&K Canal, but this does not exclude development of projects on viable recharge sites that may be located throughout CID's jurisdictional area. A number of sites have preliminary designs and CID is actively seeking to acquire controlling interest in potential project properties consistent with the intent of the GWMP.

CID has historically reduced the amount of overdraft by diverting Kings River water into the District's system of canals and recharge ponds for the purpose of irrigation and for direct groundwater recharge. CID's canal system has two main arterials, the Fowler Switch and C&K Canals.

Most of the District's recharge ponds are located along the Fowler Switch Canal and its laterals and therefore these ponds can only receive water deliveries through the Fowler Switch. When flood water is available from the Kings River, the Fowler Switch is typically operated near its capacity to deliver recharge water. There are much fewer and smaller recharge ponds located along the C&K Canal. Typically there is capacity available in the C&K when flood water is available from the Kings River, but there are not enough recharge ponds to optimize the available flood water with the ponds capacity of the C&K.

The addition of new recharge ponds on the C&K or Lone Tree systems would increase the overall capacity for delivering recharge water and put more water into storage in the area of proposed municipal development, thus increasing supply reliability, maintaining economic activity, and reducing overdraft. In addition, recharge facilities on the C&K would provide multiple benefits. In response to the agricultural waivers program, CID has closed off the canal connections to the Kings River to reduce spills. This closure resulted in less flexibility when delivering irrigation water down these canals. The recharge ponds on the C&K would be dual purpose and provide storage, thus increasing operational flexibility and delivery system efficiency, and recharge. The facilities would also help CID re-capture water that is released as part of the Kings River Fisheries' management program.

CID will also work to further identify canal improvements and pond facilities that would increase operational flexibility and increased recharge system-wide. Improvements to existing ponds, including changes to the maintenance routines, will be investigated to increase recharge, and determine if the ponds performance could be improved and how they may provide multiple benefits for both groundwater recharge and storm water management.

7.2 Description and Common Groundwater Mitigation and Banking Program Elements

7.2.1 Land Acquisition, Purchase, Easements

CID needs an ongoing land acquisition program to gain access to viable recharge properties. It is recommended that this should be a priority since all other activities are reliant on defining the specific project sites. The purpose of this activity is to acquire the necessary land, including identification of candidate properties, negotiations with the owners, development of purchase options or agreements, escrow, and closing. This includes support of a real estate consultant, all property acquisition costs, and fees. Consultant and engineering costs are also to be incurred for each project related to finalization of easements and rights-of-way for locating any conveyance from CID canals to proposed recharge pond sites.

Purchasing land for purposes of developing recharge projects, to the exclusion of other uses, would be a discretionary action by the CID Board that is a project subject to CEQA. CID could develop a stand-alone land acquisition program that defines and documents how such lands would be cleared pursuant to CEQA. This program description would include the description of the specific types of lands to be acquired, the evaluations process and review criteria used for environmental clearance, and review checklist to define how CID will pre-clear land for purposes of the groundwater mitigation and banking program. This would be reviewed pursuant to CEQA. It is possible that an initial study would determine that a negative declaration or mitigated negative declaration could be used to adopt and implement a land acquisition program.

7.2.2 Surface Water Sources

Surface water for purposes of recharge would come from (1) CID water entitlements; (2) CID diversion of unregulated Pine Flat flood releases; (3) CID diversion of fish flow releases from Pine Flat Reservoir; (4) Central Valley Project (CVP) 215 flood releases; or (5) other Kings River water rights of Kings River Water Association members. Floodwater would be diverted and recharged primarily in wet years. Yield estimates are based on the average annual amount of water that could be recharged above the existing conditions and the number and size of ponds. To be conservative, current recharge rates and project yields are based on analysis of historical operations.[4] Yields for the proposed projects could be significantly

[4] Technical Attachment B, *Technical Memorandum on Floodwater Availability for the CID from the Kings River*, WRIME 2007.

higher should others subscribe to the bank and all potential sources of recharge water are utilized. The IRWMP summarized the evaluation of the sources of supply to the Region.[5] Funding would be used to purchase 215 flood water or water from other sources that could be imported to the basin.

7.2.3 Project Sizing and Phasing

The proposed projects will be developed over the next five to ten years based primarily on the availability of funding, number of sponsors or participants, and a project contribution to meeting measurable basin management objectives. Each of the individual projects will be developed in context of the overall Program and will need to go through a development process. An example of project task relationships and a conceptual recharge project development schedule is shown in Figure 7.2.

If CID is to seek state or federal grant funding or low interest loans to build the projects, the level of project analysis and documentation is relatively rigorous. The feasibility, cost effectiveness, design, and environmental clearances for individual projects needs to be demonstrated in order to produce competitive grant project applications. This implies substantial investment on the front end of a project. CID could seek and obtain grants to help fund the up-front cost, but this could slow down the project development efforts and delay preparation of project grant applications.

7.2.4 Diversion, Conveyance Facilities, and Wheeling

CID uses gravity to feed water through the existing canal network and current conveyance capacities to wheel water from the point of diversion at Fresno Weir. Other project sites would be served by existing or improved canals located nearest to the lands that are acquired for purposes of developing the other proposed recharge facilities. Existing rights-of-way and easements will be used when available. Secondary canals may need minor improvement to convey the water at the flow rates desired to maximize yields. If developers or cities were to acquire alternative sources of water through transfer, CID would charge a wheeling and recharge fee to provide for use of the canal and recharge facilities.

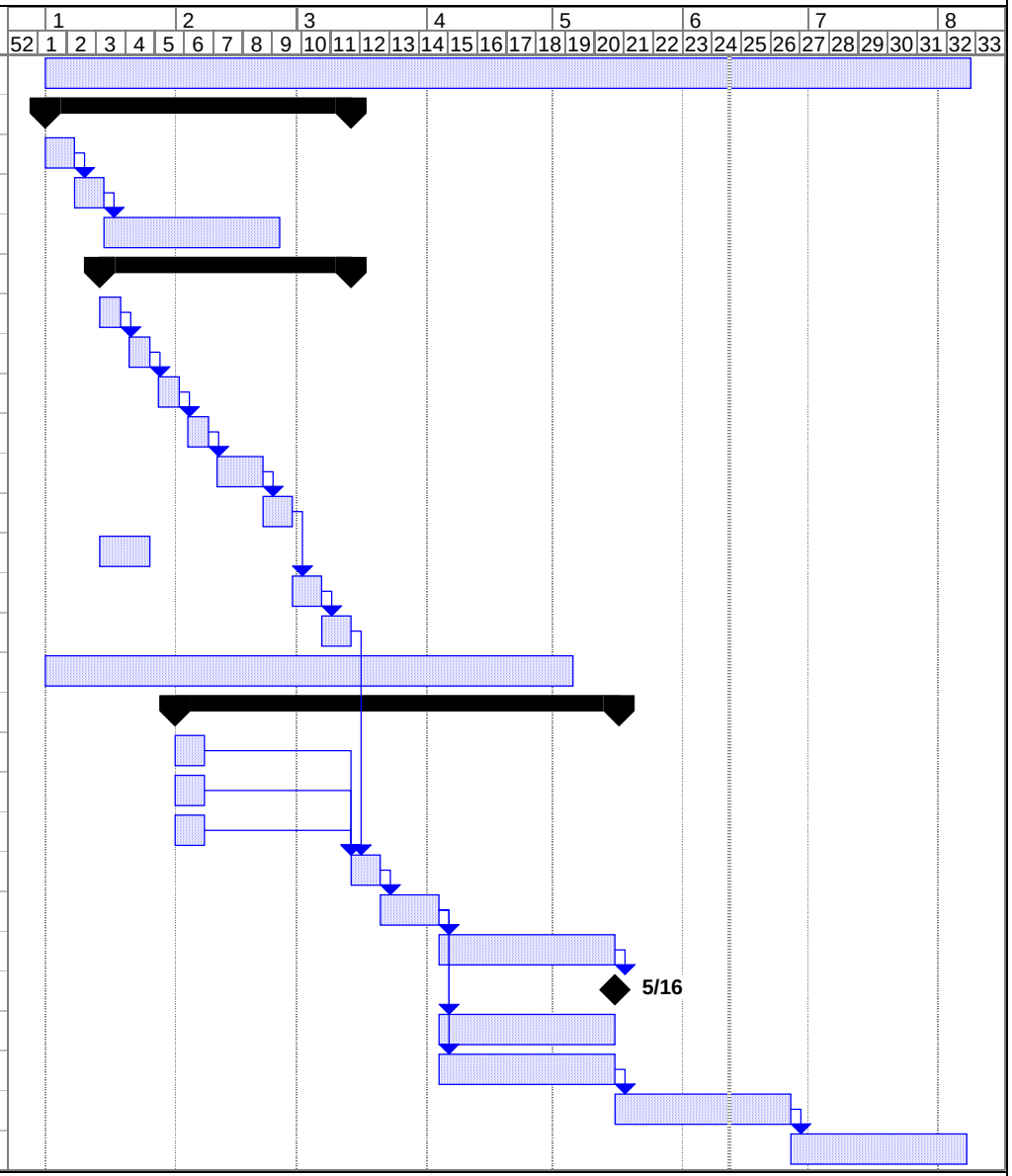
[5] Technical Attachment C, *Analysis of Water Supplies in the Kings Basin, Technical Memorandum, Phase 1, Task 4.*

7.2.5 Pond Construction and Maintenance

Ponds would be constructed through grading, scraping, and excavation to remove materials. Ponds will be connected to existing canals by pipeline or canal. Existing easements and rights-of-way will be used or acquired where necessary. Ponds would be configured into separate cells to allow alternate uses of the property for recharge, retention, and potentially for recreation purposes; to allow for alternative wetting and drying cycles; and allow for maintenance as needed. The District will be developing a maintenance plan. Such activity is likely to occur on a 5- to 10-year cycle and only if percolation rates are observed to decrease. Ponds would also be designed to include environmental features where feasible.

Figure 7.2 - Example of Task Relationships and Conceptual Recharge Project Schedule[1]

ID	Task Name
1	Project Management
2	**Preliminary Characterization and Design**
3	Gain access to the site
4	Survey and Site Mapping
5	Develop Project Description and Preliminary Design
6	**Site Characterization/ Hydrogeology Review**
7	Collect Soils, Geologic, and Hydrogeologic Data
8	Review Well Logs/Develop Site Specific Cross Section
9	Develop Exploratory Program/Geotechnical Investigation
10	Develop Drilling Plans, Specifications, and Bid Documents
11	Supervise Drilling, Collect Cores, Direct Well Construction
12	Water Quality Sampling and Lab Analysis
13	Phase I Site Assessments
14	Evaluate Recharge Effects
15	Prepare Site Characterization and Geotechnical Report
16	**Land Purchase, Option, Easement**
17	**Environmental Clearance CEQA documentation.**
18	Biological Survey or Evaluation
19	Cultural Resources Survey or Evaluation
20	Evaluate Other Resources
21	Develop Project Specific Monitoring Plan
22	Prepare Environmental Review Document
23	Public Review
24	Certification
25	**Engineering and 60 % Project Design**
26	**Permitting**
27	**Final Design, Prepare Plans and Specification**
28	**Bidding/Contracting**



Task
Split
Progress
Milestone
Summary
Project Summary
External Tasks
External Milestone
Deadline

7.2.6 Extraction of Stored Water

The banked water is intended for local use by the project sponsors/participants to help alleviate the problems of the overdraft. The extraction of the banked water will be through wells by overlying landowners within CID, and potentially other entities that are subscribers to the bank and are participating directly in funding the Program. The recharged water will be used: (1) to reduce overdraft, and (2) for planned development and future growth that is consistent with existing general plans or has undergone complete environmental review, and where agreements have been entered into with CID. CID will account for the recharged water and any assignment of the water to specific subscribers or for general groundwater recharge operations.

Proposed development and cities will need to have specific agreements with CID to rely on the water for projects, or when making findings pursuant to CEQA and SB 610 or SB 221. Such agreements would also allow for updating an Urban Water Management Plan (UWMP) or General Plan where these documents need to ensure there is a long-term, sustainable, and reliable water supply.

CID would reserve the right to manage the groundwater and existing surface water rights for the benefit of CID ratepayers and jurisdictional area and could transfer or exchange water captured through the proposed projects within or outside of the Kings River Water Association area, consistent with local laws and regulations. In no case would native or resident groundwater be transferred out of the Kings River service area, and transfer of banked water would never exceed the volume of groundwater previously recharged.

7.2.7 Environmental Features

The proposed projects may allow CID to recapture water released for the Kings River Fishery Management Program. This provides multiple benefits of these releases. As part of the IRWMP, an environmental stakeholders group was convened to develop environmental design criteria for incorporation of environmental features into recharge pond designs and to develop an approach to incorporating ecosystem values into the recharge pond design. When consistent with the primary purpose of recharge, and where economically and technically feasible, the work of the environmental stakeholders work group will be used to guide the design and operation of recharge projects.

7.2.8 Project Specific Monitoring

The work plans for each project would include monitoring to measure project outcomes and indicators. A project specific monitoring plan and Quality Assurance Project Plan will be prepared. Project specific monitoring may include:

- Monitoring wells may be installed up gradient and down gradient to measure water levels (feet above mean sea level; depth to water) and quality (Title 22 constituents concentrations)
- Measurement of flow into and out of the recharge ponds (flow in cfs; annual recharge in acre-feet)
- Stage measurements in the pond
- Wildlife use of ponds - The site may be proposed for inclusion in the annual Christmas bird survey

The sites and measurements are also to be included in the mitigation, monitoring, and reporting program to ensure CEQA compliance as required once the final environmental documents are circulated and certified by CID acting as the lead agency. It is anticipated that daily recordings will be made during pond operations to verify that the anticipated benefits are being realized. The information generated will be included in CID's annual report to the Board. Water Quality will be monitored for the first three years before and after the recharge operations have been initiated.

Project specific monitoring will be integrated into the IRWMP efforts for regional monitoring, data management, and will be compatible with Groundwater Ambient Monitoring and Assessment (GAMA) and Surface Water Ambient Monitoring Program (SWAMP) where required.

7.3 Program Implementation

Program implementation also includes the following CID activities.

7.3.1 Project Sponsor and Role, Participants, and Funding

7.3.1.1 Project Sponsor and Role

The up-front, first phase program costs are related to planning, feasibility study, engineering design, grant writing, and environmental compliance. The second phase costs are related to project construction. Finally, the final phase is for long-term maintenance and operations of CID facilities. CID could provide funding for the initial phases of the Program with state and/or federal grants and existing sources of revenue that include water standby and availability charges and water sales, but is seeking to identify cost-sharing partners to participate in all implementation phases. CID proposes to construct, maintain, and operate projects; administer the Groundwater Mitigation and Banking Program and related capital projects; provide administrative services; and account for water that is stored on behalf of the cosponsors or project participants. CID will wheel water through its existing or improved facilities for subscribers to the Groundwater Mitigation and Banking Program. This includes developing systems for monitoring and measuring the banked water and tracking project

performance. There are a number of potential subscribers and a number of funding approaches that are being developed.

7.3.1.2 Project Participant

The first priority is to recharge the groundwater basin on behalf of overlying landowners and rate payers within the District boundaries to reduce existing levels of overdraft. The second priority is to provide groundwater mitigation and banking services and benefits to entities that choose to enter into agreements with CID. Such agreements are intended to provide mitigations to those entities that are proposing projects that would increase the consumptive use of groundwater, and therefore contribute to the overdraft of the groundwater basin. A percentage or specific amount of the project yields would be assigned to meet the water needs of planned development. Funding obtained by project participants under agreement with CID will be used to: (1) cover up-front planning, grant writing, environmental compliance, and design costs; (2) construct recharge projects and physical facilities; (3) retire capital facility debt; (4) purchase additional water; and (5) maintain and operate the project facilities.

Potential participants include:

- Kings River Water Association members
- Kings River Conservation District
- Cities that may subscribe to the bank, including Sanger, Parlier, Fowler, Selma (California Water Service), Kingsburg, Fresno, and Clovis
- Fresno County and unincorporated communities
- Developers of residential, commercial, or industrial projects which would consume groundwater

7.3.1.3 Funding and Financing

The benefits of the proposed projects would accrue to the overlying landowners within CID boundaries, or to participants that enter into agreements and provide funding for proposed projects. CID is also working to identify participants to support up-front planning, and are willing to work with CID to procure grant funding from the State of California. It is believed that the probability of obtaining grant funding, either for planning or construction costs, would greatly increase if there are agreements between CID and project participants that define long-term funding mechanisms.

CID is evaluating and finalizing the mechanisms to fund additional planning, engineering, capital facilities costs, and ongoing maintenance and operations (M&O) costs of a new project. Preliminary capital project costs have been generated to provide a basis for equitably apportioning capital and M&O costs. Financing and revenue strategies will

continue to be evaluated, including discussions with private entities that could provide financing through public bonds. Final funding requirements are contingent on the amount of grants that may be available. CID funding mechanisms to be further developed as part of the GWP development include:

- State or federal grants
- Impact fees on new development
- Benefits assessments or water standby and availability charges
- Fees on municipal pumping
- Fees for wheeling water through CID facilities for purposes of recharge

Agreements between CID and other sponsors or subscribers will be developed. Participants could subscribe to the bank based on a number of models that may include, but are not limited to, one or more of the following:

- **Sponsorship** - buying pro-rated shares up front to help fund up-front planning and to capitalize the project; followed by payment of annual fees based on percentage of yield.
- **Participation** - buying credits in the bank, once constructed, but at a higher cost than initial subscribers.

Capital costs are primarily related to land acquisition for the percolation ponds and construction of necessary infrastructure improvements (canal improvements, pipelines, turnouts, etc.). M&O costs are related to measurement and data collection, pond cleaning, administration, and operation of the groundwater mitigation bank. Different funding mechanisms may be appropriate capital versus M&O costs.

Groundwater impact fees on new development have been considered and have been used in other geographic areas to develop new water supplies. These "impact" fees are collected on a one-time basis as a condition of an approval being granted by the local agency.[6] Such a fee must be directly related to mitigating a defined impact and would be based on the capital program costs for the planned groundwater mitigation bank and do not require voter approval. Impact fees are not used for M&O costs. CID or the city could be the "local agency" to collect the groundwater impact fee from development as a condition of project approval. A CID capital facilities and water acquisition fund would be established to acquire land, construct capital facilities, purchase water, and/or retire debt.

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[6] Technical Attachment G, Engineers *Report, Urban Impacts Study*, Summers Engineering, 2007

CID benefits assessments or water standby and availability charges would require a Proposition 218 election. Such assessments may reflect the distinctions between urban and agricultural uses. Benefits assessments or water standby and availability charges are appropriate for debt service and for ongoing M&O costs. Annual assessments could also be accumulated for purposes of acquiring land or for purchasing CVP 215 water or water from other sources.

Lands that annex to the cities detach from the District and are therefore not currently subject to CID standby or availability charges. The cities have their own funding mechanisms and each city may use different strategies to generate capital or pay for ongoing M&O. This could include a combination of connection fees or urban water rates.

7.3.2 Reporting and Measuring Progress

An annual report will be used to track and measure progress in implementing the GWMP. The GWMP provides for periodic report(s) summarizing groundwater basin conditions and groundwater management activities. The report will be prepared annually and include:

- Summary of monitoring results, including a discussion of historical trends.
- Aggregated project specific monitoring plans used to document that each project is performing as designed and mitigations are effective.
- Summary of management actions during the period covered by the report.
- A discussion, supported by monitoring results, of whether management actions are achieving progress in meeting BMOs.
- Summary of proposed management actions for the future.
- Summary of any plan component changes, including addition or modification of BMOs, during the period covered by the report.
- Summary of actions taken to coordinate with other water management and land use agencies, and other government agencies.

The BMOs provide the mechanism for measurement and evaluation of project performance.[7] The BMOs are intended to:

- Provide a framework for assessment and evaluation of project performance.
- Identify measures that can be used to monitor progress toward achieving goals.
- Provide tools for grant recipients and the state to monitor and measure project progress and fulfill grant requirements.

[7] See Upper Kings IRWMP Section 9.4.1 RCUP Basin Management Objectives And Performance Measures.

- Provide information to help improve current and future projects.
- Maximize the return on public investments.

Other output indicators (measures to effectively track output) and outcome indicators (measures to evaluate change that is a direct result of the work) that will be used, and which are consistent with the IRWMP include:

- Conveyance capacity improvements (linear feet of improvements; flow improvements in cubic feet per second (cfs))
- Recharge area developed
- Direct recharge volumes from the source of surface water used for recharge (acre-feet by source)
- Water levels up- and down-gradient of the ponds
- Changes in water surface elevation and gradient
- Annual water quality
- Recovery of stored water (acre-feet)

7.3.3 Community Affairs and Public Outreach

The purpose of this implementation activity is to coordinate with local stakeholders, including city staff, city councils, other nongovernmental organizations, and the media to increase awareness and understanding regarding groundwater issues and the GWMP. To be successful, CID needs to continue to engage the community to gain political support for the GWMP.

7.3.4 Integration with Land Use Plans and GWMP

CID, acting as a responsible agency, will continue to review and comment on project development proposals in the unincorporated part of CID jurisdictional area and on projects proposed by CID Cities. CID will also review and comment on any general plan updates or UWMPs of CID Cities. The purpose of the reviews will be to ensure that all impacts to groundwater are appropriately mitigated, that there are no impacts to CID facilities, and that overlying water rights and groundwater are protected.

CID proposed projects could be available to support planned development as defined in the general plans for the cities of Selma, Kingsburg, Fowler, Parlier, and Sanger should the cities have agreements with CID. Chapter 4 and the Upper Kings IRWMP provides a summary of

the detailed analysis of future water demands.[8] The analysis was based on adopted general plans, planned land uses, and the local Urban Water Management Plans. If the cities adopt the CID GWMP and participate directly in the proposed projects, they would likely be able to make defensible findings regarding the availability of a reliable water supply, and determinations that groundwater impacts would be mitigated. The analysis of future build-out conditions indicates that new development will increase groundwater pumping and decrease groundwater levels. These impacts need to be mitigated.

CID projects would provide the cities in CID's area with a source of supply and ensure that there is a long-term, sustainable water supply and that there are no impacts to other existing overlying groundwater users. The GWMP can also be factored into the city's Urban Water Management Plan and allow the cities to make necessary findings when adopting annexations to the city or in approving new development consistent with the requirements of the CEQA and the California Water Code.

7.3.5 Environmental Compliance for the GWMP

The GWMP, as a planning document, is not subject to the California Environmental Quality Act, although the Board could commit itself to an overall course of action and decide to review the document pursuant to CEQA in order to expedite and streamline project approvals and decision making. Numerous actions of the Board to implement the Groundwater Mitigation and Banking Program are discretionary and are therefore subject to environmental review using a negative declaration, mitigated negative declaration or environmental impact report. For example, purchase of land exclusively for purposes of development of recharge facilities could be construed as a project pursuant to CEQA. Constructing and operating a recharge pond would be a project requiring an environmental document and determination by the Board. State grant funding is contingent on the applicant completing appropriate CEQA evaluations and determinations for the proposed projects. There is a wide array of alternative approaches and strategic considerations that must be considered prior to adopting a final environmental compliance strategy.

7.4 Recharge Project Sites and Descriptions

The preliminary list of potential projects is provided in Appendix E. The list is not inclusive of all the project concepts being considered and the program is not limited to these specific

[8] Technical Attachment F, Technical Memorandum, *Analysis of Water Demand in the Kings Basin. Technical Memorandum, Phase 1, Task 3,* WRIME, 2006.

sites. The feasibility of other sites is to be evaluated as they come onto the market or as CID can make contact and negotiate agreements with land owners that are willing sellers. To allow for flexibility in implementing projects, all CID facilities can be developed and operated as stand-alone projects. There are no critical dependencies between the individual projects, and all proposed recharge projects are moving forward and/or are at various stages in the design process.

Table 7-1 contains a preliminary listing of potential projects and the general project locations are shown in Figure 7.3. The overall cost breakdown is presented in Table 7-2, and the budgets for the individual projects are presented in Appendix E.

Conceptual designs for the projects have been developed,[9] and preliminary cost estimates include acquisition of land; easements and rights-of-way; connecting canals, pipelines, and appurtenances; or an inlet and outlet structure back to canals may be included to allow for both recharge and regulation purposes.

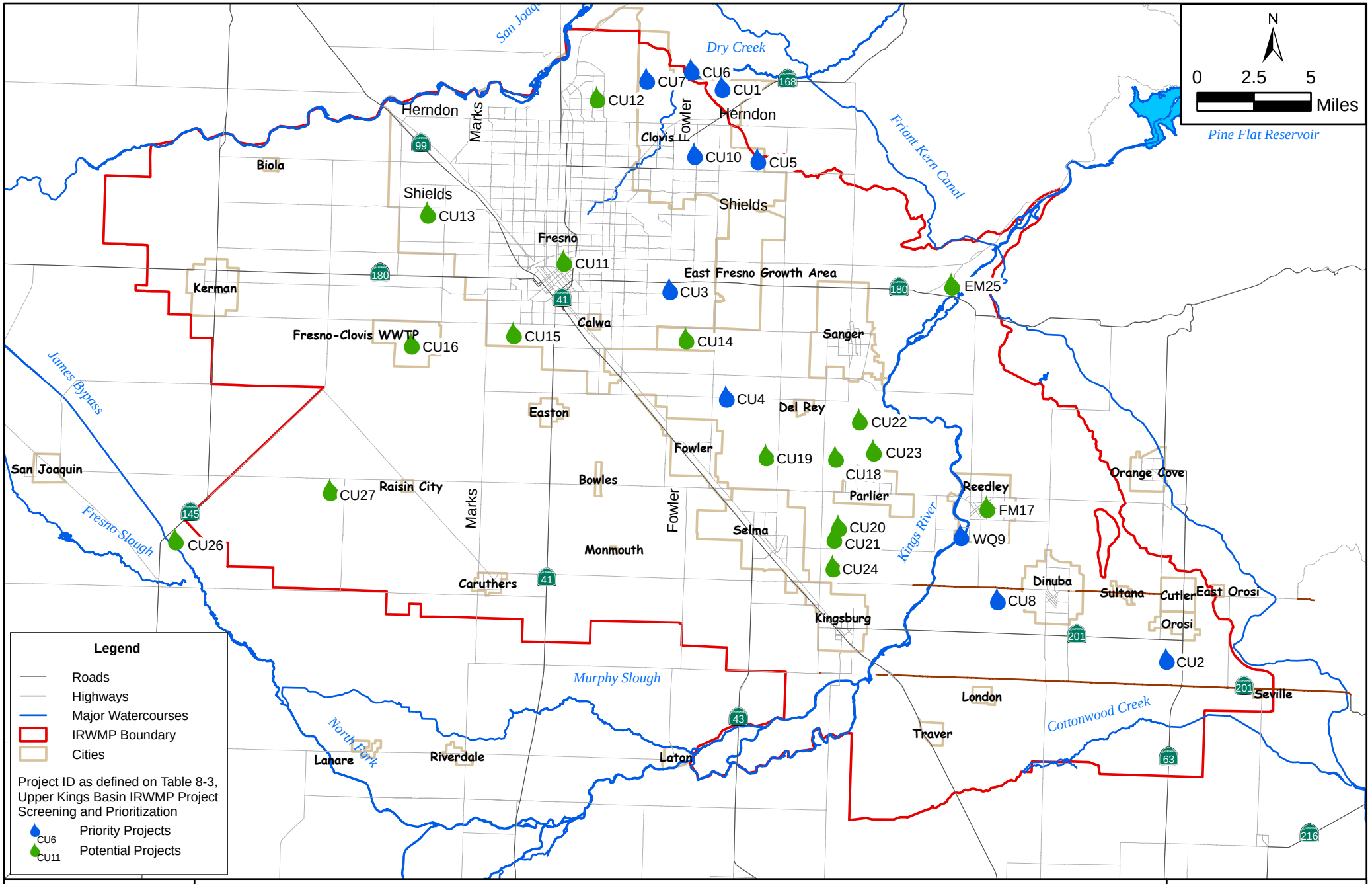
[9] Technical Attachment G, Engineers *Report, Urban Impacts Study*, Summers Engineering, 2007

Table 7-1. Site Locations, Size, and Costs for Development

IRWMP Reference No./CID Ref No.	Location	Size (acres)	Preliminary Cost Estimate
CU3D/CID No. 13	Wards Drain Pond North of Floral	60	$2,257,675
CU3A/CID No. 10	Kingsburg/Selma Branch Divide	150	$6,156,000
CU3B/CID No. 14	Fowler Switch between Summer and South	40	$1,852,500
CU3C/CID No. 11	Kingsburg Branch North of Huntsman	10	$584,250
CU3E/CID No. 8	Cole Slough between Jefferson & Lincoln	30	$1,774,125
CU3F/CID No. 9	Santa Fe Pond Enlargement	60	$2,636,250
CU3G/CID No. 12	Wards Drain Canal Works	4	$235,125
	Total	354	$15,495,925

Table 7-2. Groundwater Mitigation and Banking Program Preliminary Project Total Costs

Proposal Title		Upper Kings IRWMP				
Project Title		CID Groundwater Mitigation and Banking Program				
Budget Category		Other State (1)	Non-State Share (Funding Match)	Requested Grant Funding	Total	% Funding Match
(a)	Direct Project Administration Costs	$0	$486,600	$348,375	$834,975	
(b)	Land Purchase/Easement	$0	$0	$8,540,000	$8,540,000	
(c)	Planning/Design/Engineering/ Environmental Documentation	$0	$559,500	$574,500	$1,134,000	
(d)	Construction/Implementation	$0	$0	$2,453,000	$2,453,000	
(e)	Environmental Compliance/ Mitigation/Enhancement	$0	$324,400	$232,250	$556,650	
(f)	Construction Administration	$0	$348,375	$378,375	$726,750	
(g)	Other Costs	$0	$0	$0	$0	
(h)	Construction/Implementation Contingency	$0		$1,345,550	$1,345,550	
(i)	Grand Total (Sum rows (a) though (h) for each column)	$0	$1,718,875	$13,872,050	$15,590,925	
(j)	Calculation of Funding Match %			$13,872,050	$15,590,925	11.0%
Local match met through local District revenues and fees						
CID project will support and provide benefits to DACs which include Selma, Fowler, Parlier, Sanger, Kingsburg						



Upper Kings IRWMP Proposed Project Locations

Upper Kings Basin IRWMP

June 2007

Figure 7.3

7.5 Economic Benefits and Analysis

The Groundwater Mitigation and Banking Program presents significant water quality and economic benefits to the region and to the state. The Program provides new water that would be available either to support local needs or for transfer to users within or outside the boundaries of the Upper Kings IRWMP. In instances where the water was used locally, the Program would relieve pressure to: (1) import water into the region, (2) construct alternative surface water supply projects, or (3) continue to overdraft the local aquifer.

As described in Chapter 4, the ongoing conversion of agricultural land uses to urban uses together with ongoing improvements in the efficiency of irrigation practices is shifting the regional balance of water usage from surface water to groundwater. This shift is occurring primarily because agricultural land uses, which are primarily served by surface water, are being replaced by municipal uses that are almost exclusively reliant on groundwater. The shift in demand is exacerbated by the loss of groundwater recharge that occurs as agricultural land is taken out of production and as more efficient irrigation techniques are introduced on remaining irrigated lands.

Implementation of this Program will provide a mechanism for recharge of floodwater to offset impacts due to increased groundwater demand.

Water Quality Benefits

Baseline water quality and the potential impacts and benefits of conjunctive use operations were evaluated during the development of the Upper Kings IRWMP in the *Technical Memorandum, Water Quality Standards, Conditions, and Constraints*. The data show that recharge of San Joaquin and Kings River water would result in a net benefit to groundwater quality as compared to current conditions. The high quality of source water will result in dilution of minerals and other constituents in the native groundwater, and, as a consequence, any recovered water would generally be of better quality than the native groundwater. The available data also indicate that groundwater is currently meeting standards in most cases and has historically sustained municipal and agricultural beneficial uses. Maintaining or improving groundwater quality could result in avoided costs for treatment of drinking water at the point of extraction in the down gradient cities. In addition to avoiding the capital and operational costs associated with water treatment, protection of groundwater quality to enable compliance with drinking water standards would also be likely to reduce regulatory and permitting burdens.

Although the benefits of preserving the ability to rely on groundwater for drinking water supply are relatively certain, these benefits are difficult to confidently quantify without additional groundwater modeling and economic analysis.

Environmental Benefits

Consistent with the environmental strategy documented in the Upper Kings IRWMP, specific environmental and habitat features could be included into the site designs when consistent with the primary purpose of recharge, and where economically and technically feasible; and the work of the environmental stakeholders work group will be used to guide the design and operation of recharge projects..

Measurement of Water Quality Improvements

Project monitoring plans will be prepared for individual projects within the Program to guide collection and analysis of water quality data. The broad impact of Program implementation on water quality within the Upper Kings IRWMP area is likely to be detected by established flow and water quality measurement programs.

Water Supply Benefits

The central purpose of the Program with respect to water supply is to capture flood water that is now conveyed by CID canals and to route this water to recharge basins for percolation to groundwater. The Program will convert flood water, which is available without cost but is of little regional benefit because of its infrequent, unpredictable occurrence, into a reliable groundwater asset that can be used to meet growing municipal and agricultural demands. Recharge from the Program will be a component in the IRWMP's strategy to respond to the chronic and worsening overdraft of aquifers in the planning area.

The water supply benefits of Program implementation have been estimated for the Upper Kings IRWMP Step 2, Project Implementation grant application based on a feasibility study performed for the Recharge Pond off Ward Drainage Canal Project. This project is representative of the array of projects included within the Program, and, as such, provides a useful yardstick for estimating the water supply benefits for the full Program. A feasibility study for the Recharge Pond off Water Drainage Canal Project demonstrates the technical viability of this project and illustrates the capacity of the CID conveyance system to convey flood water sufficient to meet the percolation capacity of the project during years when flood water enters the system (approximately 40 percent of years). The operational capacity to convey and recharge flood water is available throughout the year including during the irrigation season. Although the economic analysis of this project is based exclusively upon recharge of flood water, pond operation may be expanded at many of the Program's recharge facilities to reduce operational spillage by storing and recharging rejected irrigation deliveries or surface water from other sources that exceed immediate irrigation demands.

While importation of surface water or construction of a new reservoir would provide water sources that are more predictable than flood water, aquifer recharge using flood water offers

a mechanism that effectively utilizes existing CID infrastructure to convey water to proposed recharge ponds, an approach that contributes greatly to controlling Program costs. Because storm water is conveyed by gravity to the Program's recharge sites, there is no energy costs associated with the recharge component of the Program.

Avoided Cost Analysis

The unit values used to derive water supply benefits were estimated using data from the Environmental Water Account (EWA) water acquisitions program and prices paid for EWA water since its inception in 2001 through 2004. These prices were used because they provide a firm foundation for estimating the value of transferred water over a span of years. While pumping restrictions at the Delta and other actions that have occurred since 2004 have substantially increased the costs associated with long-term water purchases, the water prices associated with EWA activity constitute a conservative basis for estimating the price of water imported into the Kings River IRWMP area.

The EWA water acquisition program separates acquisitions by region (upstream or north of the Delta and south of the Delta). Table 7-3 shows the EWA water acquisitions and the calculated average price per acre-foot for four years of program operation. As noted above, these values provide a conservative basis for estimating the cost of importing water to the Upper Kings IRWMP area and, therefore, the avoided cost associated with use of flood water for recharge.

The FY 2000-01 prices were higher than any of the following three years due to (1) higher percentage of water bought from sellers south of the Delta where prices paid for water are generally higher and, (2) 2000-01 being a dry year. Because all of the prices shown in this table result from transactions completed before establishment of current restrictions on Delta Pumping, the FY 2000-2001 values may be representative of near term conditions. However, because of the long-term character of this project, the average value presented in Table 7-3 of $145 will be applied for analysis.

Table 7-3. EWA Water Acquisitions, 2001 to 2004, AF, and Average Price Paid, $/AF

	FY 2000-01	FY 2001-02	FY 2002-03	FY 2003-04	Mid-point[1]
EWA Acquisitions (Total)					
Water purchased (AF)	336,034	239,543	214,914	155,000	
Total paid	$60,173,008	$28,333,455	$30,383,550	$17,111,000	
Average price/AF	$179	$118	$141	$110	$145

Source: Environment Water Account Acquisitions CDWR 2001 to 2004

[1] Mid-point value is the value half-way between the highest and the lowest average price

When adjusted to 2007 dollars using the Consumer Price Index (CPI), the mid-point value shown in Table 7-3 converts to an average price per acre foot of $159. This average annual price for an acre-foot of water yields a present value of an annual delivery of one acre-foot over the 30-year life of the project of $2,065. This equates to a total present value for the 10,000 acre-feet of captured storm water avoided on an average annual basis by the Program of $21,886,000.

An alternative estimate for the cost of imported water is presented in the draft engineer's report *Urban Impacts Study* prepared for CID by Summer's Engineering in July 2007.[10] This report notes that SWP water that is delivered through the California Aqueduct in the San Joaquin Valley and Central Valley Project water from the Friant-Kern Canal on the east side is frequently purchased or exchanged among eligible contractors. The cost to purchase a permanent supply in this market typically includes a one-time charge of $3,000 per acre-foot plus an annual charge of approximately $90 per acre-foot. The present value of an annual delivery of an acre-foot of water from this source over the 30-year life of the Program is $3,984. As the present value of this avoided cost stream is higher than that estimated based on the EWA, the EWA values will be applied as they lead to a more conservative economic analysis.

The per-acre-foot value of water developed from the preceding analysis was used to estimate the cost of water that would be imported into the Upper Kings IRWMP area absent implementation of the project. Water supply benefits are then based on the assumption that Program implementation would produce an average annual yield of 10,000 acre-feet that would reduce the need to import water for groundwater recharge. The basis for computation of the average annual yield is described in the feasibility report for the Recharge Pond off Ward Drainage Canal project.

Direct Water Supply Benefit Analysis

An alternative to the avoided cost analysis is analysis of the direct water supply benefits of the Program. These benefits represent the value of recharged water in reducing overdraft and compare the cost of constructing the Program with those of the no action alternative, continued overdraft of local aquifers. A report prepared for the KRCD directly addresses the economic value of recharged water in the project area and was used as a source for

[10] Summers Engineering, *Engineers Report-Consolidated Irrigation District Urban Impacts Study, July 2007*

estimating this value.[11] In its conclusion, the report states that, "The cost of overdraft can be used directly as the value of an acre-foot of recharge project yield. In other words, if water were to be recharged to the area, it would be worth $62/AF in avoided costs." Because the benefits associated with reduction of overdraft are largely associated with energy prices, the CPI index for Fuels and Utilities was applied when adjusting the 1999 costs to 2007 dollars. This adjustment resulted in an adjusted pumping cost of $97/acre-foot. Applying this adjustment leads to an estimated present worth for reducing overdraft by 10,000 acre-feet of $13,292,700.

Program Capital Costs

Capital costs for Program implementation are estimated to total $10,517,925. This total provides for construction of 240 acres of recharge ponds (Wards Drain Pond North, Kingsburg/Selma Branch Divide; and Cole Slough between Jefferson and Lincoln). This area is believed to be sufficient to generate the target average annual recharge of 10,000 acre feet and would be supplemented by improvements to the Wards Drain Canal Works and updating the GWMP. For simplicity, the conservative assumption is made that these funds would be committed to the Program at the beginning of the implementation period.

Program Operations Costs

Annual Program operations costs were drawn from the draft *Urban Impact Study*. Table 7-4 presents how this report detailed operational and maintenance costs for the recharge pond Program and prorates costs computed for the 1,300 acres of recharge ponds now in place to estimate costs for the 240-acre Program area. Because the report presents costs from CID's 2005-2006 budget, for the purposes of this economic analysis, the costs shown in Table 7-4 have been adjusted to 2007 dollars.

[11] S.R. Haugen and R.W. Andrus, *The Economic Value of Recharged Water as it Relates to the Cost of Overdraft, KRCD, April 2000*

Table 7-4. CID Budget Expenses FY 2005-2006 for Recharge Facilities

	Full CID System	Program Area (240 Acres)
Administration		
Administration	$105,862	$1,368[1]
Administration – salaries	$357,519	$4,620[1]
Operation		
Operation for recharge ponds	$38,690	$7,143
Maintenance		
Class A maintenance	$141,746	$1,832[1]
Class B maintenance	$462,293	$5,974[1]
Replacement		
Capital cost for storage ponds	$2,324	$429

[1] CID budget presents combined costs for Class A and Class B maintenance of irrigation and recharge facilities. Because seven percent of irrigation, recharged, and storm water management costs are assigned to recharge, this allocation was used as a basis for assigning seven percent of the Administration, Class A, and Class B maintenance costs to recharge facilities.

Costs from Table 7-4 have been used in the economic analysis and, together with the project's capital costs, yield a total present value of discounted Program costs of $10,793,225.

Summary of Project Water Supply Benefits

The preceding analyses demonstrate that at the average annual project yield anticipated for the Program of 10,000 acre-feet per year, over the 30-year Program life benefits can be computed using two approaches:

- The net present value of controlling overdraft is computed to be $13,292,700.
- The net present value of avoiding the requirement to import water is computed as $21,886,000.

The total present value of the costs of Program implementation and operation ($10,793,225) compares favorably with the benefits estimated based either on control of overdraft or avoidance of water importation.

The result of this analysis is that the economic feasibility of the Program can be broadly justified based upon quantifiable water supply benefits. Should energy prices continue to escalate, the water supply benefits of controlling overdraft will increase. This evaluation of water supply benefits gives no consideration to the non-quantifiable benefits discussed earlier in this section.

Detailed designs and complete feasibility studies for other sites will be developed once access or control of the specific property is obtained. The priority is to acquire lands from willing sellers. CID will seek to option properties when pursuing grant funding to demonstrate control of the proposed project site. CID could use eminent domain to acquire properties but only as a last resort. Under such circumstances, CID would select and appraise the property and extend to the owner an offer to purchase it at the appraised value. If that offer were refused, the District could adopt a Resolution of Public Necessity finding that (1) public interest and necessity require the project, (2) the proposed project is planned or located in a manner that will be most compatible with the greatest public good and the least private injury, (3) the property described in the resolution is necessary for the proposed project, and (4) an offer to acquire the property has been made.

8 Annotated References – Scientific and Technical Studies

This section describes the wide array of data that has been collected, analyzed, and used to design the proposed CID Program and specific recharge projects. It documents technical studies and engineering and scientific investigations that supported definition and feasibility evaluation for CID Groundwater Mitigation and Banking Program. The reader is referred to the enclosed disk for copies of the studies that are referenced in this document, or to the Upper Kings Water Forum website located at http://project.wrime.com/krcd/ for copies of many of the reports cited in this section.

8.1.1 Project Development and other Technical Investigation

KRCD, 1979. Groundwater Recharge Study. Fresno, CA.

KRCD, 1991. Alta Irrigation District Surface Water Study. Fresno, CA.

KRCD, 1999a. Artificial Groundwater Recharge in the Kings Service Area. Fresno, CA.

KRCD, 1999b. Artificial Recharge in the Kings River Service Area. Fresno, CA.

KRCD, 2000. Feasibility Study Report. Preliminary Design and Estimate of Costs for Two Potential Groundwater Recharge Sites Within the McMullin Recharge Project Area. Fresno, CA.

Provost and Pritchard, 1995. Feasibility of Utilizing the City of Fresno's Wastewater for Raisin City Water District. Fresno, CA.

Provost and Pritchard, 2005. Unpublished Canal Characteristic Data. Fresno, CA.

Provost and Pritchard, 2005. Unpublished Water Delivery and Water Entitlement Data in Lower Kings Basin. Fresno, CA.

Summers Engineering, 2007, Engineer's Report, Urban Impacts Study. (Attachment H) This report evaluated financing and funding opportunities and evaluates the connection between urban development and impacts to flood and recharge in CID; it documents the preliminary project design and canal improvements needed for recharge and flood management.

WRIME, 2002a. Upper Kings River Basin Phase in Basin Assessment Report. Prepared for Upper Kings River Basin ISI Participants in Coordination with California Department of Water Resources, Division of Planning and Local Assistance, Conjunctive Water

Management Branch. Sacramento, CA. This study reviewed historical data, documented current conditions, provided feasibility/suitability study for recharge project, and included site characterization for a range of locations in Fresno Irrigation District (FID), Alta Irrigation District (AID), and CID. The study documented soil and aquifer parameters (transmissivity and hydraulic conductivity, infiltration rates), described the lithology and stratigraphy of the basin, and presented a range of groundwater level contours.

WRIME, 2006f. Kings Basin Conjunctive Use Feasibility Analysis Memorandum. (Attachment EE) Prepared for the Upper Kings River Water Forum Planning and Steering Committee. Sacramento, CA. The report evaluated regional and more localized hydrogeology to support locating direct and in-lieu recharge facilities. Evaluated canal/conveyance constraints, identified surface water availability for the proposed projects, and quantified the recharge capacities of the Region using GIS and specific site selection criteria.

WRIME, June, 2007. Technical Memorandum on Floodwater Availability for the CID from the Kings River, File: 304.T06.00. (Attachment C) As part of the feasibility investigations of the proposed CID Groundwater Mitigation Bank, WRIME analyzed the historical unregulated flood releases in the Kings River to quantify the additional diversions that could be made for purposes of groundwater recharge. Four different diversion scenarios, 50, 100, 150 and 200 cfs, were tested against two different canal capacity constraints; an operational constraint of 2,100 cfs, and a design constraint of 2,700 cfs.

8.1.2 Demand, Supply, and Water Budget Analysis

The development of the Upper Kings Basin IGSM (WRIME, 2007) allows for extensive analysis of the water budget; supports planning of proposed capital facilities; and provides for evaluation of impacts and benefits of proposed projects. There were a number of separate technical studies conducted to support model development that also helped demonstrate the need and feasibility of the proposed projects.

DWR, 1975. Vegetative Water Use in California. DWR Bulletin 113-3, Department of Water Resources, California.

DWR, 1989. Effective Precipitation: A Field Study to Assess Consumptive Use of Winter Rains by Spring and Summer Crops. Department of Water Resources, San Joaquin District, California.

DWR, 1999. Tulare County Land Use Survey.

DWR, 2000. Fresno County Land Use Survey.

DWR, 2004. Kings County Land Use Survey.

KRCD, 1993. Consolidated Irrigation District Surface Water Study. Fresno, CA.

KRWA, 2001. Summary of Flood Releases from Pine Flat Reservoir 1954-2000. Revised August 3. Fresno, CA.

KRWA, 2005. Unpublished Kings River Flow Data Measured Below Weirs Data. Fresno, CA.

USBR, 2005. Mid-Pacific Region 2005 Conservation and Efficiency Criteria. Sacramento, CA.

WRIME, 2002b. Upper Kings Basin Phase IB Basin Assessment Report. Sacramento, CA. This study evaluated the basin conditions in greater detail and supported formation of the Water Forum.

WRIME, 2003a. Upper Kings Basin Conjunctive Use Project Assessment. Prepared for Upper Kings River Basin ISI Participants in Coordination with California Department of Water Resources, Division of Planning and Local Assistance, Conjunctive Water Management Branch. Sacramento, CA. This report helped define conjunctive use project opportunities and the feasibility of projects subsequently constructed including Waldron Ponds in the FID area and Harder ponds in the AID area.

WRIME, 2004. White Paper No. 1, Summary of Land Use and Water Use. Prepared for the Upper Kings River Basin Water Forum and The California Department of Water Resources. Sacramento, CA. This was a non-technical presentation of the range of urban and agricultural water demands in the basin and was used by the Forum to define issues.

WRIME, 2005a. Lower Kings Basin Groundwater Management Plan Update. Prepared for the Kings River Conservation District. Sacramento, CA. Provided review of historical water levels, quality, and hydrogeology in the western part of the basin; defined project opportunities and management actions.

WRIME, 2005b. Hydrologic Modeling in Kings Basin, A White Paper. Prepared for the Upper Kings Water Forum. Sacramento, CA. A non-technical publication to support the Forum in defining the purpose, need, and approach to developing modeling tools.

WRIME, October 2006. Existing Conditions and 2030 Baseline Conditions and Assumptions. This draft memorandum was used by the Technical Advisory Committee and Water Forum to finalize the assumptions for the without project future conditions.

WRIME, 2006a. Analysis of Water Demand in the Kings Basin. Technical Memorandum, Phase 1, Task 3. (Attachment G) Prepared for the Upper Kings Basin Water Forum and the Kings River Conservation District with support from the California Department of

Water Resources. Sacramento, CA. Presents an evaluation of historical agricultural and urban demands and forecast of future water needs. Used to develop model input files.

WRIME, 2006b. Analysis of Water Supplies in the Kings Basin. Technical Memorandum, Phase 1, Task 4. (Attachment D) Prepared for the Upper Kings Basin Water Forum and the Kings River Conservation District with support from the California Department of Water Resources. Sacramento, CA. Presents an evaluation of historical supplies and diversions and provides discussion on potential future water supply opportunities. Used to develop model input files.

WRIME, 2007. Kings IGSM Model Development and Calibration Report. (Attachment A) Prepared for the Upper Kings Basin Water Forum and the Kings River Conservation District with support from the California Department of Water Resources. Sacramento, CA.

WRIME, 2007b. Kings IGSM Model Development and Calibration Report, (Work in progress). Prepared for the Upper Kings Basin Water Forum and the Kings River Conservation District with support from the California Department of Water Resources. Sacramento, CA.

8.1.3 Planning

City of Sanger, 2000. Urban Water Management Plan. Sanger, CA.

City of Sanger, 2006. Wastewater Treatment Plan 2006. Sanger, CA.

Department of Health Services, 2006. Groundwater Recharge Reuse DRAFT Regulations 12-01-04. Sacramento, CA.

DWR, 2005c. The California Water Plan Update 2005. Sacramento, CA

DWR, 2005. Guidebook to Assist Water Suppliers in the Preparation of a 2005 Urban Water Management Plan. January 18, 2005.

FID, 2000. Water Conservation Plan, 5 Year Update. Fresno, CA.

FID, 2005. Groundwater Management Plan (Draft). Fresno, CA.

Fresno County, 2000. Fresno County General Plan Policy Document, October 3, 2000. Fresno, CA.

Fresno County, 2000. The Fresno County General Plan Background Report. October 2000. Fresno, CA.

Fresno County, 2004. The Fresno County General Plan. Fresno, CA.

Fresno County, 2004. The Fresno County General Plan. Fresno, CA.

Hauge, Carl J. 1992. The Impact of Groundwater in California. In: Changing Practices in Groundwater Management –The Pros and Cons of Regulation. Proceedings of the Eighteenth Biennial Conference on Groundwater, Sacramento, California.

Ireland, R. L., Poland, J. F., and Riley, F. S. 1984. Land Subsidence in the San Joaquin Valley, as of 1980, U. S. Geological Survey Professional Paper 437-I, 93 p.

Ireland, R.L., et al., 1984. Land Subsidence in the San Joaquin Valley, as of 1980. USGS Professional Paper 437-1.

KRCD, 1974. Master Plan. Fresno, CA.

KRCD, 1999c. Consolidated Irrigation District Ponding Basin Volume. Fresno, CA.

KRCD, 2006b. Environmental Baseline Conditions. Fresno, CA. Report aggregates environmental data for the Region and documents studies, data sources, and maps; describes current conditions.

State of California, 2006. Water Code. Sacramento, CA.

State of California, 2000. Cortese-Knox-Hertzberg Local Government Reorganization Act of 2000. Sacramento, CA.

SWRCB, 2002. Water Transfer Issues in California, Final Report to the California State Water Resources Control Board by the Water Transfer Workgroup. Sacramento, CA.

WRIME, 2006c. Baseline Conditions. Technical Memorandum. Phase 1, Task 5. Prepared for the Upper Kings Basin Water Forum and the Kings River Conservation District with support from the California Department of Water Resources. Sacramento, CA. Documents historical and existing baseline conditions in the Region, evaluated physical and as-built facilities and policy/institutional settings. .

WRIME, 2006d. Planning Framework, Integration Strategy, and Assumptions. Technical Memorandum. Phase 1, Task 12. Prepared for the Upper Kings Basin Water Forum and the Kings River Conservation District with support from the California Department of Water Resources. Sacramento, CA. Defines the approach to configuring alternatives and evaluating water management strategies.

WRIME, 2006e. Water Management Strategies, Opportunities, and Constraints. Technical Memorandum. Phase 1, Task 13. Prepared for the Upper Kings Basin Water Forum and the Kings River Conservation District with support from the California Department of Water Resources. Sacramento, CA. Detailed evaluation of the water management strategies required for consideration in an IRWMP; defines approaches and applicability to the Region.

WRIME, 2007a. (Attachment F) Draft Technical Memorandum- Review of City and County General Plans. Prepared for the Upper Kings River Water Forum Planning and Steering Committee Land Use and Water Supply Work Group. Sacramento, CA. Evaluates city and county general plan goals, objectives, and policies to define plan integration opportunities and to better integrate land use and water supply plans and the planning process.

8.1.4 Hydrogeology/Geology

The geology and hydrogeology of the Kings River Basin and San Joaquin Valley has been extensively investigated. The major reports listed below, and other publications, were used to characterize the hydrogeology and develop the Upper Kings Basin IGSM (WRIME, 2007b, 2006f) and to conduct the regional recharge feasibility study (WRIME, 2006f), which defined recharge areas. The major geological studies that were examined include the following:

Brown and Caldwell, 2006. Technical Memorandum, Kings Basin Integrated Hydrologic Modeling, Hydrogeoligic Investigation. This report documents the collection and review of over 2,000 drillers logs, contains cross sections, and developed the conceptual hydrogeologic model.

Cehrs, David, Stephen Soenke, and William C. Bianchi, 1980. A Geologic Approach to Artificial Recharge Site Selection in the Fresno-Clovis Area, California. This study discusses site selection criteria for potential artificial recharge including how the geology influences recharge.

Croft, M.G., 1969. Subsurface Geology of the Late Tertiary and Quaternary Water-Bearing Deposits of the Southern Part of the San Joaquin Valley, California. This report describes the occurrence of groundwater and aquicludes and aquifers in the area including their thickness, lithology, and stratigraphic relations.

Davis, G. H., J. H. Green, S. H. Olmstead, and D. W. Brown, 1959. Ground Water Conditions and Storage Capacity in the San Joaquin Valley, California. U.S. Geological Survey. Water Supply Paper No. 1469. 287p.

Davis, S. N. and R. J. M. DeWiest, 1966. Hydrogeology. NewYork, John Wiley.

DWR, 1980. Groundwater Basins in California. DWR Bulletin 118-80, Department of Water Resources, California.

KRCD, 2001. Kings River Service Area, Annual Groundwater Report 2000. Fresno, CA.

Muir, K.S., 1977. Ground Water in the Fresno Area, California. This report documents the water-bearing deposits, direction of movement, recharge, and discharge characteristics, fluctuations of water levels, and chemical quality of the aquifers. • A series of papers

between 1997 through 2005 by Gary S. Weissmann and others on the area's glacial history, stratigraphic sequences, groundwater, and modeling of aquifers.

Page R.W. and R.A. LeBlanc, 1969. Geology, Hydrology, and Water Quality in the Fresno Area, California. Geologic and hydrologic conditions of the San Joaquin Valley were investigated during this study to utilize the area for groundwater storage and relate the study area to adjacent areas and the valley as a whole.

U.S. Geological Survey. 1959. Ground-water Conditions and Storage Capacity in the San Joaquin Valley California, Water Supply Paper 1469.

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Appendix A Land Use-Water Supply Briefing

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GEI Consultants
Bookman-Edmonston Division

Memo

To: Phil Desaloff, General Manager, CID

From: Matt Zidar

Date: March 14, 2008

Re: Briefing on Integrating Water Supply and Land Use Planning in CID

Summary

- The Kings Groundwater Basin, including the area of the Consolidated Irrigation District (CID), is in a state of overdraft. This means that more water is removed than is recharged on an average annual basis. Over the long-term, overdraft is not sustainable.

- Future municipal and industrial uses that are reliant on groundwater will increase overdraft and have a negative impact on the groundwater basin and current overlying water users.

- A physical solution consisting of projects and funding is needed to reduce overdraft that results from current water demands, and for mitigating the impacts of new development on groundwater overdraft.

- The cities within CID include Selma, Fowler, Kingsburg, Parlier, and Sanger (CID Cities), which have authority over land use, adopt General Plans to guide land use, prepare Urban Water Management Plans (UWMP) to guide use of their available water supplies, and act as lead agency pursuant to the California Environmental Quality Act (CEQA).

- CID is a regional water management agency with appropriate powers and authorities, infrastructure, water rights, and experience needed to develop physical solutions to the water supply problems, and to provide solutions that increase the reliability of the water supply.

- CID is updating the 1995 Groundwater Management Plan (GMP), which includes identifying projects, programs, and policies that will define the proposed Groundwater Mitigations and Banking program. This program will ensure that a long-term, sustainable water supply is available to meet both current and future demands.

- The intended uses of the GMP are to:

  - Define projects (physical solutions) to manage overdraft.
  - Streamline the development review process for CID cities, water suppliers, and CID.[1]

- Document regional water demand and supply sources to a level of detail such that the GMP would serve as a regional water supply assessment for CID Cities when considering new development.[2]
- Define the financial mechanism to implement, operate, and maintain projects.
- Provide mitigation for groundwater impacts pursuant to CEQA.
- Provide a mechanism for CID Cities to verify water supply availability and adopt legally defensible findings of sufficiency.

Problem Statement

There is substantial evidence of historical overdraft in the Upper Kings Groundwater Basin, including the portions of the groundwater basin that underlie CID and the cities within the CID boundaries, including Selma, Fowler, Kingsburg, Parlier, and Sanger. The Kings Basin area has been defined as being in a critical state of overdraft by the California Department of Water Resources. The Kings Basin Integrated Groundwater and Surface Water Model (Kings IGSM) was developed as part of the Upper Kings Integrated Water Resources Management Plan (Kings IRWMP).[3] The model was used to simulate the historical conditions and quantify overdraft. The Kings IGSM was also used to evaluate baseline and future build out conditions. The results indicate that future land use and growth will contribute to the overdraft problem.[4]

Urban and industrial demands are different than the historical overlying agricultural uses in both the source of water and the type of water use. Urban and industrial uses rely 100% on groundwater, whereas agricultural uses within CID may rely on both delivered surface water and/or groundwater sources. Urban uses require greater reliability, higher quality, and represent a year-round, rather than seasonal, demand for water.

New development or other projects that increase consumptive use of groundwater, also increase groundwater overdraft and impact current overlying groundwater users. The negative impacts should be mitigated.[5] In addition, increased contributions to overdraft have a negative effect on the existing, overlying groundwater rights.

Changes in State legislation over the past ten years have created informational and procedural requirements that mandate that land use agencies and water supply agencies communicate and coordinate during the planning process. CID and the CID Cities need to review the information requirements, current land and water management plan and candidly define the issues and opportunities to streamline the development review process, while also ensuring there is reliable water for current and proposed agricultural, municipal, and industrial water users.

Planning Issues and Policy Environment

Roles and Responsibilities for Land Use and Water Management

CID and the CID Cities participated in the development of the Kings IRWMP. The Kings IRWMP identified the need for integration of land use and water supply plans, and the related planning and decision making process.

CID Cities and County of Fresno have the powers and authorities to develop general plans, make land use decisions, and approve new development. They are the lead agencies to comply with the California Environmental Quality Act (CEQA) when making land use decisions. CID Cities and Fresno County are responsible for ensuring that impacts from

projects are mitigated or avoided. When CID Cities annex land, they detach the land from the County and CID.

The Fresno County General Plan has clear regional water management goals and objectives and has well-defined requirements for groundwater management. The Fresno County General Plan takes a regional perspective for addressing groundwater overdraft. The general plans for cities within CID generally do not recognize the regional problems of overdraft.[6]

CID is a regional water agency that has conducted conjunctive-use operations and worked to manage groundwater in its jurisdictional area since 1921. It holds the rights to the surface water from the Kings River, which it manages and distributes to overlying land owners for agricultural purposes and groundwater recharge, and has a 1995 GMP that is being updated.

CID is a responsible agency with jurisdiction for reviewing city development that may affect groundwater supplies by law pursuant to CEQA. CID has a compelling interest in the protection of groundwater rights of the overlying land owners within the jurisdictional area. The Cities' rights to groundwater are prescriptive and potentially adverse and subordinate to the right of existing overlying agricultural groundwater rights. The Cities, through their municipal utilities or as part of a franchise agreement with a private water company, are acting as an appropriator of groundwater and can only legally pump surplus groundwater. Their use and commitment of groundwater to new development could significantly affect existing overlying groundwater users in the CID area. The Cities' commitment of groundwater to new development is a prescriptive use of the groundwater in the Kings Basin.[7]

Local Agency Formation Commission (LAFCO) also has an affirmative responsibility to ensure that water supplies are available prior to granting an annexation. The CID Cities water supply assessments are needed by LAFCO to make appropriate findings prior to annexation to the city and de-annexing from CID. Important changes to the governing statutes[8] and added responsibility include requirements to determine timely and available water supplies; prepare comprehensive water services reviews; and assess firm yield water supply availability, reliability, and quality for annexations and extension of services. The legislature also tasked LAFCO with considering water and wastewater management regionally, including evaluating the ability of public facilities to meet current and future service needs, or to extend services outside of existing boundaries.

Urban Water Management Plans

The CID Cities with 3,000 service connections are "urban water suppliers" and are required to adopt UWMPs. Selma is serviced by California Water Service, which has prepared the UWMP. UWMPs define how cities and/or water service providers will meet current and future demands over a 20-year planning horizon for different hydrologic conditions.[9] They generally describe water supply and demand (existing and projected) and water conservation measures, as well as water supply reliability and shortage contingency plans.

The planning functions of the UWMPs were significantly elevated by the enactment of laws creating water supply assessment and verifications.[10] UWMPs must describe the plans to supplement or replace a water supply source with alternate sources or water demand management measures if it is shown that current sources cannot meet all anticipated demands.[11] The cities must identify specific projects and include a description of the increase in a water supply that is expected to be available from each water supply project or source.[12] If groundwater is a water supply source, the UWMP must provide detailed information

regarding the limitations of that source and, to the extent available, the historical uses of groundwater within the basin. Most of the CID Cities' UWMPs were prepared prior to the Kings IGSM analysis of the water budget and documentation of overdraft and do not contain specific projects or plans to reduce or mitigate overdraft. As a result, the currently adopted UWMP may not help CID Cities meet the state requirements related to use of the UWMP during evaluation of new development or proposed projects and when making environmental determinations.[13]

Water Supply Assessments and Verification - Information and Procedural Requirements

Water supply planning has received increased attention from both the State Legislature and the California Courts. Recent legislation and judicial rulings[14] have increased the need for CID, the CID Cities, and County of Fresno to adhere to more rigorous planning standards. Both the legislature and the courts have created substantive informational and procedural requirements for water suppliers, the CID Cities, and the County,[15] and revisions to the water code define how these land use agencies must prepare water supply assessments when considering projects and conducting the environmental review. Cities are also now required to verify a supply prior to final approval of the final subdivision map.

The purpose of the water supply assessment and verification requirements is to determine whether the total projected water supplies available will meet the projected water demand associated with the proposed project during normal, single-dry, and multiple-dry water years during a 20-year projection, in addition to the public water system's existing and planned future uses which include agriculture and manufacturing.[16]

City or County approval of new development projects is subject to CEQA review. The city's UWMP or a water supply assessment prepared for the specific project must document that the water supply sources are available for both existing and planned uses.[17] Water supply assessments should be prepared at the time of environmental review and are to be used to document water availability or provide evidence of how water will be obtained.[18] CEQA also requires evaluation of the environmental impacts of obtaining water from proposed sources. CID believes that overdraft is a significant impact that requires mitigation.

The Cities' general plans and UWMP identify groundwater as the source of supply, and this triggers additional information requirements.[19] Most of the UWMPs do not identify new water supply projects or provide substantial evidence to document the availability of, or plan for, a long-term, sustainable water supply, nor do they define specific mitigations for increased consumptive use of groundwater.

This means that the developer and/or the CID Cities need to find project-specific mitigations to overdraft conditions and document that there is a sufficient water supply available for the proposed project.

If a city (public agency) proposes to pump groundwater to meet the needs of new development, then the city must show under CEQA that its pumping will not significantly affect the environment nor interfere with existing overlying agricultural uses of groundwater. CID Cities and Fresno County need to ensure that the increased water demands that contribute to overdraft are mitigated and that such mitigations are conditions of approval imposed during the development review process.

In developing a water supply assessment, the cities, county, or water supplier must disclose and document the quantity of water received from the various sources using the following:

- Written contracts or other proof of entitlements.

- Copies of a capital outlay program for financing the delivery of a water supply.

- Federal, state, and local permits for construction of infrastructure associated with delivery of the water supply.

- Any necessary regulatory approvals that are required to be able to convey or deliver the water supply.[20]

The water supply assessment is intended as a communication mechanism between the land use planning agencies and water supply planning agencies.

The water supply verification requirements are intended as a 'backstop' and require cities to make a finding that there is a sufficient water supply available prior to final approvals. Prior to finalizing a tentative map, cities must verify that the supplies identified in the water supply assessment are prepared pursuant to state code for a project, documenting what waters are actually available and what are committed.[21]

The city, in verifying a water supply, must also include a description of the reasonably foreseeable impacts of the proposed project on the availability of water resources for agricultural and industrial uses within the public water system's service area that are not currently receiving water from the water system but are utilizing the same source.[22] Verification of a water supply must be supported by substantial evidence, which may consist of the supplier's or cities' UWMP, a water assessment, or other information similar to the assessment of water supplies and demand in an UWMP.[23]

None of the available information currently provided by the CID Cities include substantial evidence to document a verifiable water supply and make substantive findings of sufficiency.

LAFCO AND THE CORTESE-HETZBERG-KNOX ACT

Local Agency Formation Commissions (LAFCOs) are tasked with ensuring water supplies are available at the time when city or special district boundaries are to be amended. The Cortese- Hetzberg-Knox (CHK) Act passed in 2000 amended the Government Code and requires all spheres of influence to be updated every five years. Prior to updating a sphere, the LAFCO is required to approve a Municipal Service Review (MSR) for public services provided within the sphere. Proposals for reorganization are subject to the CHK and to review by the LAFCO. The LAFCO is required by state law to review and make a determination of approval or denial of all annexations or other changes of organization to cities and special districts.

LAFCOs serve as the legislature's watchdog, operating at the intersection of land use, services (including water), finance, and governance. LAFCOs are tasked with balancing competing stakeholder interests of: 1) discouraging sprawl; 2) preserving open space and prime agricultural lands; and 3) efficiently providing government services.

Important changes and added responsibility include requirements to determine that there are timely and availability water supplies; prepare comprehensive water services reviews; and assess firm yield water supply availability, reliability and quality for annexations and extension of services. The legislature also tasked LAFCO's with considering water and wastewater management regionally, including evaluating the ability of public facilities to meet current and future service needs, or to extend services outside of existing boundaries.

The CHK defines the factors to be considered in the review of a proposal. This includes whether the city annexing land is able to provide the services needed, including the sufficiency of revenues for those services following the proposed boundary change24, and the timely availability of water supplies adequate for projected needs[25.] As such, the CID cities need to not only evaluate the water supplies available, but the source of supply to a project and how such new supplies will be financed. This is challenging given overdraft in the Kings Basin and the complete on groundwater by the cities.

The CHK further clarifies the legislative intent for ensuring that there be close coordination and consultation between water supply agencies and land use approval agencies to ensure that proper water supply planning occurs Section in order to accommodate projects that will result in increased demands on water supplies through a standardized process for determining the adequacy of existing and planned future water supplies to meet existing and planned future demands on these water supplies[26].

The informational requirements are similar to the information requirements that the cities must consider in making their determinations pursuant to CEQA and the Water Code. As such, this further makes the case for having the GMP serve as a water supply assessment for the cities and LAFCO to use in making determinations, as well as for defining projects and funding sources to implement such projects so that both LAFCO and the cities may verify a sustainable water supply.

Plans for providing services need to be submitted with resolution of application to LAFCO[27]. The plan for providing water services is to include along with discussion of other conditions the local agency would impose or require within the affected territory if the change of organization or reorganization is completed. This includes information with respect to how those services will be financed. Within the CID Cities, this typically included plans for wells, pumps, water storage and distribution infrastructure for use of groundwater, but did not include actions that that Cities would take to work regionally to resolve overdraft, fund development of new water supplies to meet their increasing demand, or to support conjunctive use and construction recharge facilities to increase supplies and reduce overdraft.

Prior applications to LAFCO did not acknowledge the overdraft issue nor seek to resolve the effects of new municipal development on overdraft. MSR also did not seek to include facilities or financing to resolve overdraft and effects of new development on the water budget. LAFCO has not historically conditioned annexation of resolution of overdraft issues. This lack of recognition of the regional overdraft, and of projects and financing intended to reduce overdraft, are issues for both LAFCO and the Cities to resolve prior to approval of new projects.

Findings and Conclusion

City general plans and the UWMP do not recognize overdraft or the limitation of the groundwater source, nor do they define how cities will mitigate water supply impacts of new development[28] by providing a sustainable water supply[29] and defining what projects are planned to meet the total projects' water use.[30]

Without firm plans for developing and funding water supply projects and ensuring that water supplies are available to meet current and future water demands, the Cities will have trouble making sufficiency determinations and complying with statutory requirements; land use decisions may be subject to legal challenge; and economic development could be affected.

The CID Cities need to mitigate for the groundwater impacts of new development as part of the development review process. This can be done through demonstrating that the city is not contributing to overdraft (e.g., requiring the developer to procure a new water supply in lieu of using groundwater), or through some other appropriate project or agreements to mitigate for the increased groundwater consumption.

It is not likely that in matters where the city would be committing water through prescription and where there are significant effects related to overdraft, the city use of a statement of overriding consideration would withstand legal challenge.

Opportunities

Opportunities exist for CID and the land use agencies to integrate General Plan, UWMPs, and GMP requirements to streamline the decision process; avoid conflicts; meet current and future demands; and sustain the local economy.

CID is the regional water agency with appropriate powers and authorities to develop the GMP[31] for the region. CID intends to use the GMP to define projects that ensure a reliable water supply is available. It is anticipated that the GMP will define a Groundwater Mitigation and Banking Program that consists of capital projects, policies, and programs that will document how CID and the CID Cities will work together to develop additional water supplies, reduce overdraft, and avoid significant impacts.

The GMP will define the process to integrate information and meet the procedural requirements for both the CID Cities and CID. One of the GMP objectives is to implement cost-effective mitigations to overdraft that the CID Cities and development community can use to ensure that a long-term, sustainable water supply is available, that appropriate findings can be made, and that decisions are technically supported and able to withstand challenge. The intended uses of the GMP are as follows:

- Streamline development review process for CID cities, water suppliers, and CID.[1]

- Document regional water demand and supply sources to a level of detail such that the GMP would serve as a regional water supply assessments for CID Cities when considering new development.[2]

- Define projects (physical solutions) to overdraft, including the financial mechanism, which ensures implementation, operations, and maintenance, that would provide mitigations for groundwater impacts pursuant to CEQA, and provide the mechanism for CID Cities to verify water supply availability and adopt legally defensible findings of sufficiency.

- Define project funding requirements and financing mechanism.

Endnotes

1 Most CID Cities are the municipal supplier, with the exception of Selma, which is served by California Water Service.

2 CEQA statutes and guidelines; the Water Code (CWC § 10910 (c) (2), (h)); and the Govt. Code (§ 6647.3.7 (c) (1) allow incorporation by reference and support streamlining.

3 California's Groundwater - Bulletin 118. DWR, Update 2003. *Kings IGSM Model Development and Calibration Report,* WRIME, 2007.

[4] See Chapter 4 of the Upper Kings IRWMP, which presents the water budgets for the 2005 baseline and the 2030 build out conditions. Forecasts of future growth and water demand were based on review of the adopted UWMP, General Plan land use diagrams, and the accepted sphere of influence.

[5] *Engineer's Report, Urban Impacts Study*. Summers Engineers July 2007; Groundwater *Impact Analysis* WRIME, July 2007.

[6] Technical Memorandum- Review of City and County General Plans. WRIME, February 2007.

[7] CID views the increase in municipal uses of groundwater to be open, adverse, and hostile pursuant to the Water Code.

[8] Govt. Code § 56000 *et seq.* Cortese-Knox-Hertzberg Local Government Reorganization Act Of 2000

[9] California Water Code (CWC) § 10610 *et seq*)

[10] CWC § 10910-10915

[11] CWC § 10631(c)

[12] CWC § 10631 (h)

[13] Senate Bills 610 and 221 significantly elevated the planning function of UWMPs by creating water supply assessments and verification requirements (CWC § 10910 *et seq*). A supplier relying on groundwater to meet its customers' demands must provide detailed information regarding the limitations of that source, and to the extent available, the historical uses of the basin. Requirements to address groundwater sources were added in 2001 and the Kings IGSM results were published in 2007 and may not be reflected in the most recent UWMPs.

[14] Several major court decisions have interpreted CEQA in ways that place more requirements on land use and water planners. See Planning and Conservation League v Dep't of Water Resources, 83 Cal.App. 4th 892 (2000) (disapproving contract reformation between DWR and State Water Project (SWP) contractors; Santa Clarita Org for Planning and the Environment (SCOPE) v Count of Los Angeles, 106 Cal. App. 4th 715 (2003) (finding that CEQA prohibits reliance on "paper water," specifically water from the SWP; recent California Supreme Court ruling, Vineyard Area Citizens For Responsible Growth, Inc. V City Of Rancho Cordova, Sunrise Douglas Property Owner Assn., Super. Ct. No. 02CS01214., Cal. App. 3rd C044653 (2007).

[15] CWC § 10910-10915

[16] CWC § 10910 (c)(3) and (4). Also Govt. Code § 66473.7 (a)(2). Water supply assessments may be required for any project that is subject to CEQA, while verifications are not required until the tentative or parcel map stage. The laws requiring verification were added in part because of pervasive non-compliance with the earlier laws requiring assessments.

[17] CWC § 10631(b), (h) and (i); 10910 (c)(2), (c)(3), (c)(4)

[18] CWC § 10911(b). Assessments should be included in negative declarations, mitigated negative declarations, or EIRs.

[19] CWC § 10910 (f); Govt. Code § 66473.7(h)

[20] CWC § 10910 (d)(2)

[21] Govt. Code § 66473.7

[22] Govt. Code § 66473.7 (g)

[23] Govt. Code § 66473.7(c)

[24] *ibid* §56668(f)

[25] *ibid* §56668(f)

[26] *ibid* §65352.5

[27] *ibid* §56653

[28] *Technical Memorandum- Review of City and County General Plans.* WRIME, February 2007. Prepared for the Upper Kings Water Forum.

[29] CWC § 10631(b) requires UWMPs to include a copy of the most recent General Plan, description of the groundwater basin, detailed description and analysis of the location amount, and sufficiency of groundwater.

[30] CWC § 10631(h)

[31] CWC § 10750- 10755

Appendix B Kick-Off Meeting Presentation

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CID Board Meeting

Agenda Items

1. Groundwater Management Plan
2. Geringer Property Site Evaluation

Consolidated Irrigation District Groundwater Management Plan

- Why do the plan?
- What are the anticipated outcomes and benefits?
- How to do the plan?

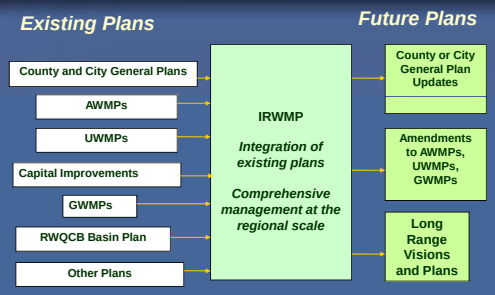
Everything should be made as simple as possible, but not one bit simpler….. Albert Einstein

Why Do the GWMP? Purpose and Need

- Reduce or eliminate overdraft
- Protect overlying ground water rights
- Define "physical solution" solutions
- Engage cities & stakeholders
- Meet SB 1938 requirements and qualify for state funding
- Provide CID with a strategic roadmap

In preparing for battle I have always found that plans are useless, but planning is indispensable. Dwight D. Eisenhower

Why Do the GWMP? Relationship to Other Plans



What is the Anticipated Outcome and Benefits?

- Groundwater and Mitigation Banking Program
  - Projects
  - Programs
  - Policies
- State grants awarded
- Equitable distribution of costs
- Preservation of local control
- Increased supply reliability in all years

What is the Anticipated Outcome and Benefits? (cont.)

- Solve problems without litigation
- Consensus with Cities and developers
  - Opportunity for local land use agencies to comply with state laws
  - Mitigations for impacts of new development
- CEQA clearance for defined set of actions

How do the Plan?

- Required Elements - SB 1938/CWC § 10750
- Stakeholder/Public Involvement
- Schedule/Budget

Stakeholder/Public Involvement

- Board Meetings
  - Workshop
  - Action Items
- Groundwater "Summit"
- Policy Advisory Committee

Men often oppose a thing merely because they have had no agency in planning it, or because it may have been planned by those whom they dislike. Alexander Hamilton (1755 - 1804)

Components of GWMP

	Recommended by AB 3030	Required by SB 1938
The control of saline water intrusion	●	
Identification and management of wellhead protection areas and recharge areas	●	
Regulation of the migration of contaminated groundwater	●	
The administration of a well abandonment and well destruction program	●	
Mitigation of conditions of overdraft	●	
Replenishment of groundwater extracted by water producers	●	
Monitoring of groundwater levels and storage	●	
Facilitating conjunctive use operations	●	●
Identification of well construction policies	●	
The construction and operation by the local agency of groundwater contamination cleanup, recharge, storage, conservation, water recycling and extraction projects	●	
The development of relationships with state and federal regulatory agencies	●	
The review of land use plans and coordination with land use planning agencies to assess activities which create a reasonable risk of groundwater contamination.	●	
Description of participation by interest parties		●
Plan to involve agencies overlying the basin		●
Basin management objectives		●
Basin management entity and area map		●

Schedule

Feb	March	April	May	June	July
2/13 Workshop	3/5 Water Summit 3/12 Workshop	4/9 Workshop	5/14 Workshop	6/11 Workshop	7/9 Draft GMP
Action Items: Goals/BMOs	Action Items: - Project Desc. -Water Management Strategies	Action Items: Decisions in project approaches	Action Items: Decisions in project approaches	Action Items: Financing and economics	

Discussion Points

- Issues and concerns
- Anticipated benefits
- Who should be participating in the process
- Who need to be part of the solution
- Sticking points for implementing a solution
- Items on or off the table
- Alternative views of the problem

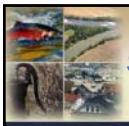
Next Steps

- Provide Board with an updated groundwater mitigation and banking program description
- Schedule Board Workshop to review program description
- Schedule Groundwater "Summit" for local stakeholders
- Finalize schedule

The significant problems we have cannot be solved at the same level of thinking with which we created them. Albert Einstein

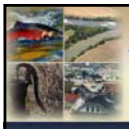
Geringer Property Site Evaluation

13



Scope of Work

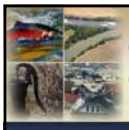
- Phase 1 Tasks
  1. Regional Review
  2. Drilling
  3. Phase I Site Assessment
- Phase 2 Tasks (Optional)
  1. Mounding Analysis
  2. Preliminary Grading Grading & Design
  3. CEQA Review



Budget

- GANTT CHART

BACKUP



Conjunctive Use Project Concepts CID Draft List

- 16 Potential Projects for approximately $16 Million to yield 12 to 20 K AF/yr.
- Prioritize land acquisitions
- Recharge ponds up gradient of the cities
  - Potentially seek to combine recharge and detention ponds below the cities
  - Regulation, recharge, habitat ponds
- Need to evaluate all funding mechanisms

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Appendix C Groundwater Summit Meeting Materials

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Meeting Purpose and Goals

The Consolidated Irrigation District (CID) Board of Directors is updating the 1995 Groundwater Management Plan (GMP). The purpose of the meeting is for the CID Board to provide information to the community on the State of the Kings Groundwater Basin and need for a GMP, and to obtain input from the community. The meeting will allow various stakeholders to share their perspectives and expectations related to groundwater management with the planning area. The CID GMP will:

- Establish groundwater management goals and basin management objectives
- Define project and program priorities for addressing groundwater overdraft
- Meet state requirements and allow CID to qualify for State grant funding
- Support development of a consensus on how to implement water supply facilities and better manage available water supplies
- Engage stakeholders in the area and gain consensus on problems and solutions

DATE
April 2, 2008 | 8:00 a.m. – 12:30 p.m.

LOCATION
Spike and Rail
2910 Pea Soup Anderson Blvd., Selma, CA 93662
(559) 891-7000

RSVP
Stephanie Sherrell
stephanie@cidwater.com, or (559) 896-1660

The anticipated outcome of the GMP is a CID Groundwater Mitigation and Banking Program that would define management actions and capital facilities that would help CID meet agricultural and municipal demands, both now and in the future.

Who Should Attend

Growers and agricultural interests; members of the city council, city planning and public works staff; developers; business interests; and representatives of other non-governmental organizations that have an interest in groundwater management.

CID Groundwater Summit Agenda

Item	Person/Subjects	Time	
Introduction and welcome	**Robert Nielsen, Larry Cruff** *CID Board Members*	8:00 am	8:15
State of the basin, water budget, purpose and need for GMP	**Matt Zidar** GEI Consultants	8:15	8:45
Upper Kings IRWMP	**David Orth** Manager, KRCD	8:45	9:15
State Perspectives on groundwater management and GMP requirements	**Mary Scruggs** *DWR Dept. of Planning and Local Assistance*	9:15	9:45
Break		9:45	10:00
Requirements and opportunities to integrate land use and water supply planning	**Doug Jensen** *BMJ/CID Counsel*	10:00	10:30
County perspective	**Judy Case** *County Supervisor*	10:30	11:00
City perspective	**Don Pauley** *City Manager and City Representative to LAFCO Mediation Team*	11:00	11:30
Developer perspective	**Glenn Pace** *Wellington Business Group*	11:30	Noon
Wrap-up & discussion		Noon	12:30 pm

Agenda for CID Water Summit

Introduction	Robert Nielsen, Larry Cruff
State of the Basin, Water Budget, Purpose and Need for GWMP	Matt Zidar, GEI
Upper Kings IRWMP	David Orth, KRCD
State Perspectives, GWMP	Tom Lutterman, DWR
Requirements for Integration of Land Use and Water Supply	Doug Jensen, BMJ
County Perspective	Judy Case, County Supervisor
City Perspective	Don Pauley
Development Perspective	Glen Pace, Wellington Corporation

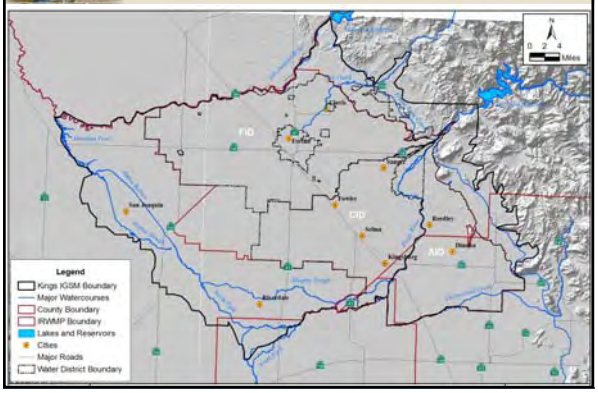
Purpose of the Meeting

- Allow CID to present information on the Groundwater Management Plan (GMP)
- Allow the Board to obtain input and hear from multiple perspectives and stakeholders
- Open up a dialog with the community on how to better manage groundwater

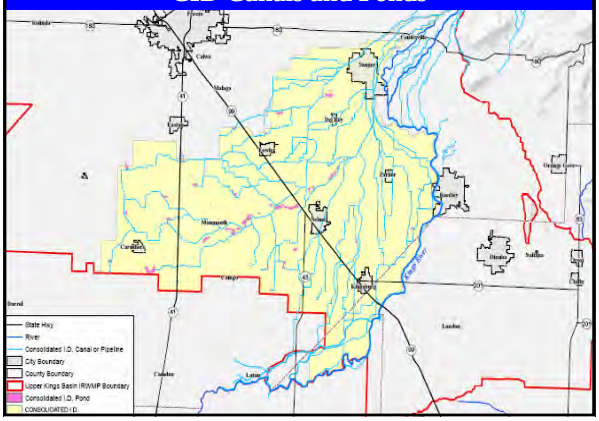
Background and History of CID

- Formed in 1921
- Senior water rights to the Kings River and
- Member of the Kings River Water Association
- Long history of conjunctive use
- Funded through annual acreage assessments

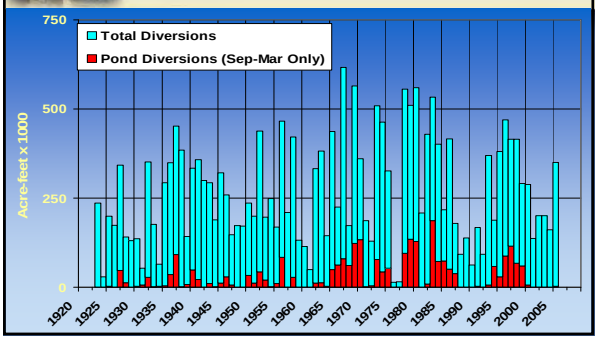
CID and the Kings Groundwater Basin



CID Canals and Ponds



Historical Water Delivery and Recharge



Why Do the GWMP? Purpose and Need

- Respond to groundwater overdraft
- Retain local control and protect overlying ground water rights
- Define "physical solution" solutions
- Engage cities & stakeholders and reduce the potential for conflicts
- Qualify for state funding and meet SB 1938 (Water Code § 10750) requirements
- Provide CID and local cities with a strategic roadmap
- Respond to changes to state laws and integrate land use and water supply planning
- Implement the Upper Kings Basin Integrated Regional Water Management Plan within CID

CID GMP Embraces the Upper Kings IRWMP Goals

- Halt and reverse overdraft and
- Provide sustainable water management
- Increase the water supply reliability, enhance operational flexibility, and reduce system constraints
- Improve and protect water quality

Objective of IRWMP & GMP

- Develop conjunctive use projects and artificial recharge facilities to:
  - Enhance operational flexibility of existing water facilities
  - Store surface water in the groundwater basin
  - Capture storm water and floodwater currently lost in the region
  - Develop multipurpose groundwater recharge facilities
  - Support the fishery management plan

Objectives of GMP – Develop Standard Practices

- Improve coordination between CID and the Cities and County during development review
- Develop equitable funding strategies to purchase water and land and to build project
- Evaluating land for its recharge potential
- Groundwater data sharing, monitoring and reporting

Anticipated Outcome = Groundwater Mitigation and Banking Program

- Projects
- Programs
- Policies

Intended Uses of GMP

- Streamline development review process
  - Provide a regional water supply assessment (WSA)
  - Provide a mechanism for verifications of a water supply availability and adoption of legally defensible findings of sufficiency
  - Define mitigations to groundwater impacts pursuant to CEQA
- Support updates of City's Urban Water Management Plans
- Support grant applications

Regional Problems and Issues
Matt Zidar, GEI

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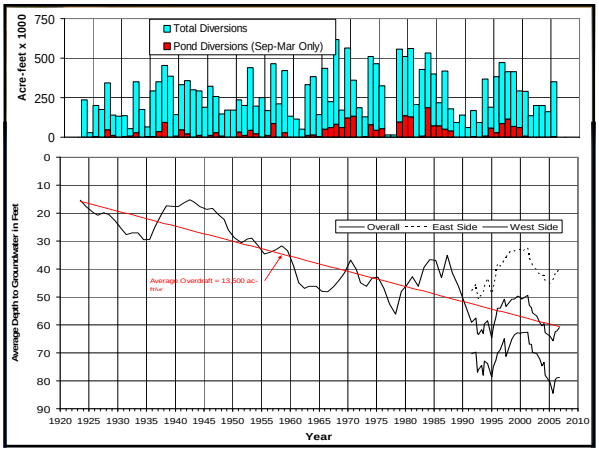
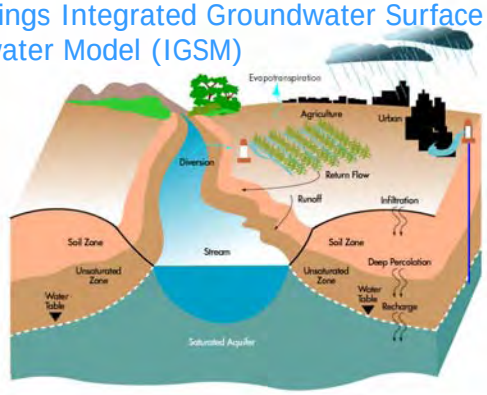
Regional Problems and Issues

- Overdraft
- Water Supply Reliability
- Urban Development
- Sustainability of Agricultural Economy

Groundwater Summit 14



Kings Integrated Groundwater Surface water Model (IGSM)

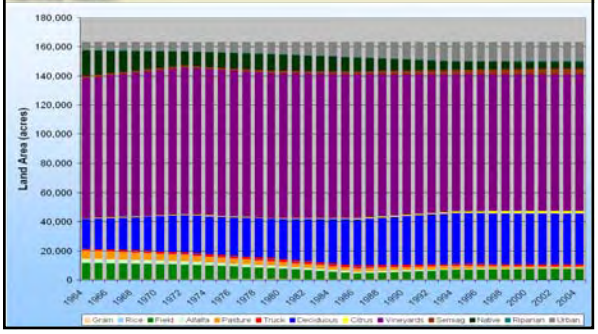


Water Budget Analysis Planning and the Kings IGSM

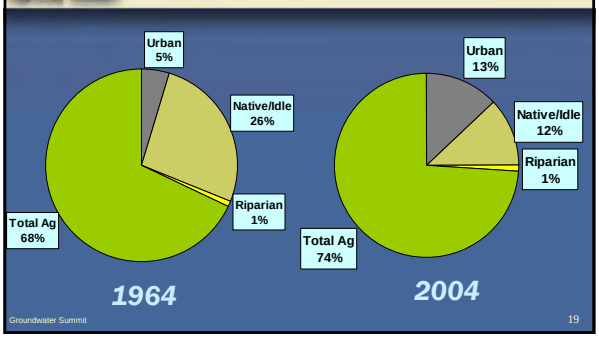
Planning Purpose	Describe Water Budget, Historical Conditions & the Problem	Evaluate Future Conditions Prescribe - Develop Management Actions
	1964-2004 →	← Years 1 to 41 →
Model Use	Calibration with Observed Data	No Project Conditions 2005 Existing & 2030 Baseline Conditions

Groundwater Summit 17

Land Use in CID

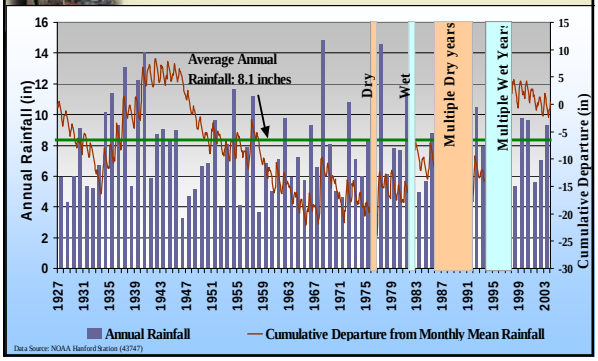


Land Use Changes 1964- 2004 in Kings Basin

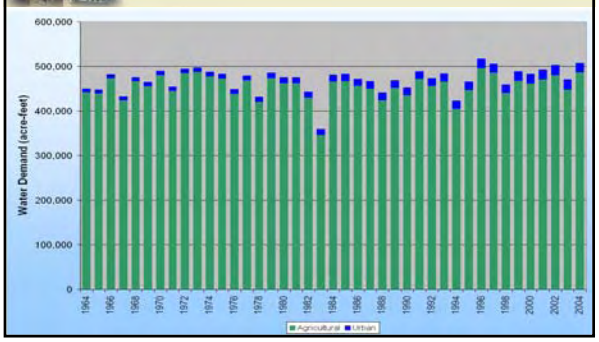


Groundwater Summit 19

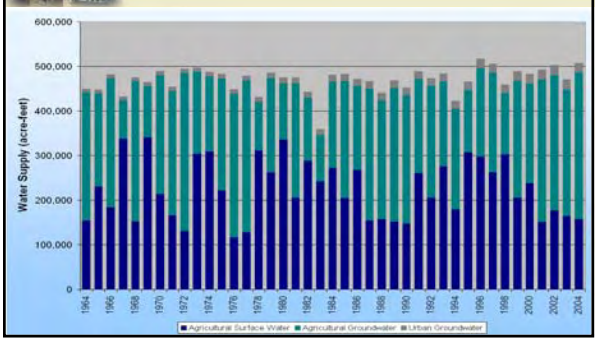
Water Supply - Annual Precipitation



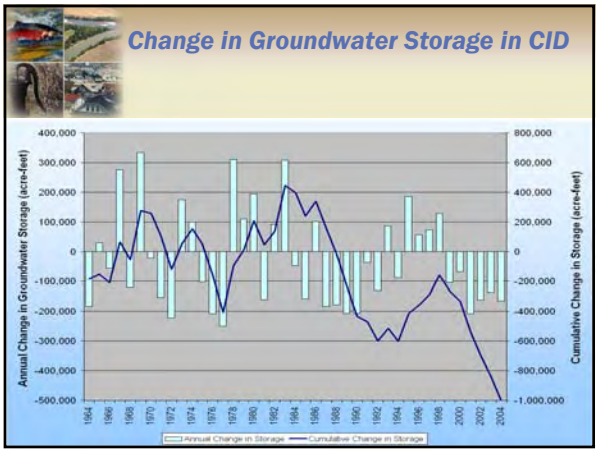
CID Annual Ag and Urban Water Demands



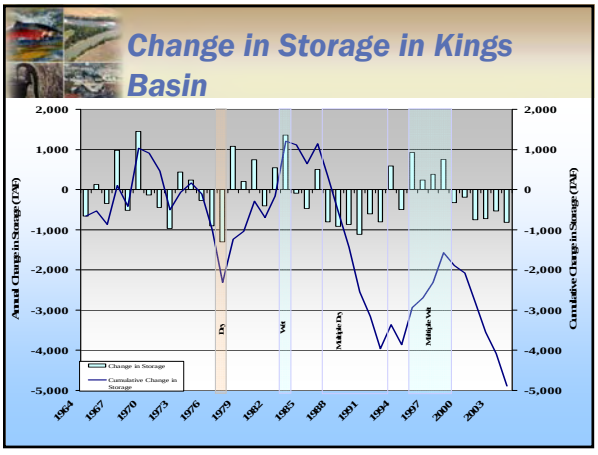
CID Annual Surface Water and Groundwater Supplies



Change in Groundwater Storage in CID



Change in Storage in Kings Basin



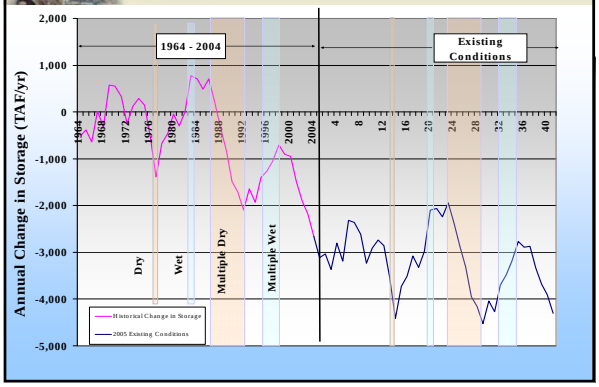
Groundwater Budget from 1964 to 2004 for CID

Budget Component	Recharge (TAF)	Discharge (TAF)
Percolation from Rainfall and Irrigation	187	
Recharge from Streams and Canals	25	
Recharge from Ponds	90	
Pumping		246
Groundwater flow out of CID		80
Overdraft	24	

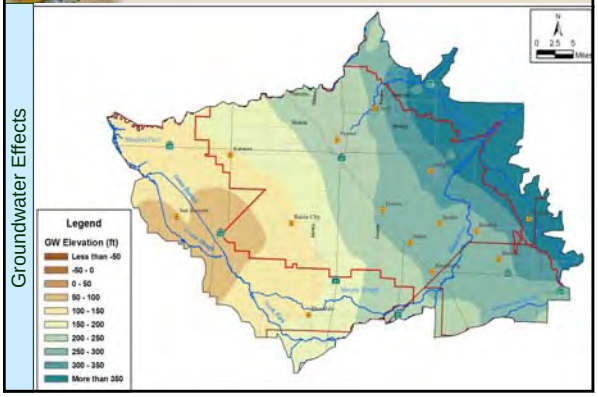
Cumulative Overdraft Summary

Area	Cumulative Overdraft (TAF)	Average Overdraft (TAF)
Kings Basin	6,637	162
IRWMP Area	3,313	81
CID	1,004	24

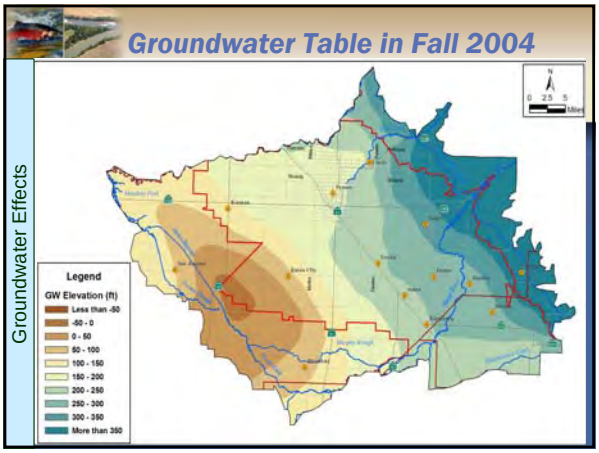
Change in Storage in IRWMP Area



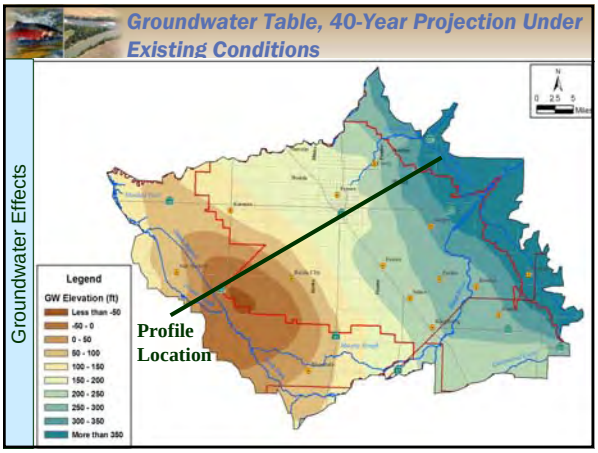
Groundwater Table in Fall 1964



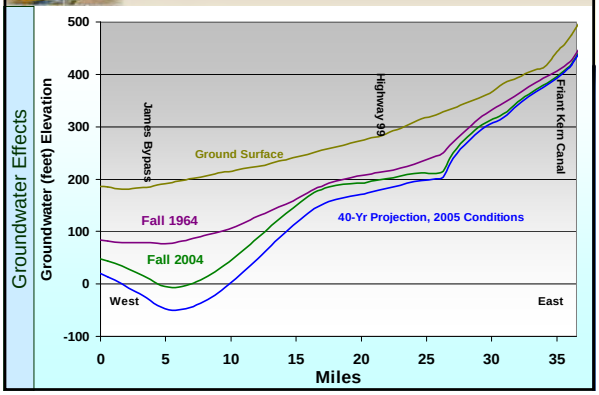
Groundwater Table in Fall 2004



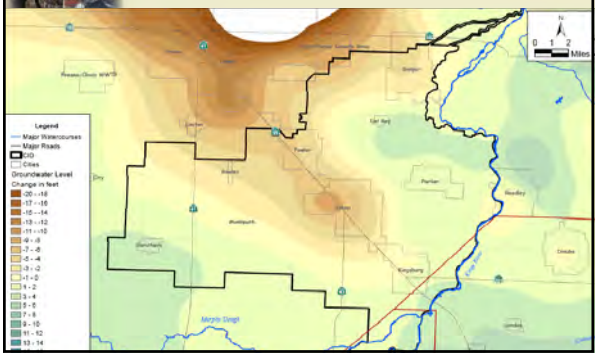
Groundwater Table, 40-Year Projection Under Existing Conditions



Groundwater Elevation Profile



Expected Changes in Groundwater Levels at Build-Out



Primary Drivers
Land and Water Use System

- **Land**
  - Total agricultural and urban acres have increased, replacing vacant and native lands
  - Urban areas increased from 49K to 129K acres, More permanent and water intensive crops
- **Water**
  - Shift from agricultural applied surface water to municipal groundwater pumping
  - "Hardened" year round urban demand
  - Municipal water quality requirements

Groundwater System
Primary drivers

- Groundwater moves east to west, from Upper to Lower Kings
- High reliance on groundwater in western portion of Kings Basin effects regional water level
- Urban development shift to reliance on groundwater reduces recharge and affects groundwater budget

Potential Consequences of Inaction
"No Project" Baseline

- Subsidence, increased pumping costs, migration of poor quality water
- Reduced economic activity in both agricultural and urban sectors
- Increased competition for available supplies and potential for conflicts over water rights
- Internal competition for reduced state and federal resources
- Lack of regional competitiveness for state and federal funding

GMP as a Solution

1. Introduction
2. Purpose and Need for Groundwater Management Planning
3. Goals, Objectives, and Intended Use of GMP
4. Water Resources Settings
5. Water Resources Management Conditions, Policy and Institutional Settings
6. Program Description
7. Stakeholder Involvement
8. Plan Implementation

Upper Kings Basin IRWMP
David Orth, General Manager
Kings River Conservation District

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Upper Kings Basin IRWMP
David Orth, General Manager
Kings River Conservation District

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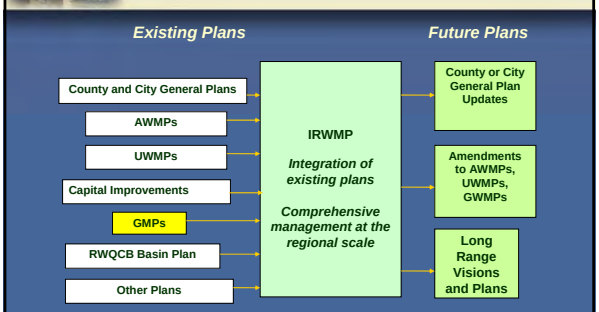
Relation to Local Plans



Requirements for Integration of Land Use and Water Supply Planning

Doug Jensen
Backer, Manock & Jensen

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Backup

Cid Regional Conjunctive Use Projects Priorities For Prop 50 and 84 Funding

- 17 Projects for a total of $507 Million Dollars
- Range of projects at different stages in the project development "life cycle"
- Emphasis on immediate-, near-, mid- and long-term priorities
- Developing conjunctive use and groundwater banking projects and a longer term view
- Define disadvantage community needs
- Regional program framework

CID Regional Conjunctive Use Projects Priorities For Prop 50 and 84 Funding

- 16 Conjunctive Use Projects
- Approximately $16 Million
- Yield 12 to 20 K AF/yr.
- Recharge ponds up gradient of the cities
  - Potentially seek to combine recharge and detention ponds below the cities
  - Regulation, recharge, habitat ponds

IRWMP Potential Benefits to CID

- Help solve CID problems using P50 and P84 funding
- Gives CID needed regional context
- Seeks to keep local water charges at a minimum
- Support local control
- Reduce potential for conflicts
- Ensure long term ag and urban needs are met

Primary Drivers Surface and Groundwater Supply

- Kings surface water supplies are well managed and little unmanaged water leaves the region
- Kings flood water is available
- San Joaquin 215 Flood water is available
- History of conjunctive use of surface and groundwater and artificial recharge
- Parts of the lower and western Kings Basin rely exclusively on groundwater and lack infrastructure to move water

IRWMP is Consistent with CID Groundwater Management Plan

- Monitor and analyze groundwater use and trends
- Develop, manage, and monitor groundwater locally
- Recommend actions for the wise use of groundwater
- Address agricultural water supply concerns and issues
- Address water quality and supply issues of cities and rural communities
- Coordinate groundwater management plan with local agencies in the region
- Did not authorize the District to levy any fees to fund the implementation of the plan

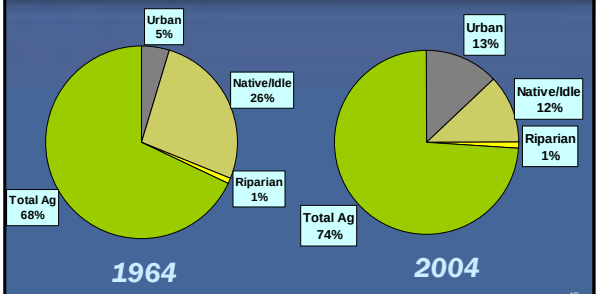
How make it happen?

- Match your priorities to the available funding sources
- Define near term project
- Develop CID program approach
  - Land acquisition program
  - Get CEQA clearances
  - Identify funding mechanism
  - Develop design standards and guidelines
  - Work with the land use agencies

Upper Kings Basin IRWMP Vision

The vision for the Upper Kings Basin Water Forum is a sustainable supply of the Kings River Basin's finite surface and groundwater resources through regional planning that is balanced and beneficial for environmental stewardship, overall quality of life, a sustainable economy, and adequate resources for future generations.

Land Use Changes 1964- 2004



RCUP integrates existing or proposed programs and projects

- The Planning Framework
- Project Timing
- Readiness to Proceed-Status in Project Life Cycle
- Geographic Scale
- Relationship to Existing Plans; and
- Institutional and Political Integration

Geographic Scale

- Sub regional (Within the jurisdiction of Water Agencies)
- IRWMP Region
  - Kings Region
  - KRWA Area
- Inter- regional

Regional Conjunctive Use Program (RCUP)

- Direct Recharge - Ponds, injection wells, spreading
  - FID
  - CID
- Indirect or In- lieu Recharge - Reduce groundwater use by providing treated surface water or reclaimed water
  - AID
  - Clovis
  - Dinuba

Project Timing

- Immediate (Proposition 50 and Prop 84 Implementation Grant application in 2007)
- Near term (1-3 years)
- Mid- term (3-6 years), and
- Long term (greater than six years)

Water Budget under No Project Conditions

Area	2005		2030	
	Cumulative Overdraft (TAF)	Average Overdraft (TAF)	Cumulative Overdraft (TAF)	Average Overdraft (TAF)
Kings Basin	3,663	89	3,919	96
IRWMP Area	1,905	46	2,219	54
CID	463	11	498	12

Evaluating Future Conditions

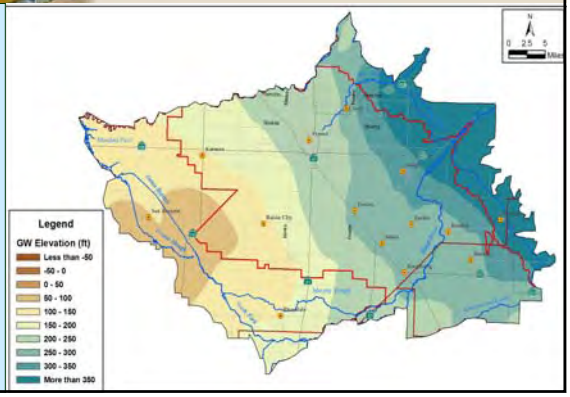
Evaluate potential scenarios

Year 1 to 41

No IRWMP
2005 Existing Conditions
2030 Baseline Conditions

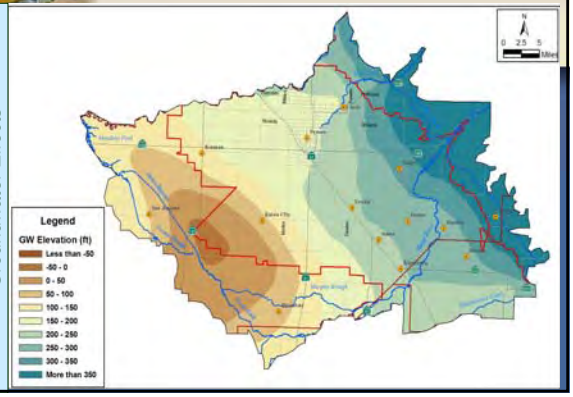
Groundwater Table in Fall 1964

Groundwater Effects

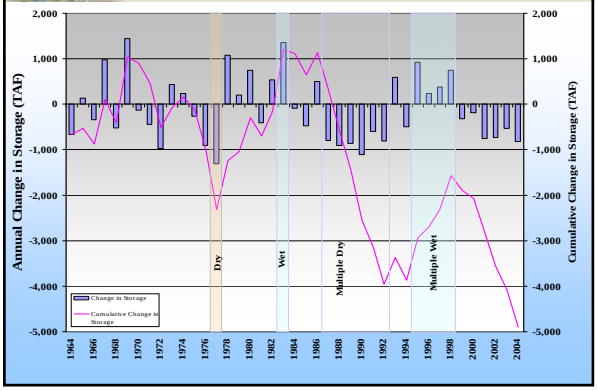


Groundwater Table in Fall 2004

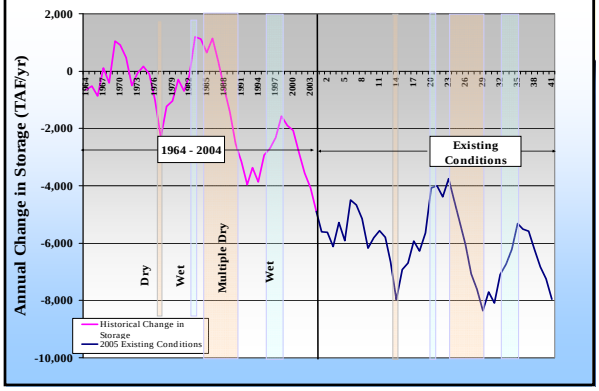
Groundwater Effects



Change in Storage in Kings Basin



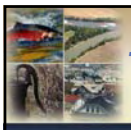
Change in Storage in Kings Basin



IRWMP will identify, evaluate and integrate Water Management Strategies

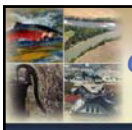
- Water Supply Reliability
- Flood management
- Groundwater management
- Storm water capture and management
- Water recycling
- Ecosystem Restoration
- Environmental and habitat protection and improvement
- Recreation and public access
- Water conservation
- Water quality protection and improvement
- Wetlands enhancement and creation
- Conjunctive use
- Desalination
- Imported water
- Land use planning
- NPS pollution control
- Surface storage
- Watershed planning
- Water and wastewater treatment
- Water transfers

Blue text indicates must be considered



The CID GMP will.....

- Define project priorities to address overdraft of the groundwater basin,
- Meet state requirements and allow CID to qualify for State grant funding,
- Support development of a consensus on how to implement water supply facilities,
- Engage stakeholders in the area and gain consensus on problems and solutions



Objectives of the IRWMP & GMP

- Define local and regional opportunities for groundwater recharge
- Develop institutional arrangements for water banking
- Develop standard practices
- Provide necessary environmental documentation that would support the recharge programs

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Appendix D Board Actions

Appendix D will be populated in the final report pending board resolutions.

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Appendix E Preliminary Project Concepts

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Project CU3D/ CID No. 13 - Recharge Pond off Ward Drainage Canal north of Floral Avenue Alignment

Status - This project and an adjoining property were the subject of a more detailed hydrogeologic investigation and feasibility study, including conduct of a Phase I site assessment. The thirty percent design and preliminary hydrogeologic site characterization are complete. Property acquisition is on hold pending review of other viable sites.

Facilities - The 60-acre site is located at the head works of the Ward Drainage Canal, along the south side of Huntsman Avenue. The property is currently fallow and was once part of a winery. Two inlets to approximately 50 acres of ponding basins would be provided off of the Selma Colony Ditch and Kingsburg Branch Canal, respectively. Water will be diverted from either canal. New recharge ponds at this location would provide recharge benefits upslope of the cities of Fowler, Selma, and Kingsburg. The first 650 feet of the drain will be piped to allow the drain to flow into the new ponds to be constructed in series to allow for cleaning, maintenance, and flexibility in operations. Water will enter at the north end and spill into the existing drain at the south end. A check structure at the pond outlet would control spills into the downstream portion of the drain.

Table E-1. Project CU3D/ CID No. 13 - Recharge Pond off Ward Drainage Canal north of Floral Avenue Alignment

Proposal Title		Upper Kings IRWMP				
Project Title		CID Groundwater Mitigation and Banking Program, Project CU3DCID No. 13 Wards Drain Pond at Huntsman				
	Budget Category	Other State (1)	Non-State Share (Funding Match)	Requested Grant Funding	Total	% Funding Match
(a)	Direct Project Administration Costs		$ 138,225		$ 138,225	
(b)	Land Purchase/Easement			$1,115,000	$ 1,115,000	
(c)	Planning/Design/Engineering/ Environmental Documentation			$110,000	$ 110,000	
(d)	Construction/Implementation			$588,000	$ 588,000	
(e)	Environmental Compliance/ Mitigation/Enhancement		$ 92,150		$ 92,150	
(f)	Construction Administration			$30,000	$ 30,000	
(g)	Other Costs				$ -	
(h)	Construction/Implementation Contingency			$184,300	$ 184,300	
(i)	Grand Total	$	$ 230,375	$2,027,300	$ 2,257,675	
(j)	Calculation of Funding Match %			$2,027,300	$ 2,257,675	10.2%
Local match met through local District revenues and fees Assume 50/50 split of state/non-state for a, c, e, f						

Project CU3A/CID No. 10 - Recharge Pond at Kingsburg / Selma Branch Canal Divide

Status - Conceptual design complete. Pending environmental evaluation, hydrogeologic site characterization and development of 30 percent design.

Facilities - A new recharge pond at the divide of the Kingsburg and Selma Branch Canals, between Adams and Sumner Avenues, would provide recharge benefits upslope of Selma, Parlier, and Kingsburg. The area of the proposed site is approximately 150 acres. To implement the project, CID would need to purchase the property and construct levees and a turnout structure. The pond would provide a secondary benefit of capturing spills during irrigation operations. This would be particularly helpful to the operations of the Kingsburg Branch Canal, which currently has no available spills, and would reduce the risk of canal breaches in Kingsburg.

Table E-2. Project CU3A/CID No. 10 - Recharge Pond at Kingsburg/Selma Branch Canal Divide

Proposal Title		Upper Kings IRWMP				
Project Title		CID Groundwater Mitigation and Banking Program, Project CU3A/CID No. 10- Recharge Pond at Kingsburg / Selma Branch Canal Divide				
Budget Category		Other State (1)	Non-State Share (Funding Match)	Requested Grant Funding	Total	% Funding Match
(a)	Direct Project Administration Costs		162,000	162,000	324,000	
(b)	Land Purchase/Easement			3,750,000	3,750,000	
(c)	Planning/Design/Engineering/ Environmental Documentation		216,000	216,000	432,000	
(d)	Construction/Implementation			570,000	570,000	
(e)	Environmental Compliance/ Mitigation/Enhancement		108,000	108,000	216,000	
(f)	Construction Administration		162,000	162,000	324,000	
(g)	Other Costs				0	
(h)	Construction/Implementation Contingency			540,000	540,000	
(i)	Grand Total (Sum rows (a) though (h))	0	648,000	5,508,000	6,156,000	
(j)	Calculation of Funding Match %			5,508,000	6,156,000	10.5%
Local match met through local District revenues and fees Assume 50/50 split of state/non-state for a, c, e, f						

Project CU3B/ CID No. 14 - Recharge Pond off Fowler Switch between Sumner and South Avenues

Status - Conceptual design complete. Pending environmental evaluation; hydrogeologic site characterization and development of 30 percent design.

Facilities - A new recharge pond at the right bank of the Fowler Switch Canal, between the Sumner Avenue alignment and South Avenue, would provide recharge benefits upslope of Selma and Fowler. The East Kirby Ditch is diverted from the C&K Canal and spills into the McCall Ditch one and a half miles east of the pond site. The McCall Ditch, which is diverted from the Lone Tree Channel, continues west from the Kirby spill and spills into the Fowler Switch Canal at the south end of the pond site. If Fowler Switch recharge deliveries were diverted into the new pond, it would free additional capacity in the Fowler Switch, downstream of South Avenue. Recharge supplies delivered through the C&K Canal and Lone Tree Channel could be added to the Fowler Switch at South Avenue via the Kirby and McCall spills. The net result would be the creation of up to 50 cfs of additional recharge flow capacity and an additional recharge site upslope of Selma and Fowler. The area of the proposed site is approximately 40 acres. To implement the project, CID would need to purchase the property and construct levees and a turnout structure.

Table E-3. Project CU3B/ CID No. 14 - Recharge Pond off Fowler Switch between Sumner and South Avenues

	Proposal Title	Upper Kings IRWMP				
	Project Title	CID Groundwater Mitigation and Banking Program, Project CU3B/CID No. 14- Recharge Pond off Fowler Switch between Sumner and South Avenues				
	Budget Category	Other State (1)	Non-State Share (Funding Match)	Requested Grant Funding	Total	% Funding Match
(a)	Direct Project Administration Costs		$48,750	$48,750	$97,500	
(b)	Land Purchase/Easement			$1,000,000	$1,000,000	
(c)	Planning/Design/Engineering/ Environmental Documentation		$65,000	$65,000	$130,000	
(d)	Construction/Implementation			$300,000	$300,000	
(e)	Environmental Compliance/ Mitigation/Enhancement		$32,500	$32,500	$65,000	
(f)	Construction Administration		$48,750	$48,750	$97,500	
(g)	Other Costs				$0	
(h)	Construction/Implementation Contingency			$162,500	$162,500	
(i)	Grand Total (Sum rows (a) though (h))	$0	$195,000	$1,657,500	$1,852,500	
(j)	Calculation of Funding Match %			$1,657,500	$1,852,500	11%

Project CU3C/ CID No. 11- Recharge Pond off Kingsburg Branch Canal north of Huntsman Avenue

Status - Conceptual design complete. Pending environmental evaluation; hydrogeologic site characterization and development of 30 percent design.

Facilities - A new recharge pond at the right bank of the Kingsburg Branch Canal, north of Huntsman Avenue, would provide recharge benefits upslope of Selma and Kingsburg. The area of the proposed site is 10 acres. There is an existing depression at the site, but development of a pond would still require land acquisition, grading, and levee construction. A pond at this site would also provide a secondary benefit of capturing operational spills from the Kingsburg Branch Canal.

Table E-4. Project CU3C/ CID No. 11- Recharge Pond off Kingsburg Branch Canal North of Huntsman Avenue

Proposal Title		Upper Kings IRWMP				
Project Title		CID Groundwater Mitigation and Banking Program, Project CU3C/CID No. 11- Recharge Pond off Kingsburg Branch Canal north of Huntsman Avenue				
Budget Category		Other State (1)	Non-State Share (Funding Match)	Requested Grant Funding	Total	% Funding Match
(a)	Direct Project Administration Costs		$15,375	$15,375	$30,750	
(b)	Land Purchase/Easement			$250,000	$250,000	
(c)	Planning/Design/Engineering/ Environmental Documentation		$20,500	$20,500	$41,000	
(d)	Construction/Implementation			$160,000	$160,000	
(e)	Environmental Compliance/ Mitigation/Enhancement		$10,250	$10,250	$20,500	
(f)	Construction Administration		$15,375	$15,375	$30,750	
(g)	Other Costs				$0	
(h)	Construction/Implementation Contingency			$51,250	$51,250	
(i)	Grand Total	$0	$61,500	$522,750	$584,250	
(j)	Calculation of Funding Match			$522,750	$584,250	11%
Local match met through local District revenues and fees Assume 50/50 split of state/non-state for a, c, e, f						

Project CU3E/CID No. 8 - Recharge Ponds off Cole Slough Canal between Jefferson & Lincoln Avenues

Status - Conceptual design complete. Pending environmental evaluation; hydrogeologic site characterization and development of 30 percent design.

Facilities - New recharge ponds at the left and right banks of the Cole Slough Canal, between Jefferson and Lincoln Avenues, would provide recharge benefits in the region between Sanger and Parlier. The sites are far enough from the bluff of the Kings River that the groundwater gradient does not run toward the river. The area off the right bank is approximately 7 acres, the area off the left bank is approximately 30 acres, and the soils for both sites are very sandy. To implement the project, CID would need to purchase the property and construct levees and turnout structures from the Cole Slough Canal.

Table E-5. Project CU3E/CID No. 8 - Recharge Ponds off Cole Slough Canal between Jefferson & Lincoln Avenues

Proposal Title		Upper Kings IRWMP				
Project Title		CID Groundwater Mitigation and Banking Program, Project CU3E/CID No. 8- Recharge Ponds off Cole Slough Canal between Jefferson & Lincoln Avenues				
Budget Category		Other State (1)	Non-State Share (Funding Match)	Requested Grant Funding	Total	% Funding Match
(a)	Direct Project Administration Costs		$46,688	$46,688	$93,375	
(b)	Land Purchase/Easement			$925,000	$925,000	
(c)	Planning/Design/Engineering/ Environmental Documentation		$62,250	$62,250	$124,500	
(d)	Construction/Implementation			$320,000	$320,000	
(e)	Environmental Compliance/ Mitigation/Enhancement		$31,125	$31,125	$62,250	
(f)	Construction Administration		$46,688	$46,688	$93,375	
(g)	Other Costs				$0	
(h)	Construction/Implementation Contingency			$155,625	$155,625	
(i)	Grand Total (Sum rows (a) though (h))	$0	$186,750	$1,587,375	$1,774,125	
(j)	Calculation of Funding Match % .			$1,587,375	$1,774,125	11%
Local match met through local District revenues and fees Assume 50/50 split of state/non-state for a, c, e, f						

Project CU3F/ CID No. 9 - Santa Fe Pond Enlargement

Status - Conceptual design complete. Pending environmental evaluation; hydrogeologic site characterization and development of 30 percent design.

Facilities - The District's Santa Fe Pond is located at the headworks of the Santa Fe Ditch, between Adams and Sumner Avenues. The pond could be expanded to the south by an additional 60 acres. To implement the project, CID would need to purchase the property and construct levees.

Table E-6. Project CU3F/ CID No. 9 - Santa Fe Pond Enlargement

Proposal Title		Upper Kings IRWMP				
Project Title		CID Groundwater Mitigation and Banking Program, Project CU3F/CID No. 9- Santa Fe Pond Enlargement				
Budget Category		Other State (1)	Non-State Share (Funding Match)	Requested Grant Funding	Total	% Funding Match
(a)	Direct Project Administration Costs		$69,375	$69,375	$138,750	
(b)	Land Purchase/Easement			$1,500,000	$1,500,000	
(c)	Planning/Design/Engineering/ Environmental Documentation		$92,500	$92,500	$185,000	
(d)	Construction/Implementation			$350,000	$350,000	
(e)	Environmental Compliance/ Mitigation/Enhancement		$46,250	$46,250	$92,500	
(f)	Construction Administration		$69,375	$69,375	$138,750	
(g)	Other Costs				$0	
(h)	Construction/Implementation Contingency			$231,250	$231,250	
(i)	Grand Total (Sum rows (a) though (h))	$0	$277,500	$2,358,750	$2,636,250	
(j)	Calculation of Funding Match %			$2,358,750	$2,636,250	11%
Local match met through local District revenues and fees Assume 50/50 split of state/non-state for a, c, e, f						

Project CU3G/ CID No. 12 CID Ward Drainage Canal Capacity Enlargement

Status - Conceptual design complete. Pending environmental evaluation; hydrogeologic site characterization and development of 30 percent design.

Facilities - The Ward Drainage Canal begins at Huntsman Avenue, east of Selma, and ends near the Cole Slough branch of the Kings River in Kings County. The canal is located within a natural depression that collects surface drainage and it is not utilized for irrigation deliveries. Recharge deliveries can be made to the Ward Drain through the Kingsburg Branch of the C&K Canal. Some portions of the Ward Drain are piped and others are open canal. The portions that are open canal are very sandy and able to rapidly percolate the drainage that is collected. The recharge capacity of the drain is limited by a series of east-west road crossings east of Selma. Enlarging these road crossings and constructing check structures at three specific locations (above and below Nebraska Avenue and above Mt. View Avenue) would increase both the flow capacity and the volume of water that can be diverted to the drain for recharge. It is estimated that an additional four acres of the drain could be wetted with these improvements.

Table E-7. Project CU3G/ CID No. 12 CID Ward Drainage Canal Capacity Enlargement

Proposal Title		Upper Kings IRWMP				
Project Title		CID Groundwater Mitigation and Banking Program, Project CU3G/CID No. 12- Ward Drainage Canal Capacity Enlargement				
Budget Category		Other State (1)	Non-State Share (Funding Match)	Requested Grant Funding	Total	% Funding Match
(a)	Direct Project Administration Costs		$6,188	$6,188	$12,375	
(b)	Land Purchase/Easement				$0	
(c)	Planning/Design/Engineering/ Environmental Documentation		$8,250	$8,250	$16,500	
(d)	Construction/Implementation			$165,000	$165,000	
(e)	Environmental Compliance/ Mitigation/Enhancement		$4,125	$4,125	$8,250	
(f)	Construction Administration		$6,188	$6,188	$12,375	
(g)	Other Costs				$0	
(h)	Construction/Implementation Contingency			$20,625	$20,625	
(i)	Grand Total (Sum rows (a) though (h))	$0	$24,750	$210,375	$235,125	
(j)	Calculation of Funding Match %			$210,375	$235,125	11%
Local match met through local District revenues and fees Assume 50/50 split of state/nonstate for a, c, e, f						

Other Project Sites and Other Improvements

CID is actively seeking other properties and tracking the agricultural real estate market. Protocols for site characterization, site design, and environmental clearance have been developed so that CID can rapidly respond to market opportunities and acquire property. In addition, CID is mapping and characterizing existing infrastructure, and has also developed a preliminary plan for rehabilitation and betterment of CID facilities (Engineer's Report, *Urban Impacts Study*, Summers Engineering, 2007) that includes an evaluation of the replacement value of the CID system.

Table E-8. Update the Groundwater Management Plan

Proposal Title		Upper Kings IRWMP				
Project Title		Update of CID GWMP				
	Budget Category	Other State (1)	Non-State Share (Funding Match)	Requested Grant Funding	Total	% Funding Match
(a)	Direct Project Administration Costs				$0	
(b)	Land Purchase/Easement				$0	
(c)	Planning/Design/Engineering/ Environmental Documentation		$95,000		$95,000	
(d)	Construction/Implementation				$0	
(e)	Environmental Compliance/ Mitigation/Enhancement				$0	
(f)	Construction Administration				$0	
(g)	Other Costs				$0	
(h)	Construction/Implementation Contingency				$0	
(i)	Grand Total (Sum rows (a) though (h) for each column)	$0	$95,000	$0	$95,000	
(j)	Calculation of Funding Match %			$0	$95,000	100.0%
Local match met through local District revenues and fees Assume 50/50 split of state/nonstate for a, c, e, f						

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Appendix E Figures

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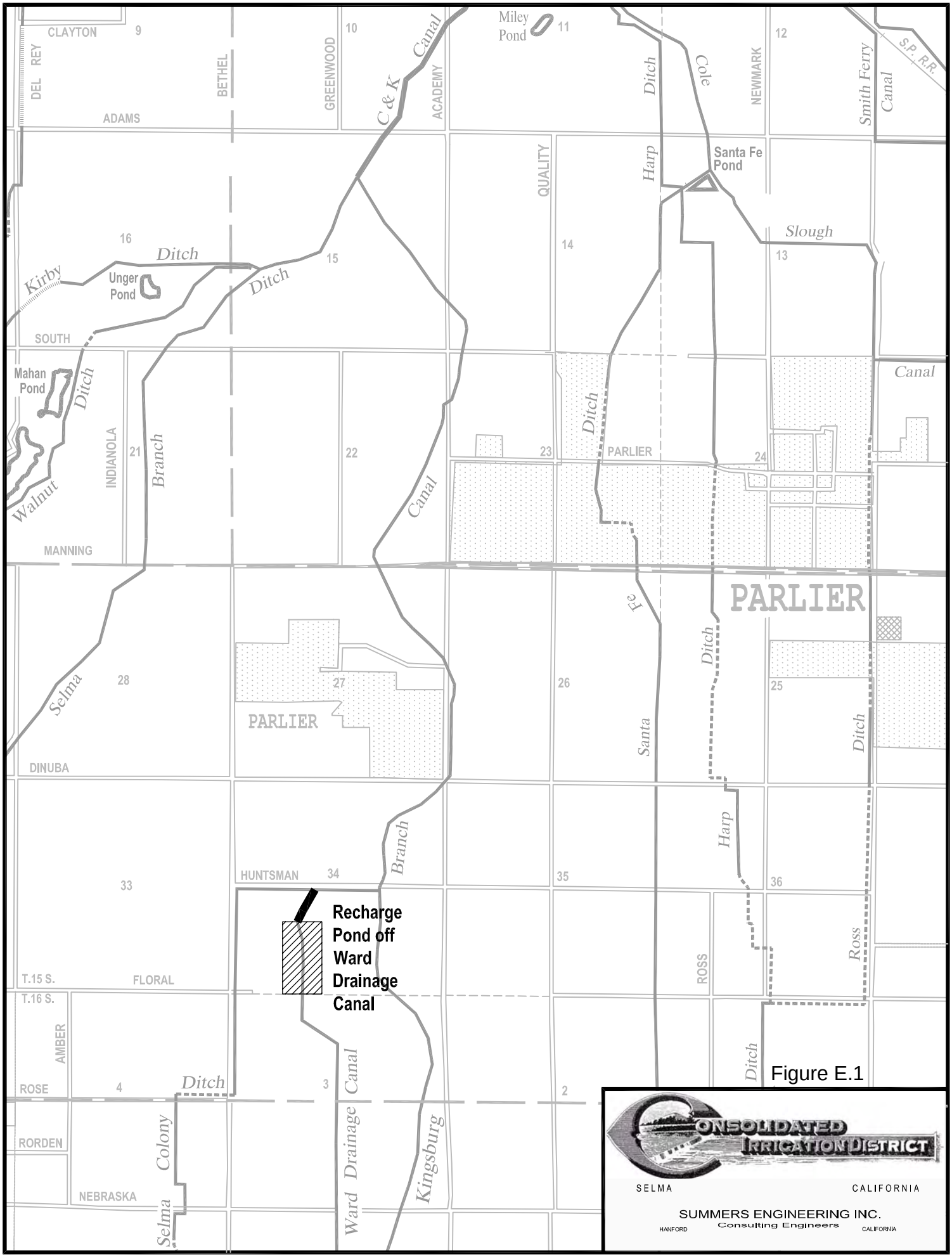

CLAYTON
DEL REY
BETHEL
GREENWOOD
ACADEMY
C & K Canal
Miley Pond
Ditch
Cole
NEWMARK
Smith Ferry Canal
S.P. R.R.
ADAMS
QUALITY
Harp
Santa Fe Pond
Slough
Kirby
Unger Pond
Ditch
Ditch
SOUTH
Mahan Pond
Ditch
INDIANOLA
Branch
Canal
Ditch
PARLIER
Canal
Walnut
MANNING
PARLIER
Selma
PARLIER
Santa Fe
Ditch
Ditch
DINUBA
Branch
Harp
HUNTSMAN
Recharge Pond off Ward Drainage Canal
ROSS
Ross
T.15 S.
FLORAL
T.16 S.
AMBER
ROSE
Ditch
Ward Drainage Canal
Kingsburg
Colony
RORDEN
NEBRASKA
Selma
Ditch
SELMA
CALIFORNIA
SUMMERS ENGINEERING INC.
HANFORD
Consulting Engineers
CALIFORNIA

Figure E.1

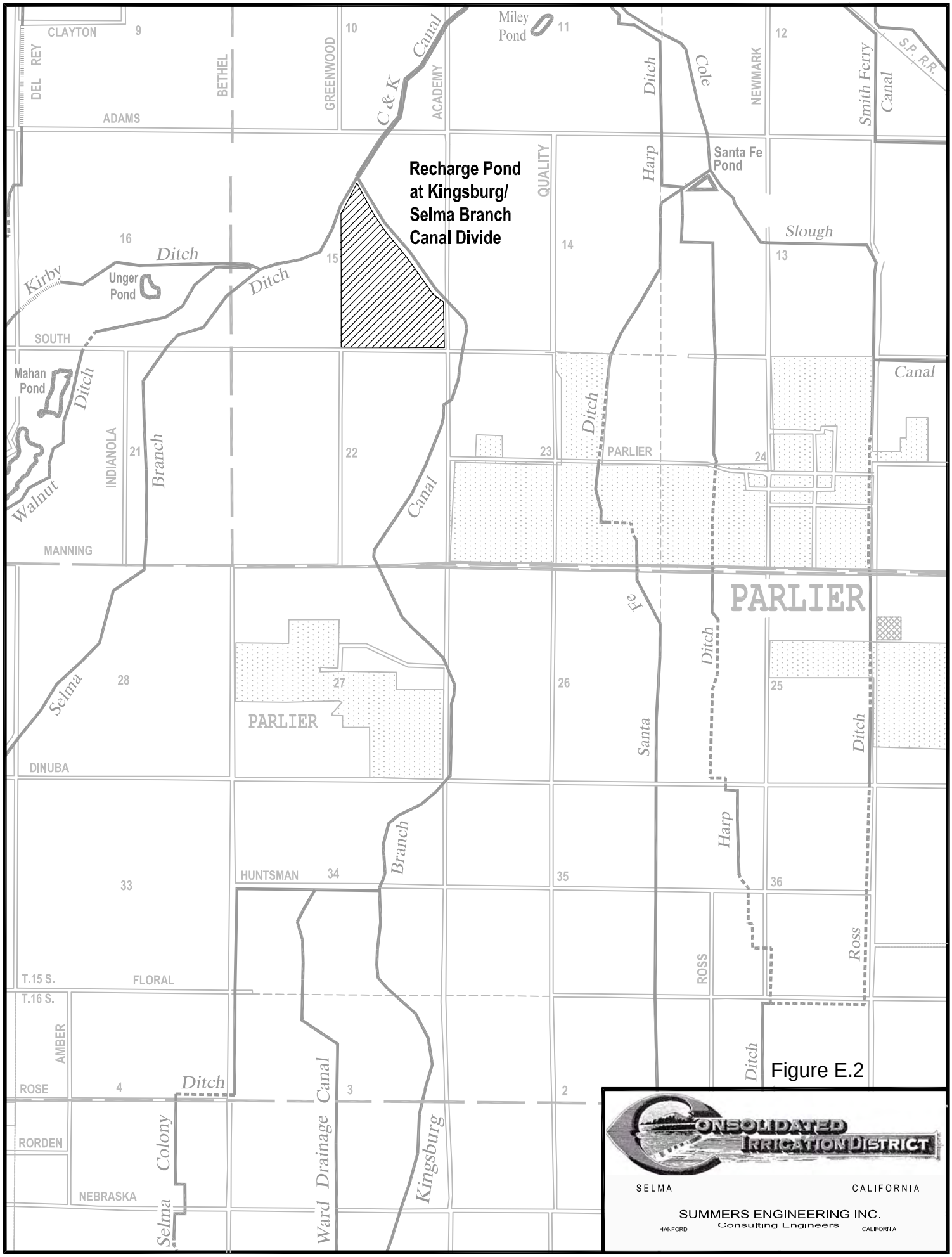


Figure E.2

CONSOLIDATED IRRIGATION DISTRICT
SELMA CALIFORNIA

SUMMERS ENGINEERING INC.
HANFORD Consulting Engineers CALIFORNIA

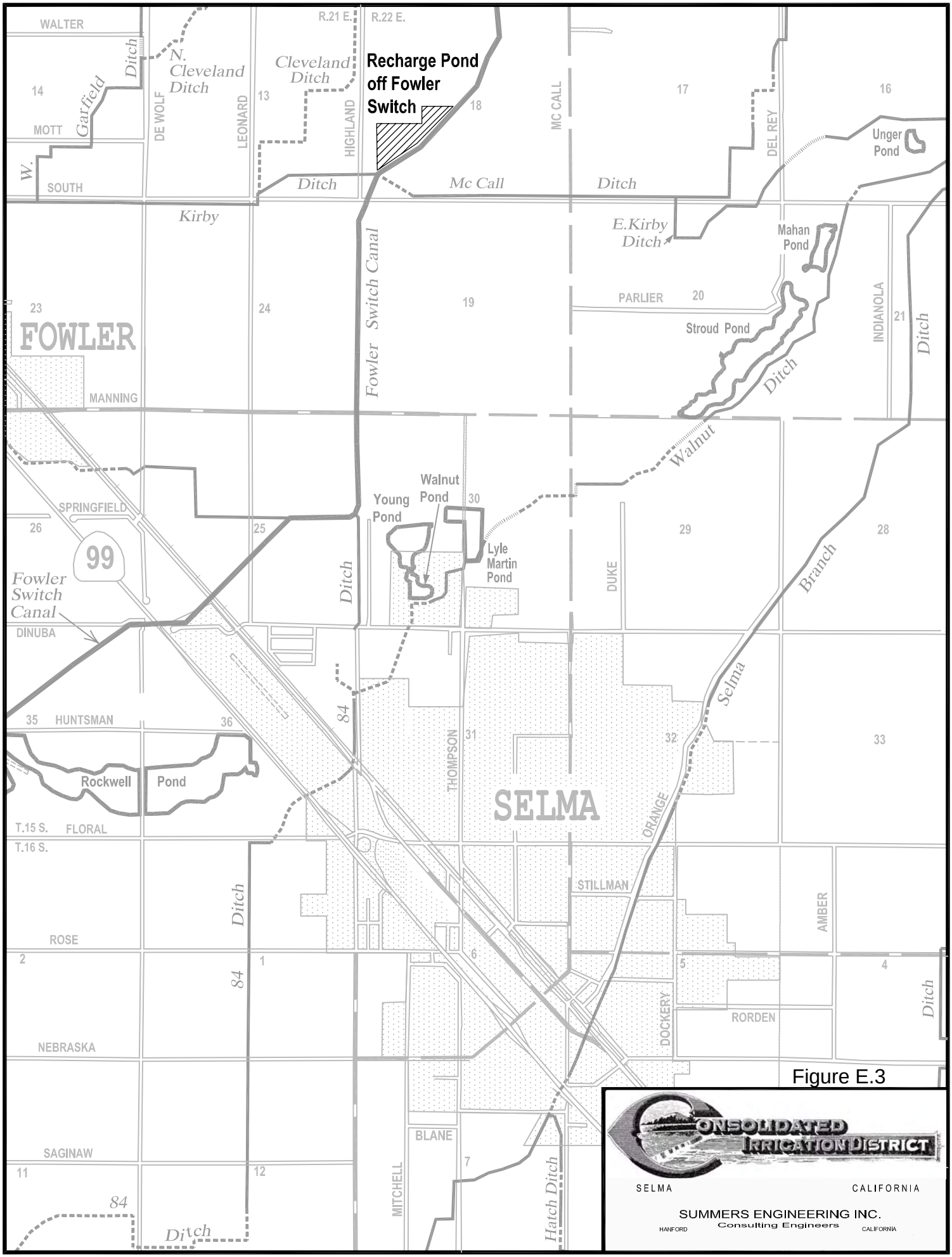


Figure E.3

CONSOLIDATED IRRIGATION DISTRICT
SELMA CALIFORNIA
SUMMERS ENGINEERING INC.
HANFORD Consulting Engineers CALIFORNIA

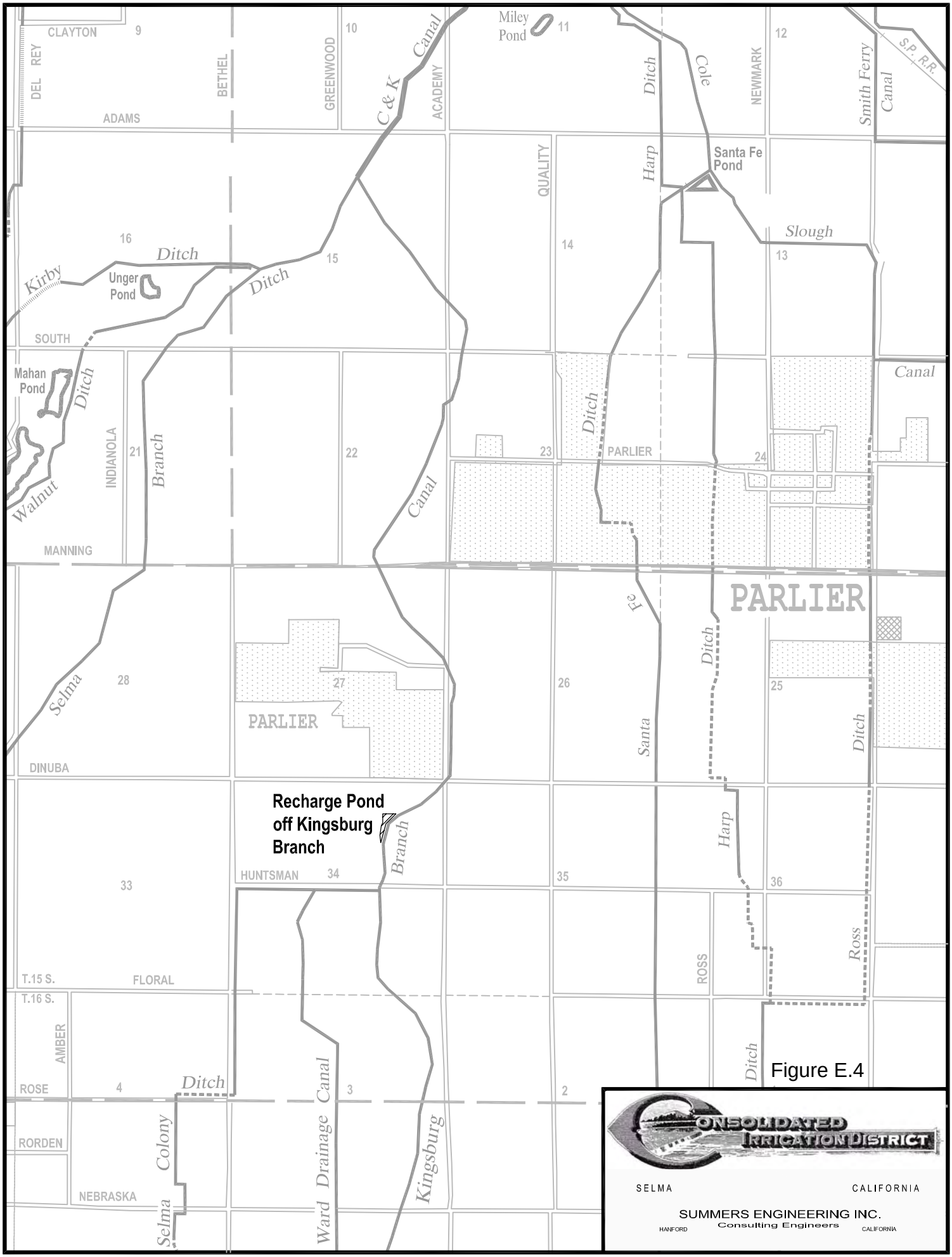


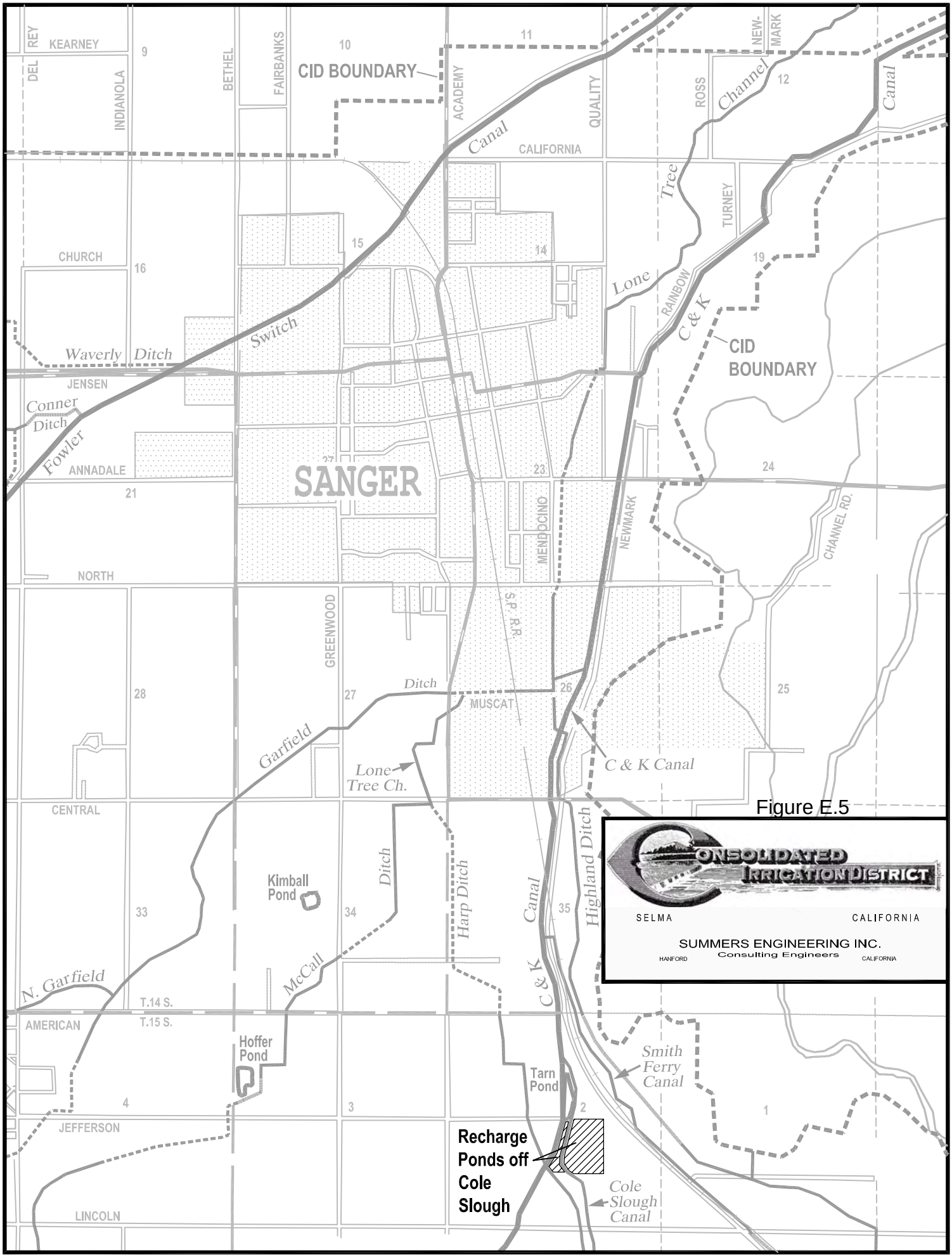
Figure E.4

CONSOLIDATED IRRIGATION DISTRICT

SELMA CALIFORNIA

SUMMERS ENGINEERING INC.

HANFORD Consulting Engineers CALIFORNIA


KEARNEY
REY
DEL
INDIANOLA
BETHEL
FAIRBANKS
CID BOUNDARY
ACADEMY
QUALITY
ROSS
NEW-
MARK
Channel
Canal
CALIFORNIA
Tree
TURNEY
CHURCH
Lone
RAINBOW
C & K
CID
BOUNDARY
Waverly Ditch
Switch
JENSEN
Conner
Ditch
Fowler
ANNADALE
SANGER
MENDOCINO
NEWMARK
CHANNEL RD.
NORTH
GREENWOOD
S.P. R.R.
Ditch
MUSCAT
Garfield
Lone
Tree Ch.
C & K Canal
CENTRAL
Kimball
Pond
Ditch
Harp Ditch
Canal
Highland Ditch
McCall
N. Garfield
T.14 S.
T.15 S.
AMERICAN
Hoffer
Pond
Tarn
Pond
Smith
Ferry
Canal
JEFFERSON
Recharge
Ponds off
Cole
Slough
Cole
Slough
Canal
LINCOLN
Figure E.5
CONSOLIDATED IRRIGATION DISTRICT
SELMA
CALIFORNIA
SUMMERS ENGINEERING INC.
HANFORD
Consulting Engineers
CALIFORNIA

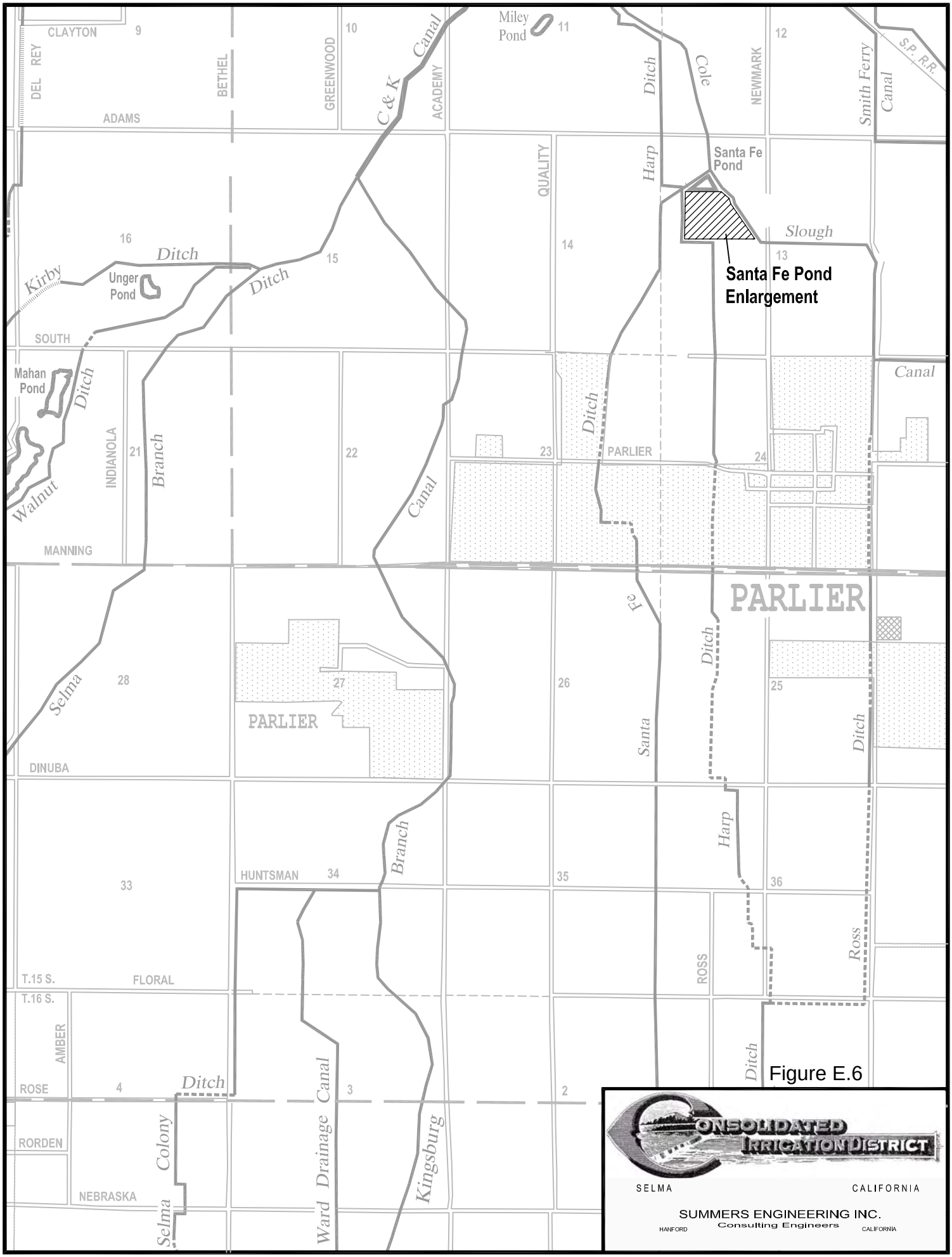


Figure E.6

CONSOLIDATED IRRIGATION DISTRICT
SELMA CALIFORNIA

SUMMERS ENGINEERING INC.
HANFORD Consulting Engineers CALIFORNIA

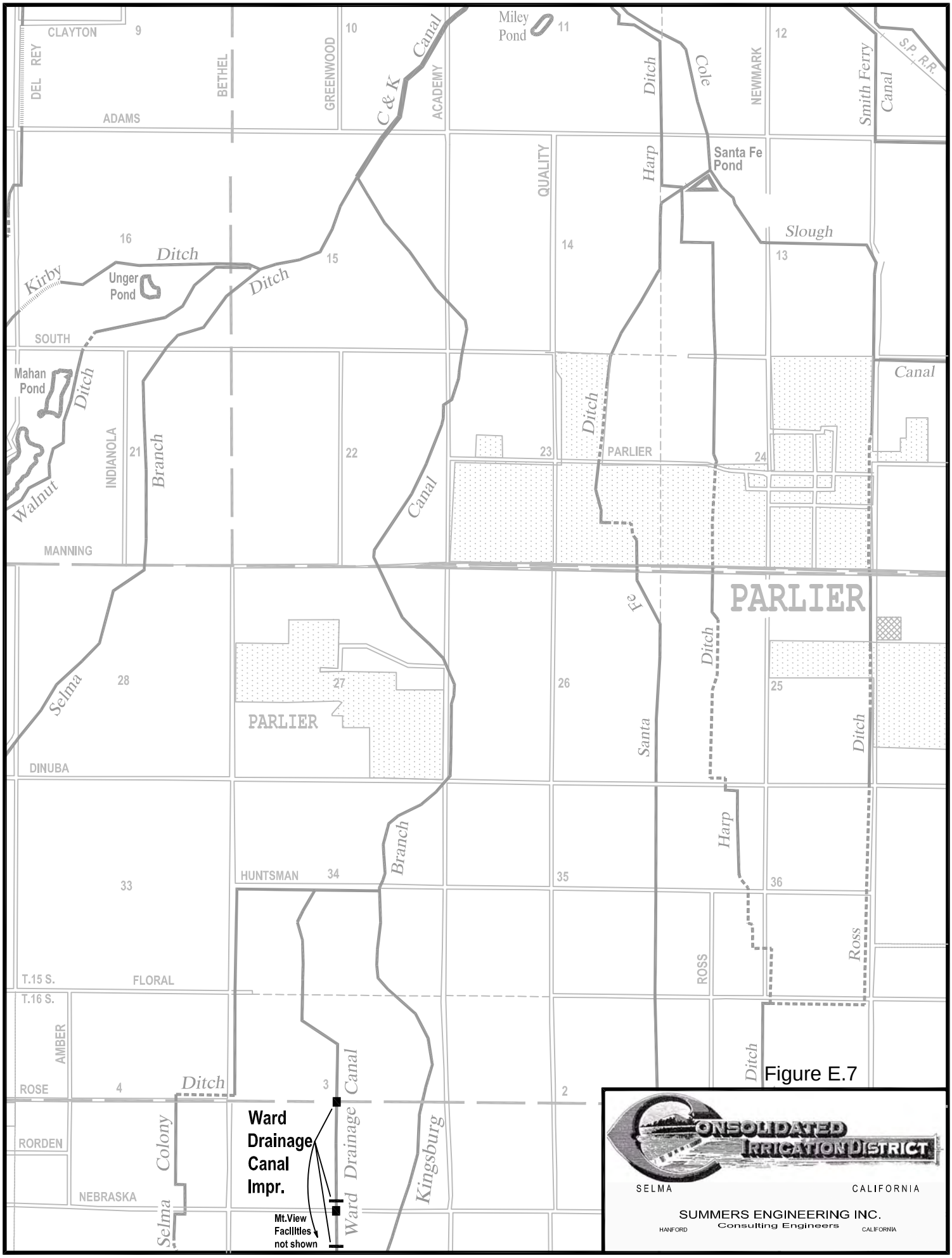

CLAYTON
DEL REY
BETHEL
GREENWOOD
C & K Canal
ACADEMY
Miley Pond
Ditch
Cole
NEWMARK
Smith Ferry Canal
S.P. R.R.
ADAMS
QUALITY
Harp
Santa Fe Pond
Slough
Kirby
Unger Pond
Ditch
Ditch
SOUTH
Mahan Pond
Ditch
INDIANOLA
Branch
Walnut
Canal
Ditch
PARLIER
Canal
MANNING
PARLIER
Selma
PARLIER
Santa Fe
Ditch
Ditch
DINUBA
Branch
Harp
HUNTSMAN
Ross
ROSS
T.15 S.
FLORAL
T.16 S.
AMBER
ROSE
Ditch
Canal
Ward Drainage Canal Impr.
Ward Drainage
Kingsburg
RORDEN
Colony
NEBRASKA
Selma
Mt.View Facilities not shown
CONSOLIDATED IRRIGATION DISTRICT
SELMA
CALIFORNIA
SUMMERS ENGINEERING INC.
HANFORD
Consulting Engineers
CALIFORNIA

Figure E.7

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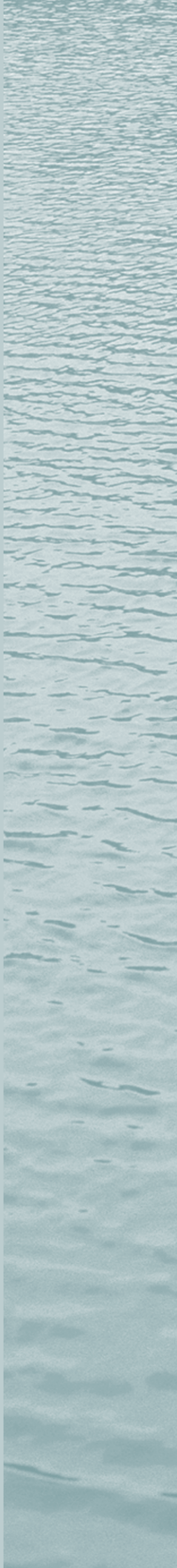

GEI Consultants

Consolidated Irrigation District
Groundwater Management Plan