AGENDA
IRVINE RANCH WATER DISTRICT
ENGINEERING AND OPERATIONS COMMITTEE
WEDNESDAY, JUNE 26, 2019

CALL TO ORDER 7:30 a.m., IRWD Operations Center, Committee Room
3512 Michelson Drive, Irvine, California 92612

ATTENDANCE Committee Chair: Doug Reinhart _____
Committee Member: Mary Aileen Matheis _____

ALSO PRESENT	Paul Cook _____	Kevin Burton _____	Paul Weghorst _____
	Jose Zepeda _____	Wendy Chambers_____	Tom Roberts _____
	Rich Mori _____	Eric Akiyoshi _____	Richard Mykitta _____
	Kelly Lew _____	Jim Colston _____	Ken Pfister _____
	Lars Oldewage _____	Steve Malloy _____	Scott Toland _____
	John Dayer _____	Bruce Newell _____	_____ _____
	Malcolm Cortez _____	_____ _____	_____ _____
	_____ _____	_____ _____	_____ _____

NOTICE: If you wish to address the Committee on any item, please file your name with the Committee. Forms are provided at the meeting. Remarks are limited to three minutes per speaker on each subject.

COMMUNICATIONS

1. Notes: Burton
2. Public Comments
3. Determine the need to discuss and/or take action on item(s) introduced that came to the attention of the District subsequent to the agenda being posted.
4. Determine which items may be approved without discussion.

INFORMATION

5. ELECTRONIC BIDDING SYSTEM FOR CONSTRUCTION OF CAPITAL PROJECTS – LYNCH / MOEDER / MORI / BURTON

   Recommendation: Receive and file.

6. POWER OUTAGE PREPAREDNESS PLANNING UPDATE – MYKITTA / CHAMBERS

   Recommendation: Receive and file.

ACTION

7. MICHELSON FORCE MAIN IMPROVEMENTS BUDGET INCREASE, CONTRACT CHANGE ORDER AND VARIANCE – BONKOWSKI / CORTEZ / BURTON

   Recommendation: That the Board authorize a budget increase in the amount of $750,000, from $2,217,300 to $2,967,300, authorize the General Manager to execute Contract Change Order No. 7 in the amount of $113,317.72 with Insituform Technologies, and authorize the General Manager to execute Variance No. 4 in the amount of $46,370 with Kleinfelder for the Michelson Force Main Improvements, Project 07097.

8. REPORT ON WATER QUALITY RELATIVE TO PUBLIC HEALTH GOALS – OLDEWAGE / COLSTON / BURTON

   Recommendation: That a public hearing on the Report on Water Quality Relative to Public Health Goals be held on July 8, 2019 at IRWD's Regular Board meeting to accept any public comments that may be provided regarding the report.

OTHER BUSINESS

9. Directors' Comments

10. Adjourn

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Availability of agenda materials: Agenda exhibits and other writings that are disclosable public records distributed to all or a majority of the members of the above-named Committee in connection with a matter subject to discussion or consideration at an open meeting of the Committee are available for public inspection in the District's office, 15600 Sand Canyon Avenue, Irvine, California ("District Office"). If such writings are distributed to members of the Committee less than 72 hours prior to the meeting, they will be available from the District Secretary of the District Office at the same time as they are distributed to Committee Members, except that if such writings are distributed one hour prior to, or during, the meeting, they will be available at the entrance of the meeting room at the District's Operations Committee Room at 3512 Michelson, Irvine, California. The Irvine Ranch Water District's Committee Room is wheelchair accessible. If you require any special disability-related accommodations (e.g., access to an amplified sound system, etc.), please contact the District Secretary at (949) 453-5312 during business hours at least seventy-two (72) hours prior to the scheduled meeting.

June 26, 2019
Prepared by: T. Lynch / J. Moeder / R. Mori
Submitted by: K. Burton
Approved by: Paul A. Cook

ENGINEERING AND OPERATIONS COMMITTEE

ELECTRONIC BIDDING SYSTEM FOR CONSTRUCTION OF CAPITAL PROJECTS

SUMMARY:

In recent years, several electronic bidding (eBidding) systems have been developed and used successfully by other water agencies and local governments to automate and improve construction advertising and bidding processes. Over the past 18 months, staff reviewed and evaluated several eBidding systems to automate and streamline IRWD's traditional advertising and bidding processes. Staff selected eBidding platform PlanetBids and has begun transitioning to eBidding. At the Committee meeting, staff will provide an update that describes the evaluation process, the benefits of the selected eBidding system, and the transition plan.

BACKGROUND:

IRWD typically advertises approximately 20 capital projects per year for construction to a select list of bidders. Traditional advertisement of construction projects is labor intensive for staff and bidding contractors. The traditional process consists of several manual steps including staff emailing and mailing notices to a select list of bidders to notify them of the construction project, contractors purchasing hard copies of the construction documents to determine the full scope of the project, staff conducting public bid openings, and staff manually preparing summary reports. This system can result in bid errors because bidding contractors complete the bid forms and calculate bid totals manually. When errors occur, staff and legal counsel spend substantial time reviewing the errors to determine bid responsiveness. Electronic bidding systems that streamline the traditionally manual and labor intensive advertising and bidding processes are now available and have begun to be used by other water agencies and local governments. Local agencies and governments generally use electronic bidding in addition to maintaining portions of their paper bidding procedures, and they advertise to all contractors rather than a select list of bidders.

In an effort to improve efficiency and to streamline IRWD's advertising and bidding processes, staff reviewed and evaluated several electronic bidding systems. Staff selected a preferred e-Billing system and has begun the transition to fully convert to an electronic bidding system that maintains the ability to advertise to a select bidders list.

Electronic Bidding System for Construction of Capital Projects:

In January 2018, staff began researching companies that offer eBidding services. Through this process, staff received demonstrations from various online bidding companies and determined the electronic bidding service, PlanetBids, provides a platform best suitable for IRWD's bidding needs. Staff subsequently attended meetings with South Orange County Wastewater Authority and the City of Irvine, which are both PlanetBids users, to discuss eBidding implementation and to receive feedback on their use of the platform.

The PlanetBids platform provides free-of-charge downloadable access to contract documents to all interested contractors and vendors, networking capabilities between prime and subcontractors, automatically generated reports, and controls that reduce the potential for errors in contractor bid proposals. These features, among other benefits including online bid submissions and openings, greatly reduce staff time during the bidding phase and enhance communication with all contractors and vendors interested in the project.

eBidding Implementation and Initial Results:

In January 2019, staff executed an agreement between IRWD and PlanetBids and started thoroughly testing the eBidding platform. In April, staff advertised the first project through PlanetBids, the Ladd Canyon Pipeline Project, which served as the initial live test of the system. Staff held a mandatory pre-bid meeting with the contractors to discuss the project and the new electronic bidding process. During this meeting, it was clear that the transition to PlanetBids would be smooth since all of the contractors had previous experience submitting bids through the system. During the bidding phase, staff used the platform to track bidder activity including when and which contract documents were being downloaded and to view and respond to bidder questions. Similarly, bidders utilized PlanetBids to post questions, acknowledge addenda, and enter bids for the various bid items. Staff held the electronic bid opening on May 21, and five contractors submitted bids. After the bid opening, staff used the automatic reporting tools to generate reports that summarize the bid proposal and all of the licensing information for the prime contractors and subcontractors.

Overall, the first electronic bid process was successful, and staff is proceeding with a full rollout of the system. In the coming months, staff will conduct eBidding training for IRWD project managers, coordinate with IRWD's prequalified contractors to ensure their registration with PlanetBids, and formally update the Project Manual front-end documents with provisions associated with eBidding. Staff anticipates providing a recommendation to the Board in July to adopt the revised front-end documents, after which all construction projects will be advertised for bid using the eBidding system.

FISCAL IMPACTS:

IRWD entered into a three-year support services agreement with PlanetBids in the total amount of $30,931.74, from January 7, 2019 to January 6, 2022. The agreement costs are included in, and will be funded by, the Operating Budget.

ENVIRONMENTAL COMPLIANCE:

Not applicable.

RECOMMENDATION:

Receive and file.

LIST OF EXHIBITS:

Exhibit "A" – Electronic Bidding Presentation

Electronic Bidding System for Construction of Capital Projects

Engineering & Operations Committee

June 26, 2019

Agenda

- Current Bid Process Overview – Why eBidding
- Electronic Bidding Evaluation and Selection
- Overview of PlanetBids
- Results from first Electronic Bid

Current Bid Phase Process – Why eBidding

- Existing Process:
  - Labor intensive and manual process
  - Paper Advertisement
  - Addenda reminders and confirmations
  - Purchase hard copies of contract documents
  - Contractor submits hard copy of bid
  - Prone to errors and bid irregularities

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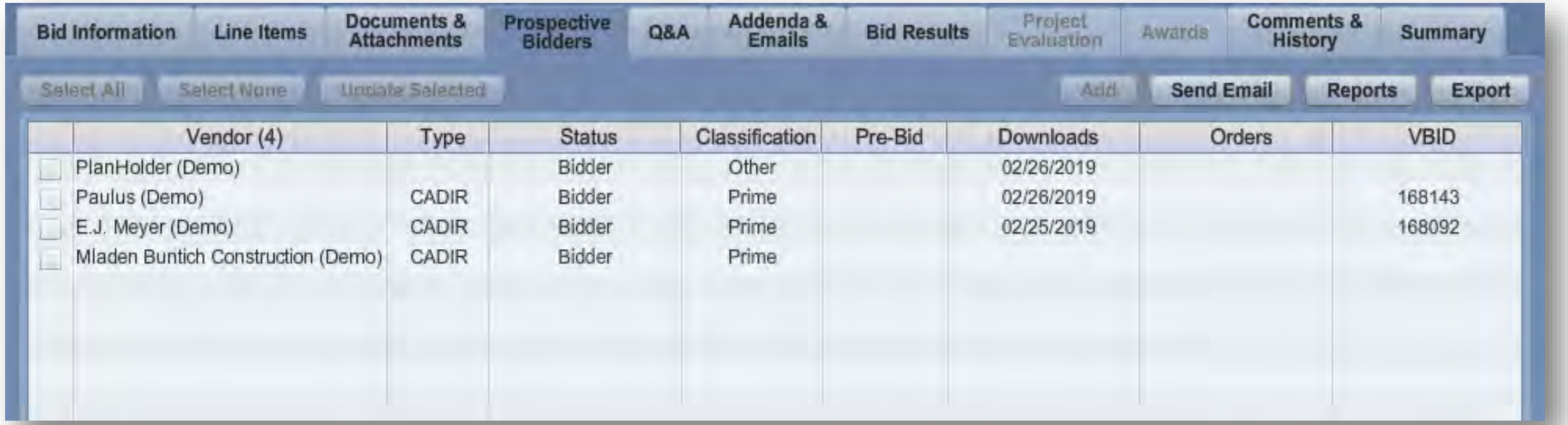
Benefits to Electronic Bidding – Why eBidding

- Electronic Bidding:
  - Reduces staff time
  - Controls to reduce bid errors and irregularities
  - Automated reporting tools
  - Downloadable contract documents
  - Convenient bid opening
  - Contractor networking
  - Stores information from previous bids

Background

Evaluation Phase	JAN – JUL 2018	• Documented existing process • Interviewed other Agencies and Contractors • Finalized PlanetBids recommendation
Agreement Phase	JUL – DEC 2018	• Negotiated and executed PlanetBids Service Agreement
Implementation Phase	JAN – MAR 2019	• Prepared IRWD specific User Manual, training material, and project manual front end documents • Go Live

PlanetBids Snapshots



- Electronic documents
- Controls that reduce bid errors and staff time
- Time stamped and logged information
- Bidders can ask questions

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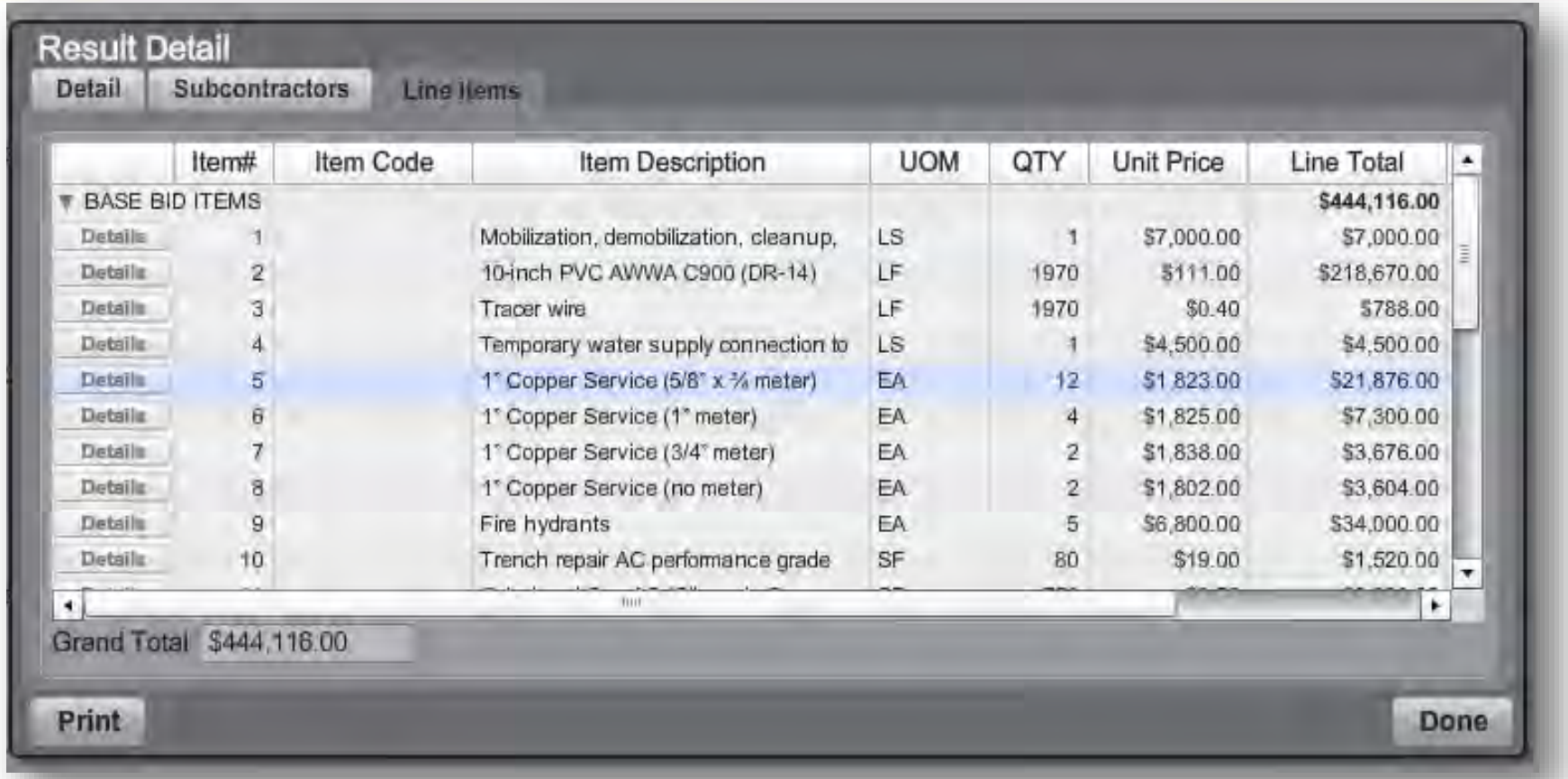
PlanetBids Snapshots



- Any vendor can view bid results
- Bid openings can be viewed remotely

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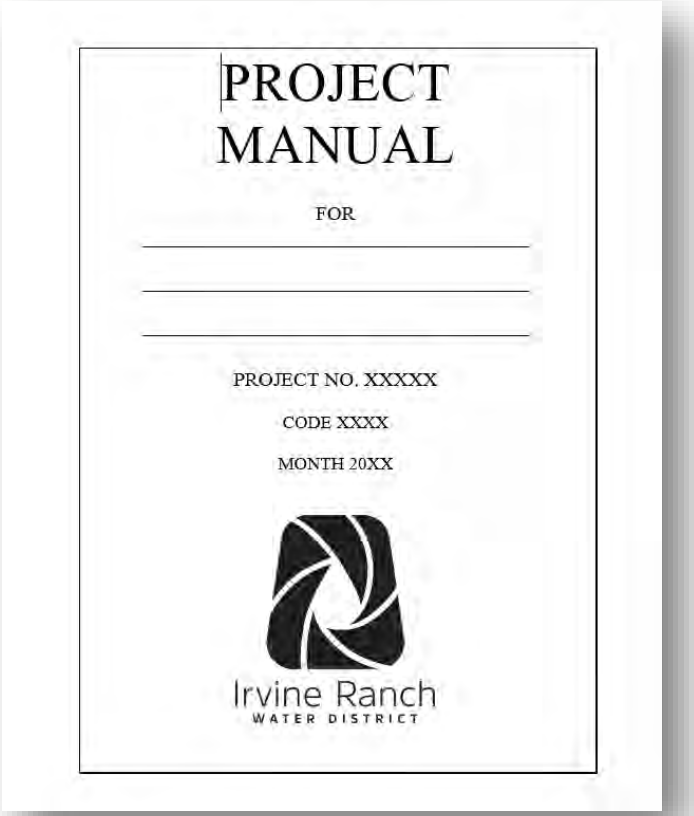
Revisions to Front End Documents

- Revised wording for electronic submission
- Schedule of Work Items
- Information for Subcontractors
- Bid Security Declaration
- Anticipate presenting revised Front End Documents to Board in July


PROJECT
MANUAL

FOR

PROJECT NO. XXXXX

CODE XXXX

MONTH 20XX

Irvine Ranch
WATER DISTRICT

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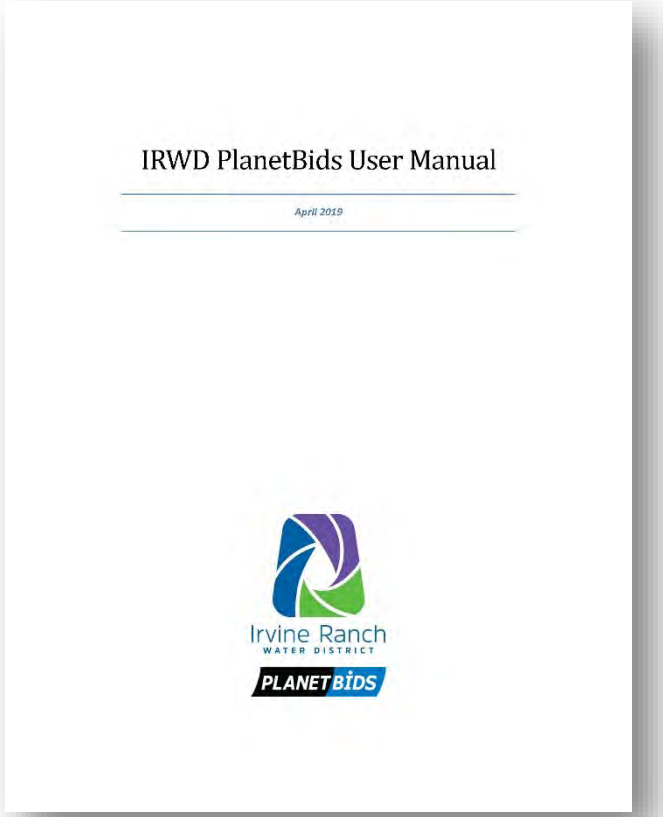
IRWD PlanetBids User Manual

- Roadmap for staff responsible for electronic bidding
- Documents process for creating bid, reports, conducting bid openings and communicating information



Changes to Bid Process

- Advertisement
  - Communicate through PlanetBids
  - Contractor can download electronic version of Contract Documents or order hard copies
- Bid Opening
  - Will be located in Sand Canyon meeting rooms
  - Most contractors will view opening remotely
- Construction Award
  - Write-up will have table with totals from each bidder and line items from lowest bidder

Contractor	Bid Amount
Engineer's Estimate	*$ 617,515*
Paulus Engineering, Inc.	$ 444,116
T.E. Roberts, Inc.	$ 519,528
Sukut Construction	$ 844,875
Ferreira Construction	$ 875,425
Leatherwood Construction	$1,265,090

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Electronic Bidding – Sample Project

- Ladd Canyon Road 10-inch Domestic Water Improvements
  - Approximately 2,000-feet of 10-inch pipe and 20 residential service connections
- Contractor Experience:
  - familiar with the e-bidding platform
  - utilized the questions and answer feature to submit bidder questions
- Staff Experience:
  - User friendly
  - Saved time
  - Efficient communication
  - Simple and accurate reporting tools

Next Steps

• Project Manager Training	July 2019
• Adopt revised front end documents	July 2019
• Advertise Bonita Pipeline Replacement project	July 2019
• Roll-out full use of PlanetBids on all Construction Projects	September 2019

Questions?

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June 26, 2019
Prepared by: R. Mykitta
Submitted by: W. Chambers
Approved by: Paul A. Cook

ENGINEERING AND OPERATIONS COMMITTEE

POWER OUTAGE PREPAREDNESS PLANNING UPDATE

SUMMARY:

In accordance with IRWD's 2019 Target Activities, staff is conducting an assessment of the District's ability to continue operation of key facilities during short- and long-term power outages. At the Committee meeting, staff will provide an update of analyses performed to date and will review the scenarios being evaluated. The discussion will cover capabilities during an outage and will present risks and dependencies associated with a long-term power interruption.

BACKGROUND:

IRWD's existing emergency generation systems are designed to manage localized short-term power outages that are experienced throughout the year. Additionally, the existing facilities can support a short-term full power outage across the District. During a longer power outage, IRWD's ability to provide services becomes more dependent on resources beyond IRWD. The following is a summary of the potential impacts to IRWD's ability to continue to provide basic services in the event of a prolonged power outage.

Potential Impacts from an Extended Power Outage on District Operations:

To determine the impact of potential power outages to IRWD, it is important to understand that the vulnerabilities associated with being dependent on outside entities will vary greatly according to circumstances. For example, an electrical power interruption not associated with a natural disaster may have no effect on the diesel fuel supply or other outside resources. Therefore, IRWD should be able to provide adequate services for an extended period of time. A significant major natural disaster, such as a 7.8 magnitude earthquake on the southernmost section of the San Andreas Fault (as described in the United States Geological Service's "Shake Out Scenario"), requires a deeper analysis. To determine the potential impacts on District operations from a disaster of this magnitude, staff focused on the potable water system, the sewage collection system (including lift stations), and the water recycling systems. Summaries of expected challenges including dependencies and limitations are provided below:

Potable Water System: In a complete electrical power interruption, the potable water system can meet water demands if imported water is available. If electrical service and imported water supplies are both unavailable, IRWD's groundwater production resources will not be adequate to meet demands due to emergency power generation limitations.

Sewage Collections System: Most of the IRWD sewage collection system operates with gravity. In a complete power outage, all necessary lift stations can be operated using both permanent and portable generators. Extended operation is dependent upon the diesel fuel supply.

Water Recycling Systems:

- In a complete power outage, the Michelson Water Recycling Plant (MWRP) relies on both diesel and natural gas power to generate electricity and sustain operations. The existing emergency generation system can support treatment at a daily average incoming flowrate of approximately 10 million gallons per day (MGD). (Note that current flows into the MWRP average 20.5 MGD). At reduced flow rates, portable diesel generation can sustain operations, but only if natural gas supplies are not available to the Plant. Beyond 10 MGD, sewage diversions to OCSD will be required to avoid sewage releases. The MWRP Biosolids and Energy Recovery Facilities is not designed to operate during an extended electrical power outage. Supplemental power generation is available to bring the unit to a stable state only. Once stable, the system will be shut down and solids would be diverted to OCSD;

- The Los Alisos Water Recycling Plant (LAWRP) is equipped with power generating facilities and will be operational during a power outage. Operation beyond two days is dependent upon the diesel fuel supply; and

- During power outages of a long duration, customer demands for recycled water demands will not be as urgent, so the recycled water distribution system will be managed as a lower priority. Recycled water distribution will be curtailed to conserve resources that can be directed to sewage treatment and domestic water operations.

<u>IRWD's Dependencies to Continue Service in a Power Outage:</u>

IRWD's ability to continue sewage treatment and domestic water deliveries during a complete electrical power supply interruption will rely substantially on IRWD's access to the following:

- Diesel fuel supplies;
- Natural gas from Southern California Gas;
- Imported potable water supply from Metropolitan Water District; and
- Orange County Sanitation District's (OCSD) system to divert sewage flows.

Diesel Fuel Supply:

Bulk diesel fuel storage that is used in daily operations can vary from 14,400 gallons (full) to 7,500 gallons (the reorder point). Each permanently installed generation system has storage tanks that fluctuate from 75% to 100% full and can generally last for one to two days before refueling is required. IRWD utilizes a County of Orange contract to acquire diesel fuel supplies. The contract contains a standard force majeure provision; there is no provision in the contract that sets IRWD as a priority in an emergency. Diesel consumption is highly variable across a large number of generators. Using a significant power outage as a possible scenario, diesel resupply to the system will be required by the close of the second day without power. Additional daily deliveries of one to three truckloads will be necessary for each day the power remains unavailable. Diesel consumption volumes increase in worst-case scenarios such as a situation where expected sewage flowrates and domestic water demand reductions do not occur.

Bulk diesel fuel storage that is used in everyday operations can vary from 14,400 gallons (full) to 7,500 gallons (re-order point). Each permanently installed generation system has storage tanks that fluctuate from 75% to 100% full and can generally last one to two days before refueling is required. IRWD currently contracts through the County of Orange to acquire diesel fuel. The contract contains a standard "Force Majeure" provision; there is no contract provision that identifies IRWD's needs as a priority in an emergency.

Diesel consumption is highly variable across a large number of generators. Using a significant power outage as a possible scenario, diesel resupply to the system will be required by the close of the second day without power. Additional daily deliveries of one to three truckloads will be necessary for each day the power remains unavailable. Diesel consumption volumes increase in worst-case scenarios such as a situation where expected sewage flowrates and domestic water demand reductions do not occur.

In a major catastrophic event, the California of Governor would likely declare a disaster by signing Emergency Order No. 6, followed by the California Energy Commission beginning to administer the Petroleum Fuels Set-Aside Program. The intent of this program is to ensure emergency services and critical infrastructure operates during the regional shortage or a declared disaster. Until the emergency order is in place, the program does not prevent IRWD from exercising the market to purchase fuel supplies. Once in place, IRWD will need to utilize the Set-Aside Program to replenish diesel supply.

Natural Gas Supply:

A significant portion of the emergency generation system at MWRP and several other services within the District (e.g., sewer cleaning trucks) use natural gas as the fuel supply. A major event that is significant enough to damage the electrical power grid will likely damage the natural gas supply system (the pipelines are often installed in the same utility right-of-ways) making the delivery of natural gas difficult. IRWD currently has no storage facilities for natural gas.

Imported Water from Metropolitan:

If a power outage reduced or eliminated IRWD's ability to produce and treat groundwater to meet customer demands, IRWD is well-positioned to compensate for this reduced production by increasing its purchases of imported water. If a power outage is broader that just central Orange County, it is probable that imported water supplies from Metropolitan would also be reduced or unavailable. Immediate water conservation would reduce customer demands quickly, but in a sustained power outage scenario IRWD's stored water supplies would be exhausted within hours.

Sewage Diversions to OCSD:

In sewage scenarios where average influent flow rates to MWRP exceed 10 MGD, sewage must be diverted to OCSD. When the Biosolids facility is shut down, sludge must be diverted to OCSD. It is our understanding that OCSD's emergency planning window assumes a power outage of two days maximum.

To develop better estimates of resources needed and to reduce risk to IRWD during an extended power outage, the following issues need to be addressed:

- Determine the number of days of operation for which the District should plan;
- Confirm OCSD's capabilities in a long-term outage;
- Define IRWD's capabilities during the planned outage period;
- Continue to study natural gas and diesel supplies, and confirm vulnerabilities; and
- Confirm the practice of managing diesel fuel tankage levels at stationary units.

Other Variables:

At the Committee meeting, staff will discuss other potential risks to consider that have not been included in this analysis. Examples include:

- Logistical issues of accessing the various sites and / or transport for refueling;
- Communication via phone, radio or internet; and
- Availability of staff to facilitate the response and ongoing operations.

Future Board discussions on this topic will include District objectives for appropriate levels of service during protracted power outage scenarios along with the estimated cost schedule for meeting these objectives.

FISCAL IMPACTS:

None.

ENVIRONMENTAL COMPLIANCE:

This activity is not subject to the California Environmental Quality Act (CEQA) as authorized under the California Code of Regulations, Title 14, Chapter 3, Section 15060 (c)(1) Preliminary Review. An activity is not subject to CEQA if the activity will not result in a direct or reasonably foreseeable indirect physical change to the environment.

RECOMMENDATION:

Receive and file.

LIST OF EXHIBITS:

None.

June 26, 2019
Prepared by: T. Bonkowski / M. Cortez
Submitted by: K. Burton
Approved by: Paul A. Cook

ENGINEERING AND OPERATIONS COMMITTEE

MICHELSON FORCE MAIN IMPROVEMENTS BUDGET INCREASE, CONTRACT CHANGE ORDER, AND VARIANCE

SUMMARY:

Rehabilitation of the existing 12-inch force main in Michelson Drive with cured-in-place pipe (CIPP) has been underway for many months and has encountered several challenges due to utility conflict, work hour changes, loss of production, and equipment stand-by charges. Staff recommends that the Board:

- Authorize a budget increase in the amount of $750,000, from $2,217,300 to $2,967,300;
- Authorize the General Manager to execute Contract Change Order (CCO) No. 7 in the amount of $113,314.72 with Insituform Technologies; and
- Authorize the General Manager to execute Variance No. 4 in the amount of $46,370 with Kleinfelder for the Michelson Force Main Improvements.

BACKGROUND:

The Michelson sewer force main, located in Michelson Drive between Jamboree Road and Riparian View, is a 12-inch ductile iron force main that conveys sewage from the Michelson Lift Station to either the Orange County Sanitation District or the Michelson Water Recycling Plant (MWRP). In summer 2015, staff repaired a corrosion-induced leak on the sewer force main in Michelson Drive, between the Michelson Lift Station and Riparian View. Video inspection of both force main segments revealed significant corrosion at most pipe joints. Kleinfelder completed the engineering design to rehabilitate both sewer force main segments with CIPP lining and a construction contract was awarded to Insituform Technologies.

Contract Change Order No. 7:

During the course of construction, an existing electrical duct bank within Michelson Drive was discovered that conflicted with the locations of proposed vaults on the force main, requiring changes to the civil and traffic control plan sheets. Insituform performed additional potholing and the plans were revised. Due to the conflicts, Vault No. 7, located east of Riparian View, was changed to a manhole, and changes to the traffic control plans were required by the City of Irvine. The traffic control scheme for construction activities within the street intersection of Michelson Drive and Riparian View will cause significant additional work including the daily covering and uncovering of the left turn pavement arrows with tape to prohibit westbound vehicles on Michelson Drive to turn left onto Riparian View. This additional work will cause a loss of production in installing the new sewer pipeline beyond the new Manhole No. 7, extending the construction schedule. Additionally, trench excavation and pipe installation are also affected by the proximity of the existing electrical duct bank. CCO No. 7 also includes additional hydrostatic pressure testing of the force main as a completed unit to ensure no leaks within the

new vaults. CCO No. 7, in the negotiated amount of $113,317.72, is attached as Exhibit "A". A construction change order summary is attached as Exhibit "B".

Variance No. 4:

Kleinfelder has completed additional work during the construction phase of this project including multiple revisions to the traffic control plans and coordination of the plans with the City of Irvine, a revision to the design of two vaults housing tee fittings due to conflicts with existing underground utilities, additional site visits and responses to Requests for Information, and plan revisions to reflect field conditions. Variance No. 4 in the amount of $46,370 is attached as Exhibit "C".

FISCAL IMPACTS:

Project 07097 is included in the FY 2019-20 Capital Budget. Staff requests a budget increase in the amount of $750,000 to fund construction of the project as shown in the following table:

Project No.	Current Budget	Addition <Reduction>	Total Budget
07097	$2,217,300	$750,000	$2,967,300

ENVIRONMENTAL COMPLIANCE:

This project is exempt from the California Environmental Quality Act (CEQA) and in conformance with California Code of Regulations Title 14, Chapter 3, 15301. Section 15301 provides exemption for minor alterations of existing structures, facilities, mechanical equipment, or topographical features, involving negligible or no expansion of use beyond that existing at the time of the lead agency's determination. Additionally, State Guideline 15282 provides exemptions for projects that involve the installation of new pipeline or maintenance, repair, restoration, removal, or demolition of an existing pipeline as set forth in Section 21080.21 of the Public Resources Code, as long as the project does not exceed one mile (or 5,280 feet) in length. A Notice of Exemption for the project was filed with the County of Orange on May 18, 2017.

RECOMMENDATION:

That the Board authorize a budget increase in the amount of $750,000, from $2,217,300 to $2,967,300, authorize the General Manager to execute Contract Change Order No. 7 in the amount of $113,317.72 with Insituform Technologies, and authorize the General Manager to execute Variance No. 4 in the amount of $46,370 with Kleinfelder for the Michelson Force Main Improvements, Project 07097.

LIST OF EXHIBITS:

Exhibit "A" – Contract Change Order No. 7
Exhibit "B" – Construction Change Order Summary
Exhibit "C" – Variance No. 4

CONTRACT CHANGE ORDER

EXHIBIT "A"

Irvine Ranch Water District
15600 Sand Canyon Avenue
P.O. Box 57000
Irvine, CA 92619-7000
(949) 453-5300

C.O. No. 7
☐ Final

Project No. 07097

Michelson Sewer Force Main Improvements
Project Title

Date: 6/20/2019

THE FOLLOWING CHANGE TO CONTRACT, DRAWINGS AND SPECIFICATIONS IS PROPOSED.	$ ADDITIONS	$ DELETIONS	DAYS ±
Addition costs for traffic control, time, lost production, change in scope & equipment at Vaults 4, 5 , 6 & 7 Insituform & MPS (Phase 2 work)	$ 113,314.72	$ -	4
The contract completion date is extended from August 23, 2019 to August 27, 2019			
TOTAL	$ 113,314.72	$ -	4

			DAYS ±
1. NET AMOUNT THIS CHANGE ORDER	=	$ 113,314.72	4
2. ORIGINAL CONTRACT AMOUNT	=	$ 1,787,045.00	110
3. TOTAL PREVIOUS CHANGE ORDER(S)	=	$ 322,980.57	355
4. TOTAL BEFORE THIS CHANGE ORDER (2+ 3)	=	$ 2,110,025.57	465
5. PROPOSED REVISED CONTRACT AMOUNT TO DATE (1+4)	=	$ 2,223,340.29	469

We hereby agree to make the above change subject to the terms of this change order for the sum of:

---------- One Hundred Thirteen Thousand Three Hundred Fourteen and 72/100 Dollars ----

6/20/2019	Insiituform	*David Bibayan*
Date	Contractor	By:

SIGNATURE	DATE	APPROVAL LEVEL REQUIRED	
	6/20/19	Department Director Approval Required	
IRWD Engineer or Consulting Engineer	Date	Executive Director Approval Required	
Malcolm A. Cortez	6/20/19	General Manager Approval Required	
Principal Engineer	Date	Board Approval Required	X
Executive Director of Engineering & Water Quality	Date		
General Manager	Date	607825 Purchase Order No.	

NOTE: The documents supporting this Change Order, including any drawings and estimates of cost, if required are attached hereto and made a part hereof. This Change Order shall not be considered as such until it has been signed by the Owner and the Contractor. Upon final approval, distribution of copies will be made as required. The parties mutually agree the pricing set forth in this Change Order are complete and fair compensation for the entirety of the work authorized under this Change Order and that no additional compensation is warranted nor shall it be allowed.

CHANGES: All workmanship and materials called for by this Change Order shall be fully in accord with the original Contract Documents insofar as the same may be applied without conflict to the conditions set forth by this Change Order. The time for completing the contract will not be extended unless expressly provided for in this Change Order.

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Michelson Forcemain Improvements
PR 07097
Construction Change Order Summary

EXHIBIT "B"

Contractor: Insituform Technologies, Inc
Design Engineer: Kleinfelder

Change Order		Description	Category	Initiated by (IRWD or Insituform)	Change Order Line Item Amount	Change Order Amount	Previous Change Orders	Cumulative Total of Change Orders	% of Original Contract Amount	Revised Contract Amount	Change Order Days	Previous Change Orders	Cum. Total C.O. days	Revised Total Contract Days	Revised Completion Date
		Contract Amount									Contract Days				Original Completion Date:
						Original Contract Amount:				$1,787,045.00		Original Days:		110	9/2/2018
1		Approved by Exe. Director of Engineering and Water Quality Approved on November 29, 2018				$37,079.59	$0.00	$37,079.59	2.07%	$1,824,124.59	21	0	21	131	9/23/2018
	1.1	Additional potholing due to unmarked AT&T duct bank and revisons to Vault 2	B	IRWD	$ 37,079.59										
2		Approved by Executive Director of Engineering and Water Quality Approved on February 4, 2019				$86,347.84	$37,079.59	$123,427.43	6.91%	$1,910,472.43	60	21	81	191	11/22/2018
	2.1	Additional costs for tools, equipment and lost production at Vaults 1, 2 and 3 for traffic control revisons due to mismarking of IRWD's existing pipelines, inadquate clearance (less than 5 feet) between construction zone and traffic.	B, C	Insituform	$ 86,347.84										
3		Approved by Executive Director of Engineering and Water Quality Approved on March 19, 2019				$0.00	$123,427.43	$123,427.43	6.91%	$1,910,472.43	161	81	242	352	5/2/2019
	3.1	Non-compensatory contract time extension for additional traffic control changes on Phase 1 segment	B, C	IRWD	$ -										
4		Approved by Executive Director of Engineering and Water Quality Approved on May 2, 2019				$42,098.21	$123,427.43	$165,525.64	9.26%	$1,952,570.64	0	242	242	352	5/2/2019
	4.1	Additional costs (set up time and equipment) associated with traffic control plan changes for Phase 1 lining work at vaults 1, 2 and 3	B, C	Insituform	$ 38,303.21										
	4.2	Cost for K-Rail required by City for traffic control during rain days.	A	IRWD	$ 3,795.00										
5		Approved by General Manager Approved on May 30, 2019				$57,901.79	$165,525.64	$223,427.43	12.50%	$2,010,472.43	25	242	267	377	5/27/2019
	5.1	Additional cost due to change of CIPP lining installation from weekdays to weekends.	A	IRWD	$ 26,777.52						21				
	5.2	Hydrostatic pressure testing of entire length of OCSD segment (Phase 1).	A	IRWD	$ 31,124.27						4				
6		Approved by General Manager Approved on June 12, 2019				$99,553.14	$223,427.43	$322,980.57	18.07%	$2,110,025.57	88	267	355	465	8/23/2019
	6.1	Additional costs for tools, equipment and lost production at Vaults 4, 5 and 6 for traffic control revisons due to inadquate clearance (less than 5 feet) between construction zone and traffic.	B, C	Insituform	$ 99,553.14										
	6.2	Non-compensatory contract time extension to process change orders	A	IRWD	$ -										
7		Pending Board Approval				$113,314.72	$322,980.57	$436,295.29	24.41%	$2,223,340.29	4	355	359	469	8/27/2019
	6.1	Additional costs for tools, equipment and lost production at Vaults 4, 5, 6 , and 7 for traffic control revisons due to inadquate clearance (less than 5 feet)	B, C	Insituform	$ 113,314.72										
	6.2	Non-compensatory contract time extension to process change orders	A	IRWD	$ -										

Michelson Forcemain Improvements
PR 07097
Construction Change Order Summary

Contractor: Insituform Technologies, Inc
Design Engineer: Kleinfelder

				Contract Amount						Contract Days				Original Completion Date:
							Original Contract Amount:		$1,787,045.00			Original Days:	110	9/2/2018
Change Order	Description	Category	Initiated by (IRWD or Insituform)	Change Order Line Item Amount	Change Order Amount	Previous Change Orders	Cumulative Total of Change Orders	% of Original Contract Amount	Revised Contract Amount	Change Order Days	Previous Change Orders	Cum. Total C.O. days	Revised Total Contract Days	Revised Completion Date

Category	Total Amount	% of Original Contract
A - District Convenience/Initiation - Project Related	$ 61,696.79	3.45%
B - Differing Site Conditions	$ 186,687.44	10.45%
C - Design Oversight	$ 187,911.06	10.52%
D - Contractor Convenience/Initiation	$ -	0.00%
TOTAL (A + B + C + D)	$ 436,295.29	24.41%

EXHIBIT "C"

IRVINE RANCH WATER DISTRICT

PROFESSIONAL SERVICES VARIANCE

Project Title: Michelson Force Main Improvements

Project No.: 7097 Date: April 4, 2019

Purchase Order No.: 533893 Variance No.: 4

Originator: [ ] IRWD [X] ENGINEER/CONSULTANT [ ] Other (Explain)_____

Description of Variance (*attach any back-up material*):

This variance is for providing additional engineering service during the construction of the Michelson Force Main Improvements project

Engineering & Management Cost Impact:

Classification	Man hours	Billing Rate	Labor $	Direct Costs	Subcon. $	Total $
Task 11.1 Project Meetings	24		3,780			3,780
Task 11.2 Contractor Request for Information	105		15,575			15,575
Task 11.3 Minor Plan Revisions	36		5,320			5,320
Task 11.4 Site Visits	30		4,600			4,600
Task 11.5 Shop Drawing Review	56		8,235			8,235
Task 11.6 Record Drawings	26		3,790			3,790
Task 11.7 Expensable Items	14		2,130			2,130
Task 11.8 TCPs for Bend Replacement (if necessary)	22		2,940			2,940
					Total $ =	46,370

Schedule Impact:

Task No.	Task Description	Original Schedule	Schedule Variance	New Schedule
11	Engineering Services During Construction	November 15, 2017	562 calendar days	May 31, 2019

Required Approval Determination:

Total Original Contract	$ 98,255	[ ] Director: Cumulative total of Variances less than or equal to $50,000.
Previous Variances $ 98,554 This Variance $ 46,370		[ ] Executive Director: Cumulative total of Variances less than or equal to $75,000.
Total Sum of Variances New Contract Amount	$ 144,924 $ 243,179	[ ] General Manager: Cumulative total of Variances less than or equal to $100,000.
Percentage of Total Variances to Original Contract	147 %	[X] Board: Cumulative total of Variances greater than $100,000.

ENGINEER/CONSULTANT: Kleinfelder (Company Name)

IRVINE RANCH WATER DISTRICT

Project Engineer/Manager	4/4/2019 Date	Department Director	6/20/19 Date
Engineer's/Consultant's Management	4/4/2019 Date	General Manager/Board	Date

IRVINE RANCH WATER DISTRICT

PROFESSIONAL SERVICES VARIANCE REGISTER

Project Title: Michelson Force Main Improvements

Project No.: 7097 Project Manager: Tom Bonkowski

Variance No.	Description	Dates		Variance Amount
		Initiated	Approved	
1	Additional work to pothole the Michelson Force Main and incorporate design changes	4/16/17	5/11/17	$37,011
2	Additional Potholing	10/11/17	10/18/2017	$24,218
3	Engineering Services During Construction	5/14/18	5/24/2018	$37,325
4	Additional Engineering Services During Construction	11/19/18		$46,370

KLEINFELDER
Bright People. Right Solutions.

April 4, 2019
IRWD Reference No. 7097
Kleinfelder Project No. 20173802.001A

Mr. Tom Bonkowski
Irvine Ranch Water District
3512 Michelson Drive
Irvine, California 92618

SUBJECT: Revised Professional Services Variance No. 4: Request for Engineering Services During Construction of IRWD Michelson Force Main Improvements Project

Dear Mr. Bonkowski:

Irvine Ranch Water District has requested that Kleinfelder prepare a variance including the scope and fee for providing engineering services during the construction of the Michelson Force Main Improvements Project. This revised variance would be the fourth variance on the existing Michelson Force Main Improvements Design contract.

The additional work includes multiple revisions to the traffic control plans, coordination with the City of Irvine traffic department, revised design of Vault 2, additional shop drawing reviews, additional RFIs, additional project meetings, modifications to Vault 7, additional site visits and minor plan revisions. Additionally, IRWD has requested a stand-alone additional cost for potential traffic control plans for the dig and replacement of bends with unacceptable wrinkles, if deemed necessary. This item will only be executed on approval from IRWD.

Attachment A identifies in detail the additional scope of service for the final design tasks.

Attachment B provides the detailed level of effort fee estimate for the additional work. The table below provides a summary of the fee estimate for the requested variance related to the tasks that are currently authorized.

Task	Current Fee, $	Variance 4, $	Revised Fee, $
Task 1 Project Management	$ 6,356	$ 0	$ 6,356
Task 2 Topographic Survey	$ 25,740	$ 0	$ 25,740
Task 3 Utility Review	$ 1,250	$ 0	$ 1,250
Task 4 Pothole Investigations	$ 8,679	$ 0	$ 8,679
Task 5 Geotechnical Eng.	$ 16,315	$ 0	$ 16,315
Task 6 Improvement P & S	$ 34,305	$ 0	$ 34,305
Task 7 Permits	$ 2,700	$ 0	$ 2,700
Task 8 Bid Period Assistance	$ 2,910	$ 0	$ 2,910
Task 9 Additional Potholing	$ 37,011	$ 0	$ 37,011
Task 9A Additional Potholing	$ 24,218	$ 0	$ 24,218
Task 10 Engineering Services	$ 37,325	$ 0	$ 37,325

550 West C Street, Suite 1200, San Diego, CA 92101 p | 619.831.4600 f | 619.232.1039

Task	Current Fee, $	Variance 4, $	Revised Fee, $
Task 11 Additional Engineering Services	$ 0	$ 46,370	$ 46,370
Totals	**$ 196,809**	**$ 46,370**	**$ 243,179**

Our current authorized budget for Tasks 1 through 10, is $196,809. As indicated above, the total design variance amount is $46,370 for Task 11. The **total requested amount for Variance No. 4** is **$46,370**. The new total authorized budget for Tasks 1 through 11 would be $243,179. A budget summary is provided below:

Current Authorized Budget (Tasks 1 - 10)	$ 196,809
Design Variance from Table	$ 46,370
Total Revised Authorized Budget	**$ 243,179**

SCHEDULE IMPACTS

The additional efforts described herein have no impact to the project schedule and shall fall within the contractor's construction schedule. It is anticipated that project substantial completion shall be complete by May 31, 2019.

Thank you for your consideration of this request. If you have any questions about our scope, assumptions or level of effort, please do not hesitate to contact me at 619.831.4537 or Jeff Walker at 949.585.3116. Upon your review of this variance request, we will prepare the Professional Services Variance form pertaining to Project Number 30496 (5407).

Sincerely,

KLEINFELDER

Marc Weinberger, PE, BCEE
Project Manager

Jeffrey S. Walker, PE, GE
Client Account Manager

Attachments: A – Variance 4 Additional Engineering Services
B – Variance 4 Fee Estimate
C – IRWD Professional Services Variance

Irvine Ranch Water District
Michelson Force Main Improvements
Engineering Services During Construction
Variance 4
November 9, 2018
Revised January 9, 2019
Revised April 4, 2019

INTRODUCTION AND BACKGROUND

Irvine Ranch Water District has requested that Kleinfelder prepare a variance including the scope and fee for providing additional engineering service during the construction of the Michelson Force Main Improvements project. This variance would be the fourth variance on the existing Michelson Force Main Improvements Design contract.

SCOPE OF WORK

1. **Project Meetings**

    a. Kleinfelder will attend a total of six (6) construction progress meetings during the construction period. Each meeting is assumed to be two hours.

    b. Total Fee Included Herein (Item 1): $3,780

2. **Contractor's Request for Information (RFI)**

    a. Kleinfelder will review and respond to the Contractor's RFIs, up to a maximum of thirty-five (35) RFIs.

    b. Total Fee Included Herein (Item 2): $15,575

3. **Minor Plan Revisions**

    a. Kleinfelder will perform minor plan revisions during construction. This task includes a maximum of 36 hours of staff time for minor plan revisions and 4 additional hours for Project Manager review of the construction drawings, as needed.

    b. Total Fee Included Herein (Item 3): $5,320

4. **Site Visits**

    a. Kleinfelder will perform up to four (4) visits to the site to observe the progress and quality of the executed work of the Contractor. Site visits will be scheduled to coincide with project meetings to maximize team efficiencies. One night visit will be required.

b. Kleinfelder will conduct one (1) site visit of three hours, with two hours for travel time during the construction period for the purpose of assisting IRWD in preparing a final "punch list" for the Contractor and to confirm that the "punch list" is complete.

c. Total Fee Included Herein (Item 4): $4,600

5. Shop Drawing Reviews

a. Kleinfelder will provide an initial review of up to fifteen (15) shop drawing submittals. It is anticipated that a second review will be performed for 11 shop drawings to verify comments from the initial submittal are addressed. Approximately three hours (3) per initial shop drawing review, and one hour for subsequent reviews is included. The list of anticipated submittals to be determined

b. Total Fee Included Herein (Item 5): $8,235

6. Record Drawings

a. Kleinfelder will prepare record drawings on 24-inch by 36-inch mylars at the completion of construction using IRWD-approved Contractor's and IRWD Inspector's redlines. Final record drawing mylars, reissued signed mylars (as needed), AutoCAD electronic files, and a single color PDF of the final as-built mylars will be submitted to IRWD on CD at the completion of construction. Record drawings are anticipated to require twenty-four (24) hours of drafting and contractor coordination along with 2 additional hours of record drawing review.

b. Total Fee Included Herein (Item 6): $3,790

7. Expense Items

a. Kleinfelder will include budget for expense items necessary to produce the aforementioned scope. This scope and budget includes anticipated travel mileage, printing, and mailing costs.

b. Total Fee Included Herein (Item 7): $2,130

8. TCPs for Bend Replacement (if necessary)

a. Kleinfelder will include budget for Traffic Control Plans required for the replacement of the 30-degree bends, with liner wrinkles. This task may not be necessary until field testing can confirm the impact of the wrinkles. This task will only be executed with explicit IRWD approval. The fee for this task included 12 hours for TCP design, 4 hours for City coordination, and two hours for senior / technical review.

b. Total Fee Included Herein (Item 8): $2,940

IRWD-Michelson Force Main Improvements Project

Variance 4

Fee Estimate

#	Variance and Activities	Proj. Mgr.	Asst. Proj. Mgr.	QA/QC	Admin.	Labor Hours	Labor, $	Design Variance Sub Fee	Design Variance Fee w/Subs, $
		$ 170.00	$ 145.00	$ 205.00	$ 70.00				
11	**Additional Construction Phase Services**								
	Task 11.1 Project Meetings (6)	12	12			24	$ 3,780		$ 3,780
	Task 11.2 Contractor Request for Information (RFI) (35)	14	91			105	$ 15,575		$ 15,575
	Task 11.3 Minor Plan Revisions (36 Hours)	4	32			36	$ 5,320		$ 5,320
	Task 11.4 Site Visits (5)	10	20			30	$ 4,600		$ 4,600
	Task 11.5 Shop Drawing Review (15)	8	48			56	$ 8,235		$ 8,235
	Task 11.6 Record Drawings (26 hours)	2	20	2	2	26	$ 3,790	-	$ 3,790
	Task 11.7 Expensable Items (mileage, printing etc.) (14 hour	4	10			14	$ 2,130	-	$ 2,130
	Task 11.8 TCPs for Bend Replacement	2	16		4	22	$ 2,940	-	$ 2,940
	Total Fee for Project Management	**56**	**249**	**2**	**6**	**313**	**$ 46,370**	-	**$ 46,370**

						Total Fee for Variance 4			**$ 46,370**

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June 26, 2019
Prepared by: L. Oldewage
Submitted by: J. Colston / K. Burton
Approved by: Paul A. Cook

ENGINEERING AND OPERATIONS COMMITTEE

REPORT ON WATER QUALITY RELATIVE TO PUBLIC HEALTH GOALS

SUMMARY:

Staff is presenting the 2019 Report on Water Quality Relative to Public Health Goals, a triennial report required by the California Health and Safety Code summarizing constituents detected in the District's water supply at levels exceeding applicable Public Health Goals or Maximum Contaminant Level Goals during calendar years 2016, 2017 and 2018. Staff recommends that a public hearing regarding the report be held on July 8, 2019 at IRWD's Regular Board meeting to accept any public comments that may be provided regarding the report.

BACKGROUND:

The California Health and Safety Code, Section 116470, requires public water systems with more than 10,000 service connections to prepare a brief written report that provides information regarding the detection of any contaminants above the Public Health Goals adopted by the State Office of Environmental Health Hazard Assessment or the Maximum Contaminant Level Goals set by the United States Environmental Protection Agency. These reports are intended to provide information to the public in addition to the Consumer Confidence Report that is provided annually to each customer. The California State Water Resources Control Board Division of Drinking Water does not require public water systems to take any action to reduce or eliminate any exceedance of a public health goal.

A public water system that is required to prepare a Public Health Goal Report is also required to hold a public hearing for the purpose of accepting and responding to public comments regarding the report. The public hearing may be part of any regularly scheduled meeting. Due to the detection of a number of contaminants in the IRWD potable water system above the Public Health Goals, the District is required to prepare a Public Health Goal Report and hold a public hearing. The report has been prepared and is attached as Exhibit "A", and a public hearing regarding the report will be held on July 8, 2019 at IRWD's Regular Board meeting to accept any public comments that may be provided regarding the report.

FISCAL IMPACTS:

None.

ENVIRONMENTAL COMPLIANCE:

Not applicable.

RECOMMENDATION:

That a public hearing on the Report on Water Quality Relative to Public Health Goals be held on July 8, 2019 at IRWD's Regular Board meeting to accept any public comments that may be provided regarding the report.

LIST OF EXHIBITS:

Exhibit "A" – Report on Water Quality Relative to Public Health Goals PWS #3010092

IRVINE RANCH WATER DISTRICT
REPORT ON WATER QUALITY
RELATIVE TO PUBLIC HEALTH GOALS
PWS #3010092
June 26, 2019

BACKGROUND:

Provisions of the California Health and Safety Code (Reference No. 1) specify that larger (>10,000 service connections) water utilities prepare a special report by July 1, 2019 if their water quality measurements have exceeded any Public Health Goals (PHGs). PHGs are non-enforceable goals established by the California Environmental Protection Agency's (Cal-EPA's) Office of Environmental Health Hazard Assessment (OEHHA). The law also requires that where OEHHA has not adopted a PHG for a constituent, the water suppliers are to use the Maximum Contaminant Level Goals (MCLGs) adopted by United States Environmental Protection Agency (USEPA). Only constituents which have a California primary drinking water standard and for which either a PHG or MCLG has been set are to be addressed. Reference No. 2 is a list of all regulated constituents with the Maximum Contaminant Levels (MCLs) and PHGs or MCLGs. Reference 3 is OEHHA's February 2019 Health Risk Information for Public Health Goal Report.

There are a few constituents that are routinely detected in water systems at levels usually well below the drinking water standards for which no PHG or MCLG has yet been adopted by OEHHA or USEPA. These will be addressed in a future required report after a PHG has been adopted.

The law specifies what information is to be provided in the report. (See Reference No. 1)

If a constituent was detected in Irvine Ranch Water District's (IRWD) water supply in 2016, 2017 or 2018 at a level exceeding an applicable PHG or MCLG, this report provides the information required by the law. Included is the numerical public health risk for associated with the MCL and the PHG or MCLG, the category or type of risk to health that could be associated with each constituent, the best treatment technology available that could be used to reduce the constituent level, and an estimate of the cost to install that treatment if it is appropriate and feasible.

What Are PHGs?

PHGs are set by the OEHHA which is part of Cal-EPA and are based solely on public health risk considerations. None of the practical risk-management factors that are considered by the USEPA or the California State Water Resources Control Board Division of Drinking Water (DDW) in setting drinking water standards (MCLs) are considered in setting the PHGs. These factors include analytical detection capability, treatment technology available, benefits and costs. The PHGs are not enforceable and are not required to be met by any public water system. MCLGs are the federal equivalent to PHGs.

Water Quality Data Considered:

All of the water quality data collected by the IRWD system from 2016 to 2018 for purposes of determining compliance with drinking water standards was considered. This data was summarized in IRWD's Annual Consumer Confidence Reports which were distributed to all of IRWD's customers in 2017, 2018 and 2019.

Guidelines Followed:

The Association of California Water Agencies (ACWA) formed a workgroup which prepared guidelines for water utilities to use in preparing these newly required reports. The ACWA guidelines were used in the preparation of this report and the cost estimates. No guidance was available from state regulatory agencies.

Best Available Treatment Technology and Cost Estimates:

Both the USEPA and DDW adopt what are known as Best Available Technologies (BATs) which are the best known methods of reducing contaminant levels to the MCL. Costs can be estimated for such technologies. However, since many PHGs and all MCLGs are set much lower than the MCL, it is not always possible or feasible to determine what treatment is needed to further reduce a constituent downward to or near the PHG or MCLG, many of which are set at zero. Estimating the costs to reduce a constituent to zero is difficult, if not impossible because it is not possible to verify by analytical means that the level has been lowered to zero. In some cases, installing treatment to try and further reduce very low levels of one constituent may have adverse effects on other aspects of water quality.

CONSTITUENTS DETECTED THAT EXCEED A PHG OR A MCLG:

The following is a discussion of constituents that were detected in one or more of the IRWD's drinking water sources at levels above the PHG, or if no PHG, above the MCLG. Table 1 summarizes the information in this section.

Arsenic:

The PHG for arsenic is 0.004 parts per billion (ppb). The MCL, or drinking water standard, for arsenic is 10 ppb. We have detected arsenic in four of IRWD's 18 Dyer Road Well Field (DRWF) wells at the following levels: 3.0 ppb in DRWF Well 2, 3.2 ppb in DRWF Well 4, 6.6 ppb in DRWF Well 5, and 4.1 ppb in DRWF Well 6. The water from all DRWF wells in operation is blended prior to entering the IRWD's drinking water distribution system. The highest concentration of arsenic measured at the entry point was 3.6 ppb. We have detected arsenic in five of IRWD's five Irvine Desalter Project (IDP) wells at the following levels: 3.6 ppb in IDP Well 76, 3.7 ppb in IDP Well 77, 3.4 ppb in IDP Well 107, 5.0 ppb in IDP Well 110 and 4.1 ppb in IDP Well 115. The highest concentration of arsenic detected in product water from the IDP Potable

Treatment Plant (IDP/PTP) was 3.3 ppb. These levels were below the MCL. The category of health risk associated with arsenic, and the reason that a drinking water standard was adopted for it, is that some people who drink water containing arsenic above the MCL over many years may experience skin damage or circulatory system problems, and may have an increased risk of cancer. The numerical health risk for cancer at a PHG of 0.004 ppb is $1x10^{-6}$ (1 in 1,000,000). The numerical health risk for cancer at a MCL of 10 ppb is $2.5x10^{-3}$ (2.5 in 1,000). The BATs for arsenic to lower the level below the MCL are Reverse Osmosis (RO), Ion Exchange (IE), activated alumina, lime softening, electrodialysis reversal, oxidation/filtration or coagulation/filtration. RO or IE would be required to attempt to lower the arsenic levels to below the PHG. The IDP Potable Treatment Plant (PTP) is an RO facility which reduces arsenic levels in water from the IDP wells, though the plant would probably need to be operated with 0% bypass to meet the PHG. The estimated cost to install and operate such a treatment system on DRWF Wells 2, 4, 5 and 6 that would reliably reduce the arsenic levels to below the PHG would be approximately $19,424,000 per year including annualized capital and O&M costs. This would result in an assumed increased cost for each customer of $157 per year.

Bromate:

The PHG for bromate is 0.1 ppb. The MCL, or drinking water standard, for bromate is 10 ppb. Bromate was detected in imported water purchased from the MWD, the highest level detected was 4.7 ppb. These levels were below the MCL. The category of health risk associated with bromate, and the reason that a drinking water standard was adopted for it, is that people who drink water containing bromate above the MCL throughout their lifetime could experience an increased risk of cancer. The numerical health risk for a PHG of 0.1 ppb is $1x10^{-6}$ (1 in 1,000,000). The numerical health risk for a MCL of 10 ppb is $1x10^{-4}$ (1 in 10,000). The BATs for bromate to lower the level below the MCL is to control ozone dosage at the point of application in the treatment process. RO or IE would be required to attempt to lower the bromate level to below the PHG. The estimated cost to install and operate such a treatment system at each MWD turnout that would reliably reduce the bromate level to the PHG would be approximately $230,322,000 per year including annualized capital and O&M costs. This would result in an assumed increased cost for each customer of $1,857 per year.

Chlorite:

The PHG for chlorite is 0.05 parts per million (ppm). The MCL, or drinking water standard, for chlorite is 1.0 ppm. Chlorite was detected in imported water produced at the Baker Water Treatment Plant (BWTP), the highest level detected was 0.60 ppm. These levels were below the MCL. The category of health risk associated with chlorite, and the reason that a drinking water standard was adopted for it, is that people who drink water containing chlorite above the MCL throughout their lifetime could experience an increased risk of anemia (hemotoxicity) or neuro-behavioral effects (neurotoxicity). The numerical health risk for cancer at a PHG of 0.05 ppb is not applicable. The numerical health risk for cancer at a MCL of 10 ppb is not applicable. The BATs for chlorite to

lower the level below the MCL is to control chlorine dioxide dosage at the point of application in the treatment process. The most cost effective means to control chlorite levels to meet the PHG would be to discontinue chlorine dioxide application at the BWTP. So, no cost estimate has been prepared, but this would eliminate the Santiago Reservoir as an emergency source of raw water supply to the BWTP facility.

Coliform Bacteria:

In the month of July 2017, we collected 281 samples from our distribution system for coliform analysis. Of these samples, 0.7% were positive for coliform bacteria.

The MCL for coliform is 5% positive samples of all samples per month and the MCLG is zero. The reason for the coliform drinking water standard is to minimize the possibility of the water containing pathogens which are organisms that cause waterborne disease. Because coliform is only a surrogate indicator of the potential presence of pathogens, it is not possible to state a specific numerical health risk. While the USEPA normally sets MCLGs "at a level where no known or anticipated adverse effects on persons would occur", they indicate that they cannot do so with coliforms.

Coliform bacteria are an indicator organism that are ubiquitous in nature and are not generally considered harmful. They are used because of the ease in monitoring and analysis. If a positive sample is found, it indicates a potential problem that needs to be investigated and follow up sampling done. It is not at all unusual for a system to have an occasional positive sample. It is difficult, if not impossible, to assure that a system will never get a positive sample.

We add chloramine at our sources to assure that the water served is microbiologically safe. The chloramine residual levels are carefully controlled to provide the best health protection without causing the water to have undesirable taste and odor or increasing the Disinfection Byproduct (DBP) level. The one single action that would most likely decrease the possibility of a system having positive coliform results would be to significantly increase the disinfectant residual. This would likely result in increased DBPs which have adverse health consequences. The limits to the amount of disinfectant residual allowed in the distribution system are the maximum residual disinfectant levels (MRDLs) as established by the Disinfectants and Disinfection Byproducts Rule (D/DBPR). This careful balance of treatment processes is essential to continue supplying our customers with safe drinking water.

Other equally important measures that we have implemented include: an effective cross-connection control program, maintenance of a disinfectant residual throughout our system, an effective monitoring and surveillance program and maintaining positive pressures in our distribution system. Our system has already taken all of the steps described by DDW as "best available technology" for coliform bacteria in Section 64447, Title 22, California Code of Regulations.

Fluoride:

The PHG for fluoride is 1 ppm. The MCL, or drinking water standard, for fluoride is 2 ppm. We have detected fluoride above the PHG in one of IRWD's 27 wells at a level 1.5 ppm in DRWF Well C9. The level detected was below the MCL. The category of health risk associated with fluoride, and the reason that a drinking water standard was adopted for it, is that people who drink water containing fluoride above the MCL throughout their lifetime could experience an increased risk of musculoskeletal disease and tooth mottling. The numerical health risk for cancer at a PHG of 1 ppm is not applicable. The numerical health risk for cancer at a MCL of 2 ppm is not applicable. Following blending with water from 1 other well and treatment for color removal at the Deep Aquifer Treatment System (DATS) the water is blended with water pumped from up to 16 other wells located in the DRWF prior to delivery to the drinking water distribution system. The highest level of fluoride detected in the blended DRWF water was 1.0 ppm and the average level of fluoride in the blended DRWF was 0.60 ppm. Since the fluoride level in the blended DRWF water consistently does not exceed the PHG and the optimal level of fluoride in drinking water to prevent dental caries (or cavities) is 0.7 ppm no further treatment is necessary, so no cost estimate has been prepared.

Gross Alpha Activity (excluding Uranium):

OEHHA has not established a PHG for gross alpha activity. The MCLG for gross alpha activity is 0 picocuries per liter (pCi/l). The MCL, or drinking water standard, for gross alpha activity is 15 pCi/l. We have detected gross alpha activity in one of IRWD's 27 wells at a level of 4.0 pCi/l in IDP Well 115. Gross alpha activity was detected in imported water purchased from the MWD and the highest level was 4 pCi//l. Gross alpha activity was detected in BWTP product water and the highest level was 6.2 pCi//l. All levels were below the MCL. The category of health risk associated with gross alpha activity, and the reason that a drinking water standard was adopted for it, is that people who drink water containing gross alpha activity above the MCL throughout their lifetime could experience an increased risk of cancer. The numerical health risk for a MCLG of 0 pCi/l is 0. Since gross alpha activity is not a specific chemical contaminant, but rather a group of radioactive elements the numeric health risk at the MCL of 15 pCi/l depends on the specific alpha emitting radionuclides present and is estimated to range from $1.0x10^{-3}$ (1 in 1,000) to $1.9x10^{-4}$ (1.9 in 10,000). The BATs for gross alpha activity to lower the level below the MCL are RO, IE, lime softening or coagulation/filtration. RO or IE would be required to attempt to lower the gross alpha activity level to the MCLG. The IDP PTP is an RO facility which reduces gross alpha activity levels in water from the IDP wells, though the plant would probably need to be operated with 0% bypass to meet the PHG. The estimated cost to install and operate such a treatment system at the BWTP that would reliably reduce the gross alpha activity level to the MCLG would be approximately $8,707,000 per year including annualized capital and O&M costs. The estimated cost to install and operate such a treatment system at each MWD turnout that would reliably reduce the gross alpha activity level to the MCLG would be approximately $230,322,000 per year including annualized capital and O&M costs. This would result in an assumed increased cost for each customer of $1,857 per year.

Gross Beta Activity:

OEHHA has not established a PHG for gross beta activity. The MCLG for gross beta activity is 0 pCi/l. The MCL or drinking water standard for gross beta activity is 50 pCi/l. Gross beta activity was detected in imported water purchased from the MWD and the highest level detected was 6 pCi/l. All levels were below the MCL. The category of health risk associated with gross beta activity, and the reason that a drinking water standard was adopted for it, is that people who drink water containing gross beta activity above the MCL throughout their lifetime could experience an increased risk of cancer. The numerical health risk for a MCLG of 0 pCi/l is 0. Since gross beta activity is not a specific chemical contaminant, but rather a group of radioactive elements the numeric health risk at the MCL of 50 pCi/l depends on the specific beta emitting radionuclides present and is estimated to range from $2.3x10^{-3}$ (2.3 in 1,000) to $4.5x10^{-4}$ (4.5 in 10,000). The BATs for gross beta activity to lower the level below the MCL are RO, IE, lime softening or coagulation/filtration. RO or IE would be required to attempt to lower the gross beta activity level to the MCLG. The estimated cost to install and operate such a treatment system at each MWD turnout that would reliably reduce the gross beta activity level to the MCLG would be approximately $230,322,000 per year including annualized capital and O&M costs. This would result in an assumed increased cost for each customer of $1,857 per year.

Nitrate/Nitrite Nitrogen and Nitrate Nitrogen:

The PHG and the MCL, or drinking water standard, for nitrate/nitrite nitrogen is 10 ppm. The PHG and the MCL, or drinking water standard, for nitrate nitrogen is 10 ppm. We have detected nitrate/nitrite nitrogen and nitrate nitrogen in one of IRWD's 27 wells at levels of 13 ppm nitrate/nitrite nitrogen and 13 ppm nitrate nitrogen in Well 21. The 21-22 Desalter is an RO facility which reduces nitrate/nitrite nitrogen and nitrate nitrogen levels in the water from Well 21. Nitrate/nitrite nitrogen and nitrate nitrogen were detected in the 21-22 Desalter product water. The highest level detected for nitrate/nitrite nitrogen was 9.8 ppm and the average level was 3.6 ppm. The highest level detected for nitrate nitrogen was 9.8 ppm and the average level was 3.6 ppm. The levels detected in the treated water were below the MCL. The category of health risk associated with nitrate/nitrite nitrogen and nitrate as nitrate, and the reason that a drinking water standard was adopted for it, is that people who drink water containing nitrate/nitrite nitrogen or nitrate as nitrate above the MCL could experience an acute risk of hemotoxicity causing methemoglobinemia. The numerical health risk for cancer at a PHG and a MCL of 10 ppm is not applicable. Since the nitrate/nitrite nitrogen and nitrate nitrogen levels in the treated water are consistently below the PHG no further treatment is necessary, so no cost estimate has been prepared.

Perchlorate:

The PHG for perchlorate is 1 ppb. The MCL, or drinking water standard, for perchlorate is 6 ppb. We have detected perchlorate in two of IRWD's 27 wells at the following

levels: 4.6 ppb in DRWF Well 3 and 5.0 ppb in Well 21. All levels were below the MCL. The category of health risk associated with perchlorate, and the reason that a drinking water standard was adopted for it, is that people who drink water containing perchlorate above the MCL throughout their lifetime could experience an increased risk of thyroid effects (endocrine toxicity) or neurological developmental defects (neurodevelopment toxicity). The numerical health risk for cancer at a PHG of 1 ppb is not applicable. The numerical health risk for cancer at a MCL of 6 ppb is not applicable. The water from all DRWF wells in operation is blended prior to entering the IRWD's drinking water distribution system. Perchlorate was not detected at the entry point to the distribution system. The 21-22 Desalter is an RO facility which reduces perchlorate levels in the water from Well 21. Perchlorate was not detected in the product water from the 21-22 Desalter facility. Since the perchlorate levels in the treated water are consistently below the PHG no further treatment is necessary, so no cost estimate has been prepared.

Tetrachloroethylene:

The PHG for tetrachloroethylene is 0.06 ppb. The MCL, or drinking water standard, for tetrachloroethylene is 5 ppb. We have detected tetrachloroethylene in one of IRWD's 27 wells at a level of 0.5 ppb, the detection limit for reporting, in DRWF Well 3. All levels were below the MCL. The category of health risk associated with tetrachloroethylene, and the reason that a drinking water standard was adopted for it, is that people who drink water containing tetrachloroethylene above the MCL throughout their lifetime could experience an increased risk of cancer. The numerical health risk for a PHG of 0.05 ppb is $1x10^{-6}$ (1 in 1,000,000). The numerical health risk for a MCL of 5 ppb is $8x10^{-5}$ (8 in 100,000). The water from all DRWF wells in operation is blended prior to entering the IRWD's drinking water distribution system. Tetrachloroethylene was not detected at the entry point to the distribution system. Since the tetrachloroethylene levels in the treated water are consistently below the PHG no further treatment is necessary, so no cost estimate has been prepared.

Uranium:

The PHG for uranium is 0.43 pCi/l. The MCL, or drinking water standard, for uranium is 20 pCi/l. We have detected uranium in one of IRWD's 27 wells at a level of 6.8 pCi/l in IDP Well 115. The IDP/PTP is an RO facility which reduces uranium levels in water from the IDP wells. Uranium was detected in the IDP/PTP product water at a level of 2.8 pCi/l. Uranium was detected in product water from the BWTP, the highest level detected was 2.8 pCi/l. Uranium was detected in imported water purchased from the MWD, the highest level detected was 3 pCi/l. These levels were below the MCL. The category of health risk associated with uranium, and the reason that a drinking water standard was adopted for it, is that people who drink water containing uranium above the MCL throughout their lifetime could experience kidney problems or an increased risk of cancer. The numerical health risk for cancer at a PHG of 0.43 pCi/l is $1x10^{-6}$ (1 in 1,000,000). The numerical health risk for cancer at a MCL of 20 pCi/l is $5x10^{-5}$ (5 in 100,000). The BATs for uranium to lower the level below the MCL are RO, IE, lime

softening or coagulation/filtration. RO or IE would be required to attempt to lower the uranium level to below the PHG. The IDP PTP is an RO facility which reduces uranium levels in water from the IDP wells, though the plant would probably need to be operated with 0% bypass to meet the PHG. The estimated cost to install and operate such a treatment system at the BWTP that would reliably reduce the uranium level to the MCLG would be approximately $8,707,000 per year including annualized capital and O&M costs. The estimated cost to install and operate such a treatment system at each MWD turnout that would reliably reduce the uranium level to the MCLG would be approximately $230,322,000 per year including annualized capital and O&M costs. This would result in an assumed increased cost for each customer of $1,928 per year.

Combined Treatment Cost

Since the same technology is utilized to treat all of the constituents included in this report each of the locations above would only require a single treatment facility each to reduce levels of all of these constituents to below the PHG or MCLG. The estimated cost to install and operate such a treatment system on DRWF Wells 2, 4, 5 and 6 that would reliably reduce the levels of arsenic to levels below the PHG or MCLG would be approximately $19,424,000 per year including annualized capital and O&M costs. The estimated cost to install and operate such a treatment system at the BWTP that would reliably reduce the gross alpha activity and uranium levels (and also chlorite levels) to the PHG or MCLG would be approximately $8,707,000 per year including annualized capital and O&M costs. The estimated cost to install and operate such a treatment system at each MWD turnout that would reliably reduce the bromate, gross alpha activity, gross beta activity and uranium levels to the PHG or MCLG would be approximately $230,322,000 per year including annualized capital and O&M costs. This would result in an assumed increased cost for each customer of $2,084 per year to lower the levels of Arsenic, gross alpha activity, gross beta activity, hexavalent chromium and uranium to levels below the PHG or MCLG.

Table 1: Summary of PHG Exceedences

CONTAMINANT	UNITS	PHG [MCLG]	MCL	Level of Detection	Status
Arsenic	ppb	0.004	10	ND – 6.6	1
Bromate	ppb	0.1	10	ND – 4.7	2
Chlorite	ppm	0.05	1.0	ND – 0.60	2
Fluoride	ppm	1	2	ND – 1.5	1
Gross Alpha Activity	pCi/L	[0]	15	ND – 6.2	1
Gross Beta Activity	pCi/L	[0]	50	ND – 6	1
Nitrate/Nitrite Nitrogen	ppm	10	10	ND – 13	1
Nitrate Nitrogen	ppm	10	10	ND – 13	1
Perchlorate	ppb	1	6	ND – 5.0	2
Tetrachloroethylene	ppb	0.06	5	ND – 0.5	2
Coliform Bacteria	% Present	0	5	0 – 0.7	2
Uranium	pCi/L	0.43	20	ND – 6.8	1

Notes: Hexavalent Chromium was reported in 2016 PHG report, but is not required to be reported in 2019 PHG report.
Status: 1 – Reported in 2016 PHG report
2 – Not reported in 2016 PHG report

RECOMMENDATIONS FOR FURTHER ACTION:

The drinking water quality of the Irvine Ranch Water District meets all DDW and USEPA drinking water standards set to protect public health. To further reduce the levels of the constituents identified in this report that are already significantly below the health-based Maximum Contaminant Levels established to provide "safe drinking water", additional costly treatment processes would be required. The effectiveness of the treatment processes to provide any significant reductions in constituent levels at these already low values is uncertain. The health protection benefits of these further hypothetical reductions are not at all clear and may not be quantifiable. Therefore, no action is proposed.

REFERENCES:

No.1 Excerpt from California Health & Safety Code: Section 116470 (b)
No.2 Table of Regulated Constituents with MCLs, PHGs or MCLGs
No.3 Health Risk Information for Public Health Goal Report, February 2019

CALIFORNIA PUBLIC HEALTH GOAL REQUIREMENTS
REFERENCE NO. 1

California Health and Safety Code
Section 116470

(b) On or before July 1, 1998, and every three years thereafter, public water systems serving more than 10,000 service connections that detect one or more contaminants in drinking water that exceed the applicable public health goal, shall prepare a brief written report in plain language that does all of the following:

(1) Identifies each contaminant detected in drinking water that exceeds the applicable public health goal.

(2) Discloses the numerical public health risk, determined by the office, associated with the maximum contaminant level for each contaminant identified in paragraph (1) and the numerical public health risk determined by the office associated with the public health goal for that contaminant.

(3) Identifies the category of risk to public health, including, but not limited to, carcinogenic, mutagenic, teratogenic, and acute toxicity, associated with exposure to the contaminant in drinking water, and includes a brief plainly worded description of these terms.

(4) Describes the best available technology, if any is then available on a commercial basis, to remove the contaminant or reduce the concentration of the contaminant. The public water system may, solely at its own discretion, briefly describe actions that have been taken on its own, or by other entities, to prevent the introduction of the contaminant into drinking water supplies.

(5) Estimates the aggregate cost and the cost per customer of utilizing the technology described in paragraph (4), if any, to reduce the concentration of that contaminant in drinking water to a level at or below the public health goal.

(6)Briefly describes what action, if any, the local water purveyor intends to take to reduce the concentration of the contaminant in public drinking water supplies and the basis for that decision.

(c) Public water systems required to prepare a report pursuant to subdivision (b) shall hold a public hearing for the purpose of accepting and responding to public comment on the report. Public water systems may hold the public hearing as part of any regularly scheduled meeting.

(d) The department shall not require a public water system to take any action to reduce or eliminate any exceedance of a public health goal.

(e) Enforcement of this section does not require the department to amend a public water system's operating permit.

(f) Pending adoption of a public health goal by the Office of Environmental Health Hazard Assessment pursuant to subdivision (c) of Section 116365, and in lieu thereof, public water systems shall use the national maximum contaminant level goal adopted by the United States Environmental Protection Agency for the corresponding contaminant for purposes of complying with the notice and hearing requirements of this section.

(g) This section is intended to provide an alternative form for the federally required consumer confidence report as authorized by 42 U.S.C. Section 300g-3(c).

MCLs, DLRs, and PHGs for Regulated Drinking Water Contaminants

(Units are in milligrams per liter (mg/L), unless otherwise noted.)

Last Update: December 26, 2018

This table includes:

California's maximum contaminant levels (MCLs)

Detection limits for purposes of reporting (DLRs)

Public health goals (PHGs) from the Office of Environmental Health Hazard Assessment (OEHHA)

Also, the PHG for NDMA (which is not yet regulated) is included at the bottom of this table.

Regulated Contaminant	MCL	DLR	PHG	Date of PHG
Chemicals with MCLs in 22 CCR §64431—Inorganic Chemicals				
Aluminum	1	0.05	0.6	2001
Antimony	0.006	0.006	0.001	2016
Arsenic	0.010	0.002	0.000004	2004
Asbestos (MFL = million fibers per liter; for fibers >10 microns long)	7 MFL	0.2 MFL	7 MFL	2003
Barium	1	0.1	2	2003
Beryllium	0.004	0.001	0.001	2003
Cadmium	0.005	0.001	0.00004	2006
Chromium, Total - OEHHA withdrew the 0.0025-mg/L PHG	0.05	0.01	withdrawn Nov. 2001	1999
Chromium, Hexavalent - 0.01-mg/L MCL & 0.001-mg/L DLR repealed September 2017	--	--	0.00002	2011
Cyanide	0.15	0.1	0.15	1997
Fluoride	2	0.1	1	1997
Mercury (inorganic)	0.002	0.001	0.0012	1999 (rev2005)*
Nickel	0.1	0.01	0.012	2001
Nitrate (as nitrogen, N)	10 as N	0.4	45 as NO3 (=10 as N)	2018
Nitrite (as N)	1 as N	0.4	1 as N	2018
Nitrate + Nitrite (as N)	10 as N	--	10 as N	2018
Perchlorate	0.006	0.004	0.001	2015
Selenium	0.05	0.005	0.03	2010
Thallium	0.002	0.001	0.0001	1999 (rev2004)
Copper and Lead, 22 CCR §64672.3				
Values referred to as MCLs for lead and copper are not actually MCLs; instead, they are called "Action Levels" under the lead and copper rule				
Copper	1.3	0.05	0.3	2008

Lead	0.015	0.005	0.0002	2009
Radionuclides with MCLs in 22 CCR §64441 and §64443—Radioactivity				
[units are picocuries per liter (pCi/L), unless otherwise stated; n/a = not applicable]				
Gross alpha particle activity - OEHHA concluded in 2003 that a PHG was not practical	15	3	none	n/a
Gross beta particle activity - OEHHA concluded in 2003 that a PHG was not practical	4 mrem/yr	4	none	n/a
Radium-226	--	1	0.05	2006
Radium-228	--	1	0.019	2006
Radium-226 + Radium-228	5	--	--	--
Strontium-90	8	2	0.35	2006
Tritium	20,000	1,000	400	2006
Uranium	20	1	0.43	2001
Chemicals with MCLs in 22 CCR §64444—Organic Chemicals				
(a) Volatile Organic Chemicals (VOCs)				
Benzene	0.001	0.0005	0.00015	2001
Carbon tetrachloride	0.0005	0.0005	0.0001	2000
1,2-Dichlorobenzene	0.6	0.0005	0.6	1997 (rev2009)
1,4-Dichlorobenzene (p-DCB)	0.005	0.0005	0.006	1997
1,1-Dichloroethane (1,1-DCA)	0.005	0.0005	0.003	2003
1,2-Dichloroethane (1,2-DCA)	0.0005	0.0005	0.0004	1999 (rev2005)
1,1-Dichloroethylene (1,1-DCE)	0.006	0.0005	0.01	1999
cis-1,2-Dichloroethylene	0.006	0.0005	0.013	2018
trans-1,2-Dichloroethylene	0.01	0.0005	0.05	2018
Dichloromethane (Methylene chloride)	0.005	0.0005	0.004	2000
1,2-Dichloropropane	0.005	0.0005	0.0005	1999
1,3-Dichloropropene	0.0005	0.0005	0.0002	1999 (rev2006)
Ethylbenzene	0.3	0.0005	0.3	1997
Methyl tertiary butyl ether (MTBE)	0.013	0.003	0.013	1999
Monochlorobenzene	0.07	0.0005	0.07	2014
Styrene	0.1	0.0005	0.0005	2010
1,1,2,2-Tetrachloroethane	0.001	0.0005	0.0001	2003
Tetrachloroethylene (PCE)	0.005	0.0005	0.00006	2001
Toluene	0.15	0.0005	0.15	1999
1,2,4-Trichlorobenzene	0.005	0.0005	0.005	1999
1,1,1-Trichloroethane (1,1,1-TCA)	0.2	0.0005	1	2006
1,1,2-Trichloroethane (1,1,2-TCA)	0.005	0.0005	0.0003	2006
Trichloroethylene (TCE)	0.005	0.0005	0.0017	2009
Trichlorofluoromethane (Freon 11)	0.15	0.005	1.3	2014

1,1,2-Trichloro-1,2,2-Trifluoroethane (Freon 113)	1.2	0.01	4	1997 (rev2011)
Vinyl chloride	0.0005	0.0005	0.00005	2000
Xylenes	1.75	0.0005	1.8	1997
(b) Non-Volatile Synthetic Organic Chemicals (SOCs)				
Alachlor	0.002	0.001	0.004	1997
Atrazine	0.001	0.0005	0.00015	1999
Bentazon	0.018	0.002	0.2	1999 (rev2009)
Benzo(a)pyrene	0.0002	0.0001	0.000007	2010
Carbofuran	0.018	0.005	0.0007	2016
Chlordane	0.0001	0.0001	0.00003	1997 (rev2006)
Dalapon	0.2	0.01	0.79	1997 (rev2009)
1,2-Dibromo-3-chloropropane (DBCP)	0.0002	0.00001	0.0000017	1999
2,4-Dichlorophenoxyacetic acid (2,4-D)	0.07	0.01	0.02	2009
Di(2-ethylhexyl)adipate	0.4	0.005	0.2	2003
Di(2-ethylhexyl)phthalate (DEHP)	0.004	0.003	0.012	1997
Dinoseb	0.007	0.002	0.014	1997 (rev2010)
Diquat	0.02	0.004	0.006	2016
Endothal	0.1	0.045	0.094	2014
Endrin	0.002	0.0001	0.0003	2016
Ethylene dibromide (EDB)	0.00005	0.00002	0.00001	2003
Glyphosate	0.7	0.025	0.9	2007
Heptachlor	0.00001	0.00001	0.000008	1999
Heptachlor epoxide	0.00001	0.00001	0.000006	1999
Hexachlorobenzene	0.001	0.0005	0.00003	2003
Hexachlorocyclopentadiene	0.05	0.001	0.002	2014
Lindane	0.0002	0.0002	0.000032	1999 (rev2005)
Methoxychlor	0.03	0.01	0.00009	2010
Molinate	0.02	0.002	0.001	2008
Oxamyl	0.05	0.02	0.026	2009
Pentachlorophenol	0.001	0.0002	0.0003	2009
Picloram	0.5	0.001	0.166	2016
Polychlorinated biphenyls (PCBs)	0.0005	0.0005	0.00009	2007
Simazine	0.004	0.001	0.004	2001
Thiobencarb	0.07	0.001	0.042	2016
Toxaphene	0.003	0.001	0.00003	2003
1,2,3-Trichloropropane	0.000005	0.000005	0.0000007	2009
2,3,7,8-TCDD (dioxin)	$3x10^{-8}$	$5x10^{-9}$	$5x10^{-11}$	2010
2,4,5-TP (Silvex)	0.05	0.001	0.003	2014
Chemicals with MCLs in 22 CCR §64533—Disinfection Byproducts				
Total Trihalomethanes	0.080	--	--	--
Bromodichloromethane	--	0.0010	0.00006	2018 draft

Bromoform	--	0.0010	0.0005	2018 draft
Chloroform	--	0.0010	0.0004	2018 draft
Dibromochloromethane	--	0.0010	0.0001	2018 draft
Haloacetic Acids (five) (HAA5)	0.060	--	--	--
Monochloroacetic Acid	--	0.0020	--	--
Dichloroacetic Adic	--	0.0010	--	--
Trichloroacetic Acid	--	0.0010	--	--
Monobromoacetic Acid	--	0.0010	--	--
Dibromoacetic Acid	--	0.0010	--	--
Bromate	0.010	0.0050**	0.0001	2009
Chlorite	1.0	0.020	0.05	2009
Chemicals with PHGs established in response to DDW requests. These are not currently regulated drinking water contaminants.				
N-Nitrosodimethylamine (NDMA)	--	--	0.000003	2006

*OEHHA's review of this chemical during the year indicated (rev20XX) resulted in no change in the PHG.

**The DLR for Bromate is 0.0010 mg/L for analysis performed using EPA Method 317.0 Revision 2.0, 321.8, or 326.0.

OFFICE OF ENVIRONMENTAL HEALTH HAZARD ASSESSMENT

Public Health Goals

Health Risk Information for Public Health Goal Exceedance Reports

February 2019

Pesticide and Environmental Toxicology Branch
Office of Environmental Health Hazard Assessment
California Environmental Protection Agency

Health Risk Information for Public Health Goal Exceedance Reports

Prepared by

Office of Environmental Health Hazard Assessment
California Environmental Protection Agency

February 2019

Under the Calderon-Sher Safe Drinking Water Act of 1996 (the Act), public water systems with more than 10,000 service connections are required to prepare a report every three years for contaminants that exceed their respective Public Health Goals (PHGs).[1] This document contains health risk information on regulated drinking water contaminants to assist public water systems in preparing these reports. A PHG is the concentration of a contaminant in drinking water that poses no significant health risk if consumed for a lifetime. PHGs are developed and published by the Office of Environmental Health Hazard Assessment (OEHHA) using current risk assessment principles, practices and methods.[2]

The water system's report is required to identify the health risk category (e.g., carcinogenicity or neurotoxicity) associated with exposure to each regulated contaminant in drinking water and to include a brief, plainly worded description of these risks. The report is also required to disclose the numerical public health risk, if available, associated with the California Maximum Contaminant Level (MCL) and with the PHG for each contaminant. This health risk information document is prepared by OEHHA every three years to assist the water systems in providing the required information in their reports.

Numerical health risks: Table 1 presents health risk categories and cancer risk values for chemical contaminants in drinking water that have PHGs.

The Act requires that OEHHA publish PHGs based on health risk assessments using the most current scientific methods. As defined in statute, PHGs for non-carcinogenic

[1] Health and Safety Code Section 116470(b)
[2] Health and Safety Code Section 116365

chemicals in drinking water are set at a concentration "at which no known or anticipated adverse health effects will occur, with an adequate margin of safety." For carcinogens, PHGs are set at a concentration that "does not pose any significant risk to health." PHGs provide one basis for revising MCLs, along with cost and technological feasibility. OEHHA has been publishing PHGs since 1997 and the entire list published to date is shown in Table 1.

Table 2 presents health risk information for contaminants that do not have PHGs but have state or federal regulatory standards. The Act requires that, for chemical contaminants with California MCLs that do not yet have PHGs, water utilities use the federal Maximum Contaminant Level Goal (MCLG) for the purpose of complying with the requirement of public notification. MCLGs, like PHGs, are strictly health based and include a margin of safety. One difference, however, is that the MCLGs for carcinogens are set at zero because the US Environmental Protection Agency (US EPA) assumes there is no absolutely safe level of exposure to such chemicals. PHGs, on the other hand, are set at a level considered to pose no *significant* risk of cancer; this is usually no more than a one-in-one-million excess cancer risk (1×10^{-6}) level for a lifetime of exposure. In Table 2, the cancer risks shown are based on the US EPA's evaluations.

For more information on health risks: The adverse health effects for each chemical with a PHG are summarized in a PHG technical support document. These documents are available on the OEHHA website (http://www.oehha.ca.gov). Also, technical fact sheets on most of the chemicals having federal MCLs can be found at http://www.epa.gov/your-drinking-water/table-regulated-drinking-water-contaminants.

Table 1: Health Risk Categories and Cancer Risk Values for Chemicals with California Public Health Goals (PHGs)

Chemical	Health Risk Category[1]	California PHG (mg/L)[2]	Cancer Risk[3] at the PHG	California MCL[4] (mg/L)	Cancer Risk at the California MCL
Alachlor	carcinogenicity (causes cancer)	0.004	NA[5,6]	0.002	NA
Aluminum	neurotoxicity and immunotoxicity (harms the nervous and immune systems)	0.6	NA	1	NA
Antimony	digestive system toxicity (causes vomiting)	0.02	NA	0.006	NA
Arsenic	carcinogenicity (causes cancer)	0.000004 (4×10^{-6})	1×10^{-6} (one per million)	0.01	2.5×10^{-3} (2.5 per thousand)
Asbestos	carcinogenicity (causes cancer)	7 MFL[7] (fibers >10 microns in length)	1×10^{-6}	7 MFL (fibers >10 microns in length)	1×10^{-6} (one per million)
Atrazine	carcinogenicity (causes cancer)	0.00015	1×10^{-6}	0.001	7×10^{-6} (seven per million)

[1] Based on the OEHHA PHG technical support document unless otherwise specified. The categories are the hazard traits defined by OEHHA for California's Toxics Information Clearinghouse (online at: http://oehha.ca.gov/multimedia/green/pdf/GC_Regtext011912.pdf).
[2] mg/L = milligrams per liter of water or parts per million (ppm)
[3] Cancer Risk = Upper bound estimate of excess cancer risk from lifetime exposure. Actual cancer risk may be lower or zero. 1×10^{-6} means one excess cancer case per million people exposed.
[4] MCL = maximum contaminant level.
[5] NA = not applicable. Cancer risk cannot be calculated.
[6] The PHG for alachlor is based on a threshold model of carcinogenesis and is set at a level that is believed to be without any significant cancer risk to individuals exposed to the chemical over a lifetime.
[7] MFL = million fibers per liter of water.

Table 1: Health Risk Categories and Cancer Risk Values for Chemicals with California Public Health Goals (PHGs)

Chemical	Health Risk Category[1]	California PHG (mg/L)[2]	Cancer Risk[3] at the PHG	California MCL[4] (mg/L)	Cancer Risk at the California MCL
Barium	cardiovascular toxicity (causes high blood pressure)	2	NA	1	NA
Bentazon	hepatotoxicity and digestive system toxicity (harms the liver, intestine, and causes body weight effects[8])	0.2	NA	0.018	NA
Benzene	carcinogenicity (causes leukemia)	0.00015	1×10^{-6}	0.001	7×10^{-6} (seven per million)
Benzo[a]pyrene	carcinogenicity (causes cancer)	0.000007 (7×10^{-6})	1×10^{-6}	0.0002	3×10^{-5} (three per hundred thousand)
Beryllium	digestive system toxicity (harms the stomach or intestine)	0.001	NA	0.004	NA
Bromate	carcinogenicity (causes cancer)	0.0001	1×10^{-6}	0.01	1×10^{-4} (one per ten thousand)
Cadmium	nephrotoxicity (harms the kidney)	0.00004	NA	0.005	NA
Carbofuran	reproductive toxicity (harms the testis)	0.0007	NA	0.018	NA

[8] Body weight effects are an indicator of general toxicity in animal studies.

Table 1: Health Risk Categories and Cancer Risk Values for Chemicals with California Public Health Goals (PHGs)

Chemical	Health Risk Category[1]	California PHG (mg/L)[2]	Cancer Risk[3] at the PHG	California MCL[4] (mg/L)	Cancer Risk at the California MCL
Carbon tetrachloride	carcinogenicity (causes cancer)	0.0001	1×10^{-6}	0.0005	5×10^{-6} (five per million)
Chlordane	carcinogenicity (causes cancer)	0.00003	1×10^{-6}	0.0001	3×10^{-6} (three per million)
Chlorite	hematotoxicity (causes anemia) neurotoxicity (causes neurobehavioral effects)	0.05	NA	1	NA
Chromium, hexavalent	carcinogenicity (causes cancer)	0.00002	1×10^{-6}	none	NA
Copper	digestive system toxicity (causes nausea, vomiting, diarrhea)	0.3	NA	1.3 (AL[9])	NA
Cyanide	neurotoxicity (damages nerves) endocrine toxicity (affects the thyroid)	0.15	NA	0.15	NA
Dalapon	nephrotoxicity (harms the kidney)	0.79	NA	0.2	NA
Di(2-ethylhexyl) adipate (DEHA)	developmental toxicity (disrupts development)	0.2	NA	0.4	NA
Diethylhexyl-phthalate (DEHP)	carcinogenicity (causes cancer)	0.012	1×10^{-6}	0.004	3×10^{-7} (three per ten million)

[9] AL = action level. The action levels for copper and lead refer to a concentration measured at the tap. Much of the copper and lead in drinking water is derived from household plumbing (The Lead and Copper Rule, Title 22, California Code of Regulations [CCR] section 64672.3).

Table 1: Health Risk Categories and Cancer Risk Values for Chemicals with California Public Health Goals (PHGs)

Chemical	Health Risk Category[1]	California PHG (mg/L)[2]	Cancer Risk[3] at the PHG	California MCL[4] (mg/L)	Cancer Risk at the California MCL
1,2-Dibromo-3-chloropropane (DBCP)	carcinogenicity (causes cancer)	0.0000017 (1.7×10^{-6})	1×10^{-6}	0.0002	1×10^{-4} (one per ten thousand)
1,2-Dichloro-benzene (*o*-DCB)	hepatotoxicity (harms the liver)	0.6	NA	0.6	NA
1,4-Dichloro-benzene (*p*-DCB)	carcinogenicity (causes cancer)	0.006	1×10^{-6}	0.005	8×10^{-7} (eight per ten million)
1,1-Dichloro-ethane (1,1-DCA)	carcinogenicity (causes cancer)	0.003	1×10^{-6}	0.005	2×10^{-6} (two per million)
1,2-Dichloro-ethane (1,2-DCA)	carcinogenicity (causes cancer)	0.0004	1×10^{-6}	0.0005	1×10^{-6} (one per million)
1,1-Dichloro-ethylene (1,1-DCE)	hepatotoxicity (harms the liver)	0.01	NA	0.006	NA
1,2-Dichloro-ethylene, cis	nephrotoxicity (harms the kidney)	0.013	NA	0.006	NA
1,2-Dichloro-ethylene, trans	immunotoxicity (harms the immune system)	0.05	NA	0.01	NA
Dichloromethane (methylene chloride)	carcinogenicity (causes cancer)	0.004	1×10^{-6}	0.005	1×10^{-6} (one per million)

Table 1: Health Risk Categories and Cancer Risk Values for Chemicals with California Public Health Goals (PHGs)

Chemical	Health Risk Category[1]	California PHG (mg/L)[2]	Cancer Risk[3] at the PHG	California MCL[4] (mg/L)	Cancer Risk at the California MCL
2,4-Dichloro-phenoxyacetic acid (2,4-D)	hepatotoxicity and nephrotoxicity (harms the liver and kidney)	0.02	NA	0.07	NA
1,2-Dichloro-propane (propylene dichloride)	carcinogenicity (causes cancer)	0.0005	1×10^{-6}	0.005	1×10^{-5} (one per hundred thousand)
1,3-Dichloro-propene (Telone II®)	carcinogenicity (causes cancer)	0.0002	1×10^{-6}	0.0005	2×10^{-6} (two per million)
Dinoseb	reproductive toxicity (harms the uterus and testis)	0.014	NA	0.007	NA
Diquat	ocular toxicity (harms the eye) developmental toxicity (causes malformation)	0.006	NA	0.02	NA
Endothall	digestive system toxicity (harms the stomach or intestine)	0.094	NA	0.1	NA
Endrin	neurotoxicity (causes convulsions) hepatotoxicity (harms the liver)	0.0003	NA	0.002	NA
Ethylbenzene (phenylethane)	hepatotoxicity (harms the liver)	0.3	NA	0.3	NA
Ethylene dibromide (1,2-Dibromoethane)	carcinogenicity (causes cancer)	0.00001	1×10^{-6}	0.00005	5×10^{-6} (five per million)

Table 1: Health Risk Categories and Cancer Risk Values for Chemicals with California Public Health Goals (PHGs)

Chemical	Health Risk Category[1]	California PHG (mg/L)[2]	Cancer Risk[3] at the PHG	California MCL[4] (mg/L)	Cancer Risk at the California MCL
Fluoride	musculoskeletal toxicity (causes tooth mottling)	1	NA	2	NA
Glyphosate	nephrotoxicity (harms the kidney)	0.9	NA	0.7	NA
Heptachlor	carcinogenicity (causes cancer)	0.000008 (8×10^{-6})	1×10^{-6}	0.00001	1×10^{-6} (one per million)
Heptachlor epoxide	carcinogenicity (causes cancer)	0.000006 (6×10^{-6})	1×10^{-6}	0.00001	2×10^{-6} (two per million)
Hexachloroben-zene	carcinogenicity (causes cancer)	0.00003	1×10^{-6}	0.001	3×10^{-5} (three per hundred thousand)
Hexachloro-cyclopentadiene (HCCPD)	digestive system toxicity (causes stomach lesions)	0.002	NA	0.05	NA
Lead	developmental neurotoxicity (causes neurobehavioral effects in children) cardiovascular toxicity (causes high blood pressure) carcinogenicity (causes cancer)	0.0002	$<1\times10^{-6}$ (PHG is not based on this effect)	0.015 (AL[8])	2×10^{-6} (two per million)
Lindane (γ-BHC)	carcinogenicity (causes cancer)	0.000032	1×10^{-6}	0.0002	6×10^{-6} (six per million)
Mercury (inorganic)	nephrotoxicity (harms the kidney)	0.0012	NA	0.002	NA

Table 1: Health Risk Categories and Cancer Risk Values for Chemicals with California Public Health Goals (PHGs)

Chemical	Health Risk Category[1]	California PHG (mg/L)[2]	Cancer Risk[3] at the PHG	California MCL[4] (mg/L)	Cancer Risk at the California MCL
Methoxychlor	endocrine toxicity (causes hormone effects)	0.00009	NA	0.03	NA
Methyl tertiary-butyl ether (MTBE)	carcinogenicity (causes cancer)	0.013	1×10^{-6}	0.013	1×10^{-6} (one per million)
Molinate	carcinogenicity (causes cancer)	0.001	1×10^{-6}	0.02	2×10^{-5} (two per hundred thousand)
Monochloro-benzene (chlorobenzene)	nephrotoxicity (harms the kidney)	0.07	NA	0.07	NA
Nickel	developmental toxicity (causes increased neonatal deaths)	0.012	NA	0.1	NA
Nitrate	hematotoxicity (causes methemoglobinemia)	45 as nitrate	NA	10 as nitrogen (=45 as nitrate)	NA
Nitrite	hematotoxicity (causes methemoglobinemia)	3 as nitrite	NA	1 as nitrogen (=3 as nitrite)	NA
Nitrate and Nitrite	hematotoxicity (causes methemoglobinemia)	10 as nitrogen[10]	NA	10 as nitrogen	NA

[10] The joint nitrate/nitrite PHG of 10 mg/L (10 ppm, expressed as nitrogen) does not replace the individual values, and the maximum contribution from nitrite should not exceed 1 mg/L nitrite-nitrogen.

Table 1: Health Risk Categories and Cancer Risk Values for Chemicals with California Public Health Goals (PHGs)

Chemical	Health Risk Category[1]	California PHG (mg/L)[2]	Cancer Risk[3] at the PHG	California MCL[4] (mg/L)	Cancer Risk at the California MCL
N-nitroso-dimethyl-amine (NDMA)	carcinogenicity (causes cancer)	0.000003 (3×10^{-6})	1×10^{-6}	none	NA
Oxamyl	general toxicity (causes body weight effects)	0.026	NA	0.05	NA
Pentachloro-phenol (PCP)	carcinogenicity (causes cancer)	0.0003	1×10^{-6}	0.001	3×10^{-6} (three per million)
Perchlorate	endocrine toxicity (affects the thyroid) developmental toxicity (causes neurodevelop-mental deficits)	0.001	NA	0.006	NA
Picloram	hepatotoxicity (harms the liver)	0.166	NA	0.5	NA
Polychlorinated biphenyls (PCBs)	carcinogenicity (causes cancer)	0.00009	1×10^{-6}	0.0005	6×10^{-6} (six per million)
Radium-226	carcinogenicity (causes cancer)	0.05 pCi/L	1×10^{-6}	5 pCi/L (combined $Ra^{226+228}$)	1×10^{-4} (one per ten thousand)
Radium-228	carcinogenicity (causes cancer)	0.019 pCi/L	1×10^{-6}	5 pCi/L (combined $Ra^{226+228}$)	3×10^{-4} (three per ten thousand)
Selenium	integumentary toxicity (causes hair loss and nail damage)	0.03	NA	0.05	NA

Table 1: Health Risk Categories and Cancer Risk Values for Chemicals with California Public Health Goals (PHGs)

Chemical	Health Risk Category[1]	California PHG (mg/L)[2]	Cancer Risk[3] at the PHG	California MCL[4] (mg/L)	Cancer Risk at the California MCL
Silvex (2,4,5-TP)	hepatotoxicity (harms the liver)	0.003	NA	0.05	NA
Simazine	general toxicity (causes body weight effects)	0.004	NA	0.004	NA
Strontium-90	carcinogenicity (causes cancer)	0.35 pCi/L	1×10^{-6}	8 pCi/L	2×10^{-5} (two per hundred thousand)
Styrene (vinylbenzene)	carcinogenicity (causes cancer)	0.0005	1×10^{-6}	0.1	2×10^{-4} (two per ten thousand)
1,1,2,2-Tetrachloro-ethane	carcinogenicity (causes cancer)	0.0001	1×10^{-6}	0.001	1×10^{-5} (one per hundred thousand)
2,3,7,8-Tetra-chlorodibenzo-*p*-dioxin (TCDD, or dioxin)	carcinogenicity (causes cancer)	5×10^{-11}	1×10^{-6}	3×10^{-8}	6×10^{-4} (six per ten thousand)
Tetrachloro-ethylene (perchloro-ethylene, or PCE)	carcinogenicity (causes cancer)	0.00006	1×10^{-6}	0.005	8×10^{-5} (eight per hundred thousand)
Thallium	integumentary toxicity (causes hair loss)	0.0001	NA	0.002	NA

Table 1: Health Risk Categories and Cancer Risk Values for Chemicals with California Public Health Goals (PHGs)

Chemical	Health Risk Category[1]	California PHG (mg/L)[2]	Cancer Risk[3] at the PHG	California MCL[4] (mg/L)	Cancer Risk at the California MCL
Thiobencarb	general toxicity (causes body weight effects) hematotoxicity (affects red blood cells)	0.042	NA	0.07	NA
Toluene (methylbenzene)	hepatotoxicity (harms the liver) endocrine toxicity (harms the thymus)	0.15	NA	0.15	NA
Toxaphene	carcinogenicity (causes cancer)	0.00003	1×10^{-6}	0.003	1×10^{-4} (one per ten thousand)
1,2,4-Trichloro-benzene	endocrine toxicity (harms adrenal glands)	0.005	NA	0.005	NA
1,1,1-Trichloro-ethane	neurotoxicity (harms the nervous system), reproductive toxicity (causes fewer offspring) hepatotoxicity (harms the liver) hematotoxicity (causes blood effects)	1	NA	0.2	NA
1,1,2-Trichloro-ethane	carcinogenicity (causes cancer)	0.0003	$1x10^{-6}$	0.005	2×10^{-5} (two per hundred thousand)
Trichloro-ethylene (TCE)	carcinogenicity (causes cancer)	0.0017	1×10^{-6}	0.005	3×10^{-6} (three per million)

Table 1: Health Risk Categories and Cancer Risk Values for Chemicals with California Public Health Goals (PHGs)

Chemical	Health Risk Category[1]	California PHG (mg/L)[2]	Cancer Risk[3] at the PHG	California MCL[4] (mg/L)	Cancer Risk at the California MCL
Trichlorofluoro-methane (Freon 11)	accelerated mortality (increase in early death)	1.3	NA	0.15	NA
1,2,3-Trichloro-propane (1,2,3-TCP)	carcinogenicity (causes cancer)	0.0000007 (7×10^{-7})	$1x10^{-6}$	0.000005 (5×10^{-6})	7×10^{-6} (seven per million)
1,1,2-Trichloro-1,2,2-trifluoro-ethane (Freon 113)	hepatotoxicity (harms the liver)	4	NA	1.2	NA
Tritium	carcinogenicity (causes cancer)	400 pCi/L	$1x10^{-6}$	20,000 pCi/L	$5x10^{-5}$ (five per hundred thousand)
Uranium	carcinogenicity (causes cancer)	0.43 pCi/L	1×10^{-6}	20 pCi/L	5×10^{-5} (five per hundred thousand)
Vinyl chloride	carcinogenicity (causes cancer)	0.00005	1×10^{-6}	0.0005	1×10^{-5} (one per hundred thousand)
Xylene	neurotoxicity (affects the senses, mood, and motor control)	1.8 (single isomer or sum of isomers)	NA	1.75 (single isomer or sum of isomers)	NA

Table 2: Health Risk Categories and Cancer Risk Values for Chemicals without California Public Health Goals

Chemical	Health Risk Category[1]	US EPA MCLG[2] (mg/L)	Cancer Risk[3] @ MCLG	California MCL[4] (mg/L)	Cancer Risk @ California MCL
Disinfection byproducts (DBPs)					
Chloramines	acute toxicity (causes irritation) digestive system toxicity (harms the stomach) hematotoxicity (causes anemia)	4[5,6]	NA[7]	none	NA
Chlorine	acute toxicity (causes irritation) digestive system toxicity (harms the stomach)	4[5,6]	NA	none	NA
Chlorine dioxide	hematotoxicity (causes anemia) neurotoxicity (harms the nervous system)	0.8[5,6]	NA	none	NA
Disinfection byproducts: haloacetic acids (HAA5)					
Monochloroacetic acid (MCA)	general toxicity (causes body and organ weight changes[8])	0.07	NA	none	NA
Dichloroacetic acid (DCA)	carcinogenicity (causes cancer)	0	0	none	NA

[1] Health risk category based on the US EPA MCLG document or California MCL document unless otherwise specified.
[2] MCLG = maximum contaminant level goal established by US EPA.
[3] Cancer Risk = Upper estimate of excess cancer risk from lifetime exposure. Actual cancer risk may be lower or zero. 1×10^{-6} means one excess cancer case per million people exposed.
[4] California MCL = maximum contaminant level established by California.
[5] Maximum Residual Disinfectant Level Goal, or MRDLG.
[6] The federal Maximum Residual Disinfectant Level (MRDL), or highest level of disinfectant allowed in drinking water, is the same value for this chemical.
[7] NA = not available.
[8] Body weight effects are an indicator of general toxicity in animal studies.

Table 2: Health Risk Categories and Cancer Risk Values for Chemicals without California Public Health Goals

Chemical	Health Risk Category[1]	US EPA MCLG[2] (mg/L)	Cancer Risk[3] @ MCLG	California MCL[4] (mg/L)	Cancer Risk @ California MCL
Trichloroacetic acid (TCA)	hepatotoxicity (harms the liver)	0.02	NA	none	NA
Monobromoacetic acid (MBA)	NA	none	NA	none	NA
Dibromoacetic acid (DBA)	NA	none	NA	none	NA
Total haloacetic acids (sum of MCA, DCA, TCA, MBA, and DBA)	general toxicity, hepatotoxicity and carcinogenicity (causes body and organ weight changes, harms the liver and causes cancer)	none	NA	0.06	NA
Disinfection byproducts: trihalomethanes (THMs)					
Bromodichloro-methane (BDCM)	carcinogenicity (causes cancer)	0	0	none	NA
Bromoform	carcinogenicity (causes cancer)	0	0	none	NA
Chloroform	hepatotoxicity and nephrotoxicity (harms the liver and kidney)	0.07	NA	none	NA
Dibromo-chloromethane (DBCM)	hepatotoxicity, nephrotoxicity, and neurotoxicity (harms the liver, kidney, and nervous system)	0.06	NA	none	NA

Table 2: Health Risk Categories and Cancer Risk Values for Chemicals without California Public Health Goals

Chemical	Health Risk Category[1]	US EPA MCLG[2] (mg/L)	Cancer Risk[3] @ MCLG	California MCL[4] (mg/L)	Cancer Risk @ California MCL
Total trihalomethanes (sum of BDCM, bromoform, chloroform and DBCM)	carcinogenicity (causes cancer), hepatotoxicity, nephrotoxicity, and neurotoxicity (harms the liver, kidney, and nervous system)	none	NA	0.08	NA
Radionuclides					
Gross alpha particles[9]	carcinogenicity (causes cancer)	0 (^{210}Po included)	0	15 pCi/L[10] (includes ^{226}Ra but not radon and uranium)	up to $1x10^{-3}$ (for ^{210}Po, the most potent alpha emitter
Beta particles and photon emitters[9]	carcinogenicity (causes cancer)	0 (^{210}Pb included)	0	50 pCi/L (judged equiv. to 4 mrem/yr)	up to $2x10^{-3}$ (for ^{210}Pb, the most potent beta-emitter)

[9] MCLs for gross alpha and beta particles are screening standards for a group of radionuclides. Corresponding PHGs were not developed for gross alpha and beta particles. See the OEHHA memoranda discussing the cancer risks at these MCLs at http://www.oehha.ca.gov/water/reports/grossab.html.
[10] pCi/L = picocuries per liter of water.