Process Memo 97-005 User Guide

September 2020

Process Memo 97-005 User Guide – Purpose and Scope

This Process Memo 97-005 User Guide has been prepared to provide the reader with a better understanding of the purpose, goals, requirements, and rationale of the Process Memo 97-005 document preparation and review process.

This User Guide is the result of a collaborative effort and is produced as a public service by the Coalition for Environmental Protection Restoration and Development (CEPRD). For over thirty years CEPRD and predecessor entities have promoted the development and use of private-public partnerships strategies with environmental regulatory agencies at the federal, state, regional, and local levels. This User Guide is designed to enhance opportunities for more effective utilization of California's groundwater basins for sustainable drinking water supply.

This effort was made possible through the cooperation and support of the State Water Resources Control Board Division of Drinking Water (DDW), Honeywell, Lockheed Martin Corporation, Los Angeles Department of Water and Power (LADWP), Metropolitan Water District of Southern California (MWD), Orange County Water District (OCWD), and the San Gabriel Basin Water Quality Authority (WQA).

This User Guide clarifies documentation that a Public Water System (PWS) will be required to submit for DDW's consideration of an Extremely Impaired Source for a drinking water supply under Process Memo 97-005. The applicant for an amended Water Supply Permit which proposes to treat and distribute water from an Extremely Impaired Source needs to understand the level of effort and data which will be required by DDW. In many cases, Potentially Responsible Parties (PRPs) may be working with the PWS to develop a cooperative plan to implement cleanup, and those PRPs will rely on the PWS to use the treated water.

Furthermore, DDW staff who will be reviewing the Process Memo 97-005 submittals will need to be cognizant of the regulatory requirements associated with cleanup operations, the basis of the request to use the fully treated water as a potable supply, and time considerations. A common theme throughout this User Guide is that DDW's and the PWS's mutual goal is to ensure the public receives a safe and reliable water supply.

This User Guide is a tool that may be reviewed and used to assist with the preparation of the Process Memo 97-005 documentation. However, this User Guide is not an official document developed by DDW.

CEPRD wishes to express its appreciation to all participants and in particular acknowledges the efforts of Ken Manning and Randy Schoellerman of the WQA, Kevin Smead of Stetson Engineers, Shu-Fang Orr of DDW, Susan Paulsen of Exponent, and Michael Taraszki of Wood Environment & Infrastructure Solutions for their significant contributions to the preparation of this document.

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Glossary of Key Terms

1.1 Acronyms

1,2,3-TCP	1,2,3-Trichloropropane
BAT	Best Available Technology
CCR	California Code of Regulations
CEQA	California Environmental Quality Act
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CWC	California Water Code
DDW	State Water Resources Control Board – Division of Drinking Water
DLRs	Detection Limits for Purposes of Reporting
DTSC	Department of Toxic Substances Control
DWR	Department of Water Resources
DWSAP	Drinking Water Source Assessment Plan
GPM	Gallons Per Minute
LGAC	Liquid-phase Granular Activated Carbon
MCL	Maximum Contaminant Level
MS4	Municipal Separate Storm Sewer System
NDMA	N-nitrosodimethylamine
NL	Notification Level
NPL	National Priorities List
OMMP	Operations, Maintenance, and Monitoring Plan
PCAs	Potential Contamination Activities

PCE	Perchloroethylene
PLC	Programmable Logic Controller
PRP	Potentially Responsible Parties
PWS	Public Water System
RO	Reverse Osmosis
RWQCB	Regional Water Quality Control Board
SCADA	Supervisory Control and Data Acquisition
SGMA	Sustainable Groundwater Management Act
SWRCB	State Water Resources Control Board
TCE	Trichloroethylene
TIC	Tentatively Identified Compound
TOC	Total Organic Carbon
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
UV	Ultraviolet
VOCs	Volatile Organic Compounds

1.2 Definitions

Chemicals of Emerging Concern - According to the SWRCB, Chemicals of Emerging Concern (CECs) are a vast number of chemicals that are generally unregulated in the U.S. or have limited regulation in environmental media. CECs may include pharmaceuticals, flame retardants, newly registered contemporary use pesticides, newly developed commercial products, including nanomaterials. Generally, CECs have likely been present in water bodies, sediments and tissues but at concentrations that were not detectable by commonly used analytical methods.

Contaminant Assessment - The Contaminant Assessment represents a detailed investigation into potential contaminants that have been or may be detected in the proposed extraction wells and ultimately will assist with determination of required treatment.

Cross-connection Control Training - Similar to training field personnel, PWS staff which inspect and maintain cross-connection controls should be requested to be vigilant for PCAs.

Evaluation of Risk Failure - The PWS must review all components of the treatment facility, including the source of supply, treatment equipment, wet wells, boosters, controls, alarms, SCADA and reservoirs.

Extremely Impaired Source - May be either surface water or a groundwater source and examples include but are not limited to extremely contaminated groundwater; sewage effluent dominated surface water; oilfield produced water; water that is predominantly recycled water (unless associated with an approved drinking water-related project using groundwater replenishment or surface water augmentation); urban storm drainage; treated or untreated wastewater; agricultural return water; and products of toxic site cleanup programs.

Fault Tree - Whereby a diagram is prepared for each component of the treatment process. The PWS then assumes an error (or a fault) has occurred and, using the fault tree diagrams and "if/then" statements, the PWS will progress forward until a solution is found. This detailed thought process is intended to diagnose and resolve problems within the treatment facility.

Health Risk Evaluation - PWS must evaluate the potential health impacts to its customers of receiving partially treated or untreated water.

MCL Equivalent - The MCL equivalent is calculated as the sum of each contaminant in the fully treated water divided by its respective MCL (or NL) and must be less than 1.

MS4 Permit - Many cities may be subject to the provisions of an MS4 permit from local RWQCBs which obligate the cities to monitor and eliminate non-stormwater discharges to storm channels unless the discharger is able to provide a separate RWQCB permit.

Notice of Determination - A brief notice to be filed by a public agency after it approves or determines to carry out a project subject to the requirements of CEQA.

Notification Plan - The Notification Plan is to include the names and contacts for the PWS and DDW staff assigned to the PWS in the event of a potential treatment facility issue or failure.

Raw Water Quality Characterization - The raw water quality characterization consists of a full characterization of the quality of the water that will be fed into the treatment system, so that the treatment system can be properly designed.

Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65) - Requires the state to maintain and update a list of chemicals known to the state to cause cancer or reproductive toxicity. *Reference: oehha.ca.gov/proposition-65*

Source Water Assessment - The purpose of the source water assessment for the Extremely Impaired Source is to determine the extent to which the aquifer or surface water is vulnerable to contaminating activities in the area.

Startup Testing Plan - Demonstrates the treatment technology and programming operates as designed.

Water Quality Surveillance Plan - This is the upgradient monitoring plan, which will be used to maintain information on the upgradient water quality. This plan will be modified and extended to account for the continued monitoring and reporting, as necessary, once enhanced treatment for a particular system component is no longer needed.

Water Source Assessment/Contaminant Assessment - The drinking water source assessment is the first step in the development of a complete drinking water source protection program. The assessment includes: A delineation of the area around a drinking water source through which contaminants might move and reach that drinking water supply; an inventory of possible contaminating activities (PCAs) that might lead to the release of microbiological or chemical contaminants within the delineated area; and a determination of the PCAs to which the drinking water source is most vulnerable. *Reference: www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/DWSAP.html*

Water Supply Permit - Proposes to treat and distribute Extremely Impaired Source and describes how a water system is to be operated, including water quality monitoring requirements. Almost all Water Supply Permits contain special provisions established specifically for the individual PWS, setting forth operating requirements which, if not met, could result in a formal enforcement action from DDW. Water Supply Permits do not have expiration dates, but whenever a water system adds a new water source, adds or changes treatment, has a change in ownership, or makes changes to the distribution system to be in compliance comply with DDW drinking water regulations, then an amendment to the Water Supply Permit is required.

Section 2

Introduction

2.0 Background

Groundwater historically has been, and continues to be, an important source of water supply throughout the State of California. The State Water Resources Control Board – Division of Drinking Water (DDW) regulates public water systems (PWS), oversees water recycling projects, permits water treatment devices, supports and promotes water system security, and performs a number of other functions related to drinking water in the State of California. A PWS is a system that provides water for human consumption to 15 or more connections or regularly serves 25 or more people daily for at least 60 days out of the year. Public water systems are required to have domestic water supply permits, which initially requires the PWS to complete a preliminary technical report and to comply with California Code of Regulations Title 22 (among other requirements).

In 1997, the DDW (then referred to as the California Department of Public Health) published the 97-005 Policy Memorandum in recognition of the increasing need for a PWS to rely on contaminated water (groundwater or surface water) with treatment to meet demand. This “97-005 Process” was developed to support a PWS that elects to rely on a contaminated water supply to ensure that appropriate treatment technologies and other safeguards are in place to protect human health.

Although treatment technologies are often appropriately selected to remove contaminants, DDW must be satisfied the treatment facilities will function properly at all times, and that the public will receive a safe and reliable water supply at all times.

The balance between the desire to use groundwater supply sources which have been contaminated and the need to maintain public safety at all times prompted DDW (historically referred to as the Department of Health Services) to develop Policy Memo 97-005, “Policy Guidance for Direct Domestic Use of Extremely Impaired Sources,” Policy Memo dated November 5, 1997. Subsequently, DDW developed an updated version of Process Memo 97-005 in the draft document entitled “Addressing the Direct Domestic Use of Extremely Impaired Sources, Process Memo 97-005,” dated March 25, 2015. Upon completion of this User Guide, DDW finalized the 2015 draft after making minor adjustments to the document’s examples. It is entitled “*PROCESS MEMO 97-005-R2020; Revised Guidance for Direct Domestic Use of Extremely Impaired Sources*” and is available on DDW’s website at https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/Publications.html. This User Guide is based on the requirements of the updated Process Memo 97-005 and is intended to assist all parties with the understanding of the process and deliverables that may be necessary to achieve a successful outcome. However, it does not replace the memo itself, and the reader is encouraged to review the updated 97-005 memo and this User Guide before proceeding with preparation of the documents.

2.1 Overview of the Process Memo 97-005

The purpose of Process Memo 97-005 is to "…set forth the process and principles by which DDW would evaluate the proposals, establish appropriate permit conditions, and approve the use of an extremely impaired source for direct potable use." The Process Memo 97-005 provides a PWS with a framework to fully characterize the Extremely Impaired Source, develop treated water goals that are protective of public health, determine actions to be taken to treat the source to achieve treated water goals, and assess potential health risks that may result from the unintentional exposure of a customer (directly or indirectly) to untreated or partially treated source water.

An "Extremely Impaired Source" meets two or more of the following criteria (Although an Extremely Impaired Source may be either surface water or a groundwater source, this User Guide describes groundwater sources exclusively. The same process and decisions are also applicable to surface water sources.):

- Contains a contaminant that exceeds 10 times its Maximum Contaminant Level (MCL) based on chronic health effects. **Chronic health effects are based on long-term exposure to a contaminant. Examples include Volatile Organic Compounds (VOCs) such as Tetrachloroethylene (PCE) and Trichloroethylene (TCE).**
- Contains a contaminant that exceeds 3 times its MCL based on acute health effects. **Acute health effects are associated with the short-term exposure to a contaminant. Examples include Nitrate-Nitrogen and Perchlorate.**
- Contains a contaminant that exceeds 10 times its Notification Level (NL) based on chronic health effects.
- Contains a contaminant that exceeds 3 times its NL based on acute health effects.
- Contains one or more contaminants that meet any of the criteria of the four points above and the source has not been adequately characterized by responsible parties.
- Is a surface water source, which requires more than 4 log *Giardia/5* log virus reduction.
- Is a surface water source that on an annual average contains more than five percent treated wastewater, unless it is associated with an approved drinking water-related surface augmentation project.
- Is extremely threatened with contamination due to known contaminating activities within the long-term, steady-state capture zone of a drinking water well or within the watershed of a surface water intake.
- Contains a mixture of contaminants of health concern beyond what is typically seen in terms of number and concentration of contaminants.
- Is designed to intercept known contaminants of health concern.

Examples of an Extremely Impaired Source include but are not limited to:

- Extremely contaminated groundwater;
- Sewage effluent dominated surface water;
- Oilfield produced water that is predominantly recycled water (unless associated with an approved drinking water-related project using groundwater replenishment or surface water augmentation);
- Urban storm drainage;

- Treated or untreated wastewater;
- Agricultural return water; or
- Products of toxic site cleanup programs

Because the circumstances surrounding each situation may be different, permit application by a PWS for the use of an Extremely Impaired Source must be considered on a case-by-case basis. The applicability of enhanced treatment, as discussed below, will be evaluated as part of initiating the water supply project, as well as after operations have begun and a sufficient amount of empirical data have been generated. Conditions for operating one or more specific treatment units comprising the overall treatment system shall be described in the Operations, Monitoring, and Maintenance Plan. This Process Memo 97-005 User Guide is not intended to be a rigid, prescriptive document. However, the intent is to follow the process laid out in this 97-005 User Guide to the extent possible. The reader should keep in mind the intent of treating an Extremely Impaired Source is primarily applicable to water extracted from production wells intended for use as drinking water and not to shallow “hot spot” extraction and treatment systems, which may contain concentrations of contaminants hundreds, if not thousands, of times an MCL and are generally not suitable sources for drinking water.

At the beginning of the process there should be a kickoff meeting with DDW, the PWS, PRPs (if involved), and the entity preparing the 97-005 document. The kickoff meeting should establish the lines of communication. At this meeting DDW can communicate the process as some of the steps described in Process Memo 97-005 may be able to be omitted at DDW’s discretion. Formal communications, such as letters from DDW, are sent directly to the PWS. However, DDW and the PWS may agree to involve other parties in communications with DDW on permitting.

2.2 Connection with the Sustainable Groundwater Management Act

During 2014, California enacted the Sustainable Groundwater Management Act (SGMA) as set forth in the California Water Code (CWC) Section 10720.1. SGMA was adopted as a means to: provide for the sustainable management of groundwater basins; enhance local management of groundwater consistent with rights to use or to store groundwater; establish minimum standards for sustainable groundwater management; provide local groundwater management agencies with the legal authority along with the technical and financial assistance necessary to sustainably manage groundwater; to avoid or to minimize subsidence problems; improve the collection of data and the understanding of groundwater; increase groundwater storage and remove impediments to recharge; manage groundwater basins through the actions of local governmental agencies to the greatest extent possible while minimizing state intervention; protect water quality; and, where applicable, provide for the most efficient and cost-effective allocation procedures that protect water rights and ensure due process. Public Water Systems (PWS) rely on groundwater sources for their potable water demands. Loss of groundwater sources impacts the reliability of water supplies, is contradictory to the intent of SGMA and the sustainable use of groundwater supplies, and may force a PWS to seek an alternative (and often more expensive) source of supply; in some cases that alternative source of supply is treated imported water which subsequently places additional strain on the imported water infrastructure.

Because the DDW has the responsibility to regulate the water supplies of a PWS to ensure the public will receive a safe and reliable water supply at all times, DDW has the regulatory authority to (1) issue permits for a PWS and their sources and treatment, (2) inspect water systems, (3) track monitoring requirements of water systems to determine compliance, and (4) take enforcement actions.

All PWS must have a permit issued by DDW to operate and provide potable water to customers. These "Water Supply Permits" and the accompanying DDW engineering reports describe how a water system is to be operated, including water quality monitoring requirements. Almost all Water Supply Permits contain special provisions established specifically for the individual PWS, setting forth operating requirements which, if not met, could result in a formal enforcement action from DDW. Water Supply Permits do not have expiration dates, but whenever a water system adds a new water source, adds or changes treatment, has a change in ownership, or makes changes to the distribution system to comply with DDW drinking water regulations, then an amendment to the Water Supply Permit is required; several of these examples are listed in Section 10.0. The reader is encouraged to refer to Section 64556, Title 22, CCR for a complete list of actions which require a water supply permit amendment.

Unfortunately, numerous groundwater basins have been impacted by contaminants, which have compromised the ability to use otherwise good quality groundwater sources of supply for potable water supply. In those cases, in addition to complying with SGMA requirements, a PWS may also be required to follow the 97-005 Process to obtain or modify a permit to provide drinking water to the public.

2.3 Need for Clarity

Process Memo 97-005 was developed by DDW as a means for a PWS to provide DDW staff with detailed information on an Extremely Impaired Source of supply and the planned treatment and safety features. The Process Memo 97-005 submittal, along with treated water quality from initial commissioning of the treatment facility (i.e., prior to delivering treated water to the public), is then reviewed by DDW staff. In many cases, DDW may also require a public hearing, which will provide an opportunity for the public, particularly PWS customers who may ultimately be recipients of the treated water, to review and comment upon the proposal. This User Guide has been developed, in part, to clarify the following components:

- Water quality investigations and data to be included as part of Process Memo 97-005 documentation;
- Treatment technology selection;
- Public outreach requirements
- Coordination with regulatory agencies and municipalities to facilitate source protection;
- Treatment technology redundancy and programming "fail safes" to minimize the potential for partially treated or untreated water to reach the public water supply to be delivered to customers; and
- How to complete the health risk assessment.

It is important for the PWS to note that there is no such thing as a "97-005 Permit"; instead Process Memo 97-005 provides guidance to DDW on the process of using an Extremely Impaired Source as a water source. Furthermore, submittal of an application package by a PWS to DDW does not automatically result in approval. DDW staff may choose to deny the PWS application for a new or amended Water Supply Permit in the event there are insufficient data submitted, concerns with treatment technology and reliability, unacceptable health risks, lack of public acceptance, and/or other concerns.

2.4 Potential Audience

This User Guide has been prepared to provide readers, the PWS, DDW, Potentially Responsible Parties (PRPs), and others with a better understanding of the purpose, goals, requirements, and rationale of the Process Memo 97-005 application preparation and review process. For instance, this document clarifies what documentation a PWS will be required to submit for DDW's consideration of an Extremely Impaired Source for a drinking water supply under Process Memo 97-005. Importantly, all parties need to understand the level of effort and data which will be required by DDW. In many cases, PRPs may be working with the PWS to develop a cooperative plan to implement cleanup, and those PRPs will rely on the PWS to use the treated water.

Furthermore, this User Guide has been prepared to also support the DDW staff who will review the Process Memo 97-005 submittals and who need to be cognizant of the regulatory requirements associated with cleanup operations, the basis of the request to use the fully treated water as a potable supply, and time considerations. DDW and the PWS have the mutual responsibility to ensure the public receives a safe and reliable water supply.

2.5 Future Revisions or Update Process for this Guidance Document

This User Guide should be viewed as a "living document" and as such will be periodically updated to reflect changes to the DDW Process Memo 97-005, regulations, and water quality standards, among other items. The reader should recognize revisions may occur and strive to use the most current edition of this User Guide when developing Process Memo 97-005 submittals.

Section 3

Getting Started

3.0 When Is a Process Memo 97-005 Analysis Required?

When initially considering treatment at a water source for potable purposes, the PWS and DDW must first obtain relevant data and then consider the potential applicability of Process Memo 97-005. Checklists for a variety of decision points have been included in Appendix A of this User Guide and may be used by the PWS as quick reference for actions that are to be completed to make the Process Memo 97-005 document complete. **In all cases DDW will have the final determination regarding the applicability of Process Memo 97-005.**

Consider the following questions:

1. Is the contaminated source located in the vicinity of a site included on the United States Environmental Protection Agency (USEPA) National Priorities List (NPL)[1], or a cleanup site managed by the California Department of Toxic Substances Control or the Regional Water Quality Control Board[2]
   a. If yes, this source is likely subject to Process Memo 97-005
   b. **If no, go to Item 2 below**.
2. Does the contaminated source include two or more of the following?
   - Contains a contaminant that exceeds 10 times its Maximum Contaminant Level (MCL) based on chronic health effects. **Chronic health effects are based on long-term exposure to a contaminant. Examples include Volatile Organic Compounds (VOCs) such as PCE and TCE, and Inorganic Chemicals such as arsenic.**
   - Contains a contaminant that exceeds 3 times its MCL based on acute health effects. **Acute health effects are associated with the short-term exposure to a contaminant. Examples include Nitrate-Nitrogen and Perchlorate.**
   - Contains a contaminant that exceeds 10 times its Notification Level (NL) based on chronic health effects.
   - Contains a contaminant that exceeds 3 times its NL based on acute health effects.
   - Contains one or more contaminants that meet any one of the criteria of the four points above and the source has not been adequately characterized by responsible parties.
   - Is a surface water source, which requires more than 4 log *Giardia*/5 log virus reduction.

[1] Link to USEPA's NPL list: https://www.epa.gov/superfund/superfund-national-priorities-list-nplhttps://www.epa.gov/superfund/superfund-national-priorities-list-npl

[2] Link to the GeoTracker Database: https://geotracker.waterboards.ca.gov/

- Is a surface water source that on an annual average contains more than five percent treated wastewater, unless it is associated with an approved drinking water-related surface augmentation project.
- Is extremely threatened with contamination due to known contaminating activities within the long-term, steady-state capture zone of a drinking water well or within the watershed of a surface water intake.
- Contains a mixture of contaminants of health concern beyond what is typically seen in terms of number and concentration of contaminants.
- Is designed to intercept known contaminants of health concern.
  a. If yes, this source is likely subject to Process Memo 97-005.
  b. **If no, go to Item 3 below**.

3. Does the contaminated source include <u>only one</u> of the criteria in Item 2?
   a. If yes, this source may be subject to Process Memo 97-005 depending on the circumstances for each site.
   b. If no, the PWS should
      i. Notify DDW of its planned use for the source;
      ii. Advise DDW the source may not be subject to Process Memo 97-005, and;
      iii. Obtain DDW concurrence that the source water and planned treatment facility is not subject to Process Memo 97-005.

For example, if the contaminated source does not meet any of the criteria in Item 2, and is not within a USEPA NPL, RWQCB or DTSC cleanup site, the source often is not subject to Process Memo 97-005.

Note that there may be circumstances whereby a source previously deemed to not be an Extremely Impaired Source pursuant to Process Memo 97-005 can later require such a review, e.g. it subsequently falls within a USEPA, RWQCB or DTSC cleanup area, and/or multiple contaminant concentrations increase to levels above an MCL and/or NL. Changes within the water supply system or new contaminants identified at levels of concern may also require a re-evaluation of the source of supply and applicability of Process Memo 97-005.

It is recognized that an Extremely Impaired Source which is determined to be subject to Process Memo 97-005 may also be within a USEPA NPL site.[3,4] As stated in OSWER Directive 9355.7-03, dated February 19, 1992, “CERCLA response actions are exempted by law from the requirement to obtain federal, state, or local permits related to any activities conducted completely on-site.” For example, drinking water wells associated with a Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) remedial action may be installed without having to meet the procedural requirement of a DDW permit as would be typical for drinking water wells installed pursuant to Section 64560, Title 22, CCR. Such drinking water wells, however, would have to meet the substantive requirements of California law. Regardless, any Extremely Impaired Source that is to be considered for treatment and subsequently used as a potable water supply must (a) satisfy all aspects of Process

[3] Link to USEPA’s NPL list: https://www.epa.gov/superfund/superfund-national-priorities-list-nplhttps://www.epa.gov/superfund/superfund-national-priorities-list-npl

[4] Link to the GeoTracker Database: https://geotracker.waterboards.ca.gov/

Memo 97-005, (b) receive a DDW amended Water Supply Permit, and (c) comply with the California Waterworks Standards.

Before proceeding with planned treatment of a source, the PWS is encouraged to contact DDW and provide the following, at a minimum:

1. Description of the source, including the location, drinking water well control zone, local hydrogeology and drinking water well design information. Provide a copy of the preliminary design report for the drinking water well.
2. Provide a copy of the Drinking Water Source Assessment Plan (DWSAP), if available.
3. Provide an excel file of water quality data over the prior 10 years, including water quality data from monitoring wells located within the anticipated capture area (for groundwater sources).
4. Summary of why the PWS believes Process Memo 97-005 applies or does not apply.

The PWS should request that DDW staff review the submitted data and clarify whether or not the source is subject to a Process Memo 97-005 investigation in a written response or advise the PWS that additional time will be needed to evaluate the groundwater source in question. If DDW determines that the source is not subject to a Process Memo 97-005 investigation, the PWS will still be held accountable to DDW permit requirements.

3.1 The Source is Determined to be Subject to Process Memo 97-005 – Next Steps

The PWS has now (a) reviewed the water quality data from the source water proposed for treatment, (b) reviewed Process Memo 97-005, and (c) conferred with DDW, and DDW and the PWS have collectively concluded the source water is subject to a Process Memo 97-005 evaluation. The PWS is encouraged to implement the following to initiate the Process Memo 97-005 process:

Schedule and conduct a meeting with your DDW staff engineer at the beginning of the project.

1. Include your DDW District Engineer, along with the DDW staff engineer.
2. Request that senior-level DDW staff (with prior Process Memo 97-005 experience) participate in the meeting to provide guidance to all in attendance.
3. Discuss the provisions of Process Memo 97-005.
4. Discuss DDW and PWS expectations.
    a. Timing of submittals – Typically, DDW has requested the PWS submit the Process Memo 97-005 documentation on a section-by-section basis (recognizing that each section builds on the prior section) to avoid having to unnecessarily redraft sections.
    b. DDW staff review – The PWS staff need to recognize DDW staff are responsible for multiple water systems and must divide their time accordingly. At the same time, it is critical the Process Memo 97-005 document be reviewed on a timely basis so that the Extremely Impaired Source can be returned to full service efficiently to reduce the need for the PWS to secure an alternative source of supply, which is often much more expensive.

c. Ancillary documents/tasks – There are numerous additional documents which will need to be prepared to implement the Process Memo 97-005 document and/or activities which may need to be undertaken to implement the remedy, including:
    i. Documentation required by the California Environmental Quality Act (CEQA);
    ii. Design documents, including plans and specifications for the wells, treatment, water storage facilities and associated pipelines signed by licensed professional engineers;
    iii. Operations, Maintenance, and Monitoring Plan (OMMP);
    iv. Startup Testing Plan;
    v. National Pollutant Discharge Elimination System (NPDES) permit from the local Regional Water Quality Control Board (RWQCB);
    vi. Permit with local County flood control agency (an application to this agency for a permit often must be accompanied by an NPDES permit);
    vii. Application to the local city for a permit to discharge water, which may be required as a result of a city's obligation to comply with a Municipal Separate Stormwater Sewer System (MS4) permit.
    viii. AQMD permits, if the treatment process train includes air stripper(s);
    ix. Application to DDW for an amended Water Supply Permit; and
    x. At minimum, conceptual and final design drawings with plans and specification to be submitted to DDW for review/approval.

DDW's and the PWS's common objective is safe and reliable water supply to customers. Consequently, the time and expense for a PWS to prepare Process Memo 97-005 documents (while significant) are secondary to DDW's mission. In that regard, an exhaustive source water investigation will be required by DDW.

This User Guide universally uses the term "drinking water well" to reflect new and/or existing wells which will be used to pump contaminated groundwater for contaminant removal at the planned treatment facility. It is recognized there are subtle differences between these "drinking water" wells as noted below.

- Extraction Wells – New wells that have been or may be constructed in such a manner (depth, location of screens) to optimize the removal of contaminants from within the capture zone.
- Production Wells – Existing wells historically constructed for production of groundwater for municipal supplies; however, the location of the wells, their depth and location of perforations, may make them suitable to be included as pumping (extraction) wells as part of a cleanup plan, thus avoiding the need to construct a new well.
- Monitoring Wells – While not used for drinking water purposes, these are existing or new wells perforated over specified, discrete depths to collect water quality and groundwater elevation data to characterize the groundwater aquifer. In some instances, existing production wells, which are not being used for groundwater cleanup purposes, may be used to collect additional data. However, production wells are typically screened over a large interval, many times across more than one formation. Hence, the water quality from these wells might be diluted and difficult to compare to monitoring wells.

DDW staff may not be technical experts regarding geology, hydrogeology and groundwater modeling, treatment technology selection, and risk analysis. The PWS will be requested to provide all assumptions, findings and conclusions clearly within the body of the Process Memo 97-005 document. The PWS is also encouraged to reference supporting tables, figures, etc. within the report. A detailed list of possible supporting plates, tables, and appendices is included in Appendix B.

The PWS should state its approach in a clear and concise manner such as to limit the required time by DDW staff to search through tables, figures and appendices, so that DDW may find information and draw its own conclusions. Since this report will be shared with the general public, whenever possible, the PWS is urged to use non-technical terms when describing the technical approach and the conclusions.

3.1.1 Preparer Qualifications

The PWS should consider the qualifications of the individual/firm preparing the 97-005 Report. For example:

- Does the individual or firm have prior Process Memo 97-005 experience?
- The individual or firm should have a Professional Geologist and/or Professional Engineer on staff.
- DDW will require the Process Memo 97-005 document to be stamped by a licensed Geologist and/or Engineer.
- Does the firm have risk assessment experience?
- Does the individual or firm have prior experience with computer modelling (i.e., to simulate groundwater flow using numerical models)?
- Does the individual or firm have experience with water quality data review?
- Does the individual or firm have experience with Drinking Water Treatment technologies?

Remember: Prior to and following the public hearing and after DDW evaluation, the Process Memo 97-005 document becomes a public document. It should be remembered that PWS customers may be reviewing the document. Use of technical terms may instill unnecessary concern or confusion with the public. Therefore, the PWS should strive to use non-technical terms to describe the process followed and the conclusions made by the PWS. Public understanding and acceptance of the findings will be enhanced through their understanding of the approach and the conclusions the PWS has developed.

3.2 Recommended Approach to Prepare the Process Memo 97-005 Document

The PWS should submit each section of the Process Memo 97-005 document sequentially to DDW. Because each section builds on the prior section, including DDW comments on a section by section basis will minimize the need to include wholesale edits throughout the 97-005 document and will typically accelerate the DDW review process. Based on discussions between the PWS and the DDW staff during the kickoff meeting, PWS and DDW staff should strive to adhere to the agreed upon review time frame. In addition, the PWS should consider meeting with EPA, RWQCB, and or Department of Toxic Substances Control (DTSC) staff, as appropriate, to discuss the proposed treatment and information regarding groundwater quality remediation in the area.

For each section of the Process Memo 97-005 document, the PWS should consider requesting that DDW provide a written response (requested modifications/approval/need for additional time for review) within four weeks of submittal. This response time may be subject to modification based upon mutual agreement between the PWS and DDW.

It should be noted by the PWS that DDW staff must respond to multiple water systems, which also may have permitting needs. Similarly, DDW staff need to recognize the PWS is eager to return its source of supply to service; often the PWS is seeking to avoid a more expensive alternative source.

While waiting on DDW comments, the PWS should consider preparing ancillary documents to optimize time. For example, the PWS may consider working on their CEQA documentation, NPDES application, application to the local County and/or City for the discharges, and the application to DDW for the Water Supply Permit amendment.

Section 4

Components of Process Memo 97-005 Document

4.0 Overview

There are eleven elements of the overall evaluation process for an Extremely Impaired Source and five of those are primary elements associated with the Process Memo 97-005 document (along with numerous ancillary support documents). The five primary elements include:

- *Drinking Water Source Assessment and Contaminant Assessment [Section D.1.a][5] and [Section D.1.b]*
- *Full Characterization of Raw Water Quality [Section D.2]*
- *Drinking Water Source Protection [Section D.3]*
- *Effective Treatment and Monitoring [Section D.4]*
- *Evaluation of Human Health Risks Associated with the Failure of the Proposed Treatment [Section D.5]*

The other six elements consist of the following:

- CEQA
- Submittal of an Application to DDW for an Amended Water Supply Permit
- Public Hearing
- DDW Evaluation
- Requirements of DDW Approval
- Issuance or Denial of Permit

It is critical for timely completion of the entire Process Memo 97-005 document that once DDW comments are provided, and included by the PWS, DDW staff does not subsequently revisit prior "approved" sections unless new data become available, thus requiring the applicable sections be expanded upon.

4.1 STEP 1: Drinking Water Source Assessment and Contaminant Assessment *[Section D.1]*

4.1.1 Drinking Water Source Assessment *[Section D.1.a]*

The purpose of the source water assessment for the Extremely Impaired Source is to determine the extent to which the aquifer or surface water is vulnerable to contaminating activities in the area. There may be other contaminants associated with activities that contribute to the known contamination, or

[5] As used throughout this document, *[Section D.#]* references apply to a section in the Process Memo 97-005.

other contamination sources that have yet to impact the drinking water source. Drinking water MCLs, NLs, or monitoring requirements may not have been established for these additional contaminants, but health-related information may be available through other programs. The appropriate level of monitoring and treatment to produce a safe drinking water cannot be determined unless the activities that are affecting or may impact raw (untreated) water quality are understood. The assessment should include:

- Delineation of the source water capture zone
- Identification of contaminant sources
  - Identify the origin of known contaminants found in the source water and predict contaminant level trends
  - Identify chemicals or contaminants used at or generated by facilities responsible for the known contamination
  - Identify all potential contaminant sources (including the potential contamination sources currently or historically present in the capture zone) and determine the vulnerability of the water source to these contaminant sources
  - Identify all other potential chemicals or contaminants that may be associated with potential contaminant sources
  - Present maps showing the locations of known or suspected contaminating activities, including spill or disposal sites.

The purpose of this step is to identify all sources of historical and current contamination to the sources of supply planned for treatment. An area-specific computer model should be developed to model the impacts (capture zones) of the proposed source over a 20-year planning horizon.

Often times there are databases maintained by EPA, RWQCB or DTSC that can be used to determine contaminants in the project area. Also, an analysis of each detectable chemical can be performed by reviewing the number of samples analyzed, number of detections, mean concentrations, and maximum concentrations. The PWS should consider “Fate and Transport” of each contaminant during the screening process. Factors which should be considered include solubility, biodegradation (the ease of degradation and the potential daughter products), and toxicity parameters associated with each contaminant. This rigorous exercise is critical to avoid unnecessary future interruption to the treatment facility (and water supply) and instill public confidence in the treatment process. As a result, both the public and the PWS receive a long-term benefit.

It is critical to identify all known (detected) and potential contaminants to ensure the appropriate Best Available Technology (BAT) is selected for the treatment facilities and to ensure public health is protected. Multiple tasks must be completed to adequately delineate the source water capture zone, including, but not limited to, the following.

4.1.1.1 Delineation of Source Water Capture Zones

4.1.1.1.1 Characterize the Hydrogeology

The hydrogeology in the vicinity of the source water should be thoroughly described. Often United States Geological Survey (USGS) and/or the California Department of Water Resources (DWR) reports can be used to characterize the hydrogeology of the source water study area. Geologic maps (see

Figure 1) and equipotential maps (see Figure 2) are helpful to relate large amounts of information regarding a project in a groundwater basin subject to the 97-005 evaluation process.

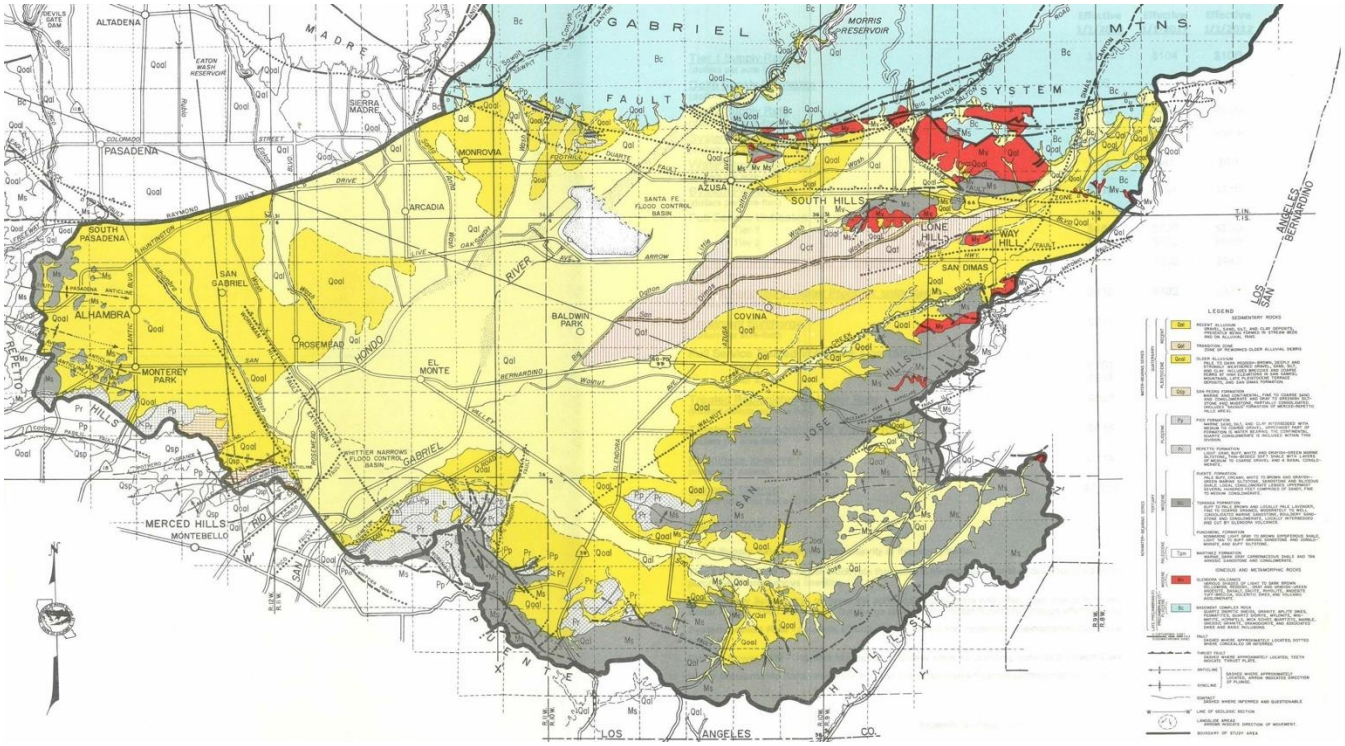

Figure 1. Geologic map of the Main San Gabriel Basin.

Source: Bulletin No. 104-2 California Department of Water Resources, March 1966

Regardless of the format, the following important questions need to be addressed in the course of developing the capture zone.

- Is the aquifer confined or unconfined?
- What is the depth to water?
- What is the areal extent of the contamination?
- Do the laboratory reporting limits of water quality data meet DDW Title 22 detection levels? It is critical that the laboratory reporting limits of the water quality data used by the PWS to evaluate the extent of the plume can meet DDW Title 22 detection limits for purposes of reporting (DLRs). Although other analytical methods may be capable of detecting contaminants, the detection level(s) may be too high to provide meaningful information. DDW should be consulted and requested to provide a list of acceptable analytical methods and DLRs prior to the PWS using the water quality information in data sets or to demonstrate the extent of a plume. However, for samples analyzed with test methods that have laboratory reporting limits higher than the DLRs acceptable to DDW, analytical results may still be used to quantify the highest concentrations.
- Are all assumptions and model parameters provided? Also, maps and geologic cross-sections in the vicinity of the capture zones should be provided with explanations on how they were determined.

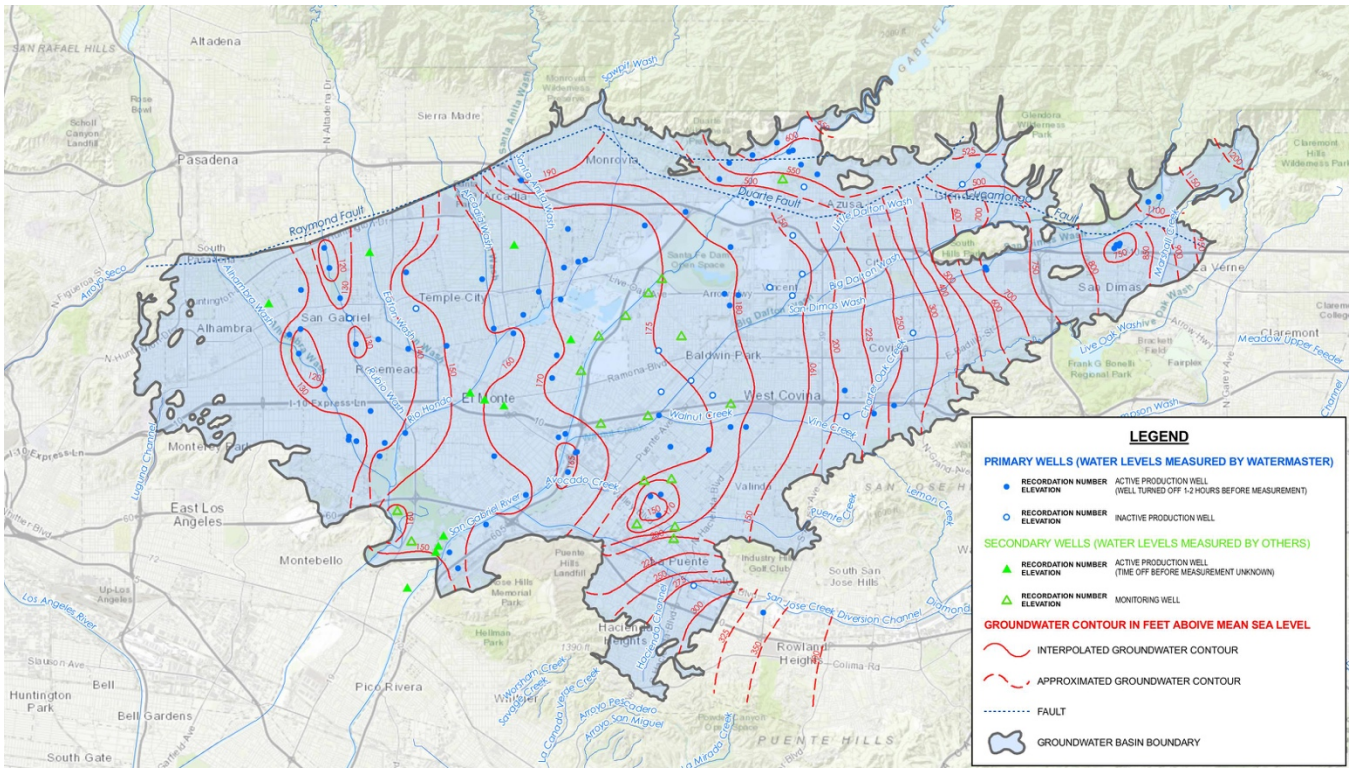

Figure 2. Main San Gabriel Basin Groundwater Contour Map, July 2018

Source: Main San Gabriel Basin Watermaster

What is the flow direction of the source? The flow direction of the source must be characterized so that appropriate up-gradient water quality data is used. The PWS should be prepared to address whether the flow direction changes seasonally or is influenced by groundwater pumping or groundwater basin replenishment activities. If the flow direction changes seasonally or is influenced by groundwater pumping and/or basin recharge activities, then multiple capture zones need to be identified to include the impacts that may result due to variable flow directions. The long-term capture zone for the proposed project should extend for a minimum of 20 years or the life of the treatment system, whichever is longer. Note that DDW does not expect the PWS to install monitoring wells specifically to characterize groundwater quality throughout the capture area – to the contrary, DDW expects the upgradient monitoring wells to be situated primarily in the vicinity of the pumping wells, typically within the 2- to 5-year capture area. These upgradient monitoring wells will be serving as the early warning wells for the well(s) to be treated. If any additional contaminants or contamination spikes are detected in these upgradient monitoring wells, water systems will have the adequate time to design and install the necessary treatment facilities.

4.1.1.1.2 Identify the Extraction Rate

The extraction rate of the proposed project may have a significant impact on the capture zone and the ability to intercept and capture contaminants. The PWS should consider the location of the proposed drinking water wells, along with the depth and location of the perforations in relationship to the areal extent, and depth of the contamination plume(s).

4.1.1.1.3 Develop a Computer Model

The Process Memo 97-005 document will need to include a projection of future and anticipated contaminants and their levels based on the capture zone of the proposed drinking water wells. The PWS may choose to use staff, retain a consultant with demonstrated capability with computer modeling or have the PRPs consultant perform the modeling. Often times the site is part of a remedial action and a groundwater model has already been developed for the remedy and approved by the USEPA or State-regulatory agency.

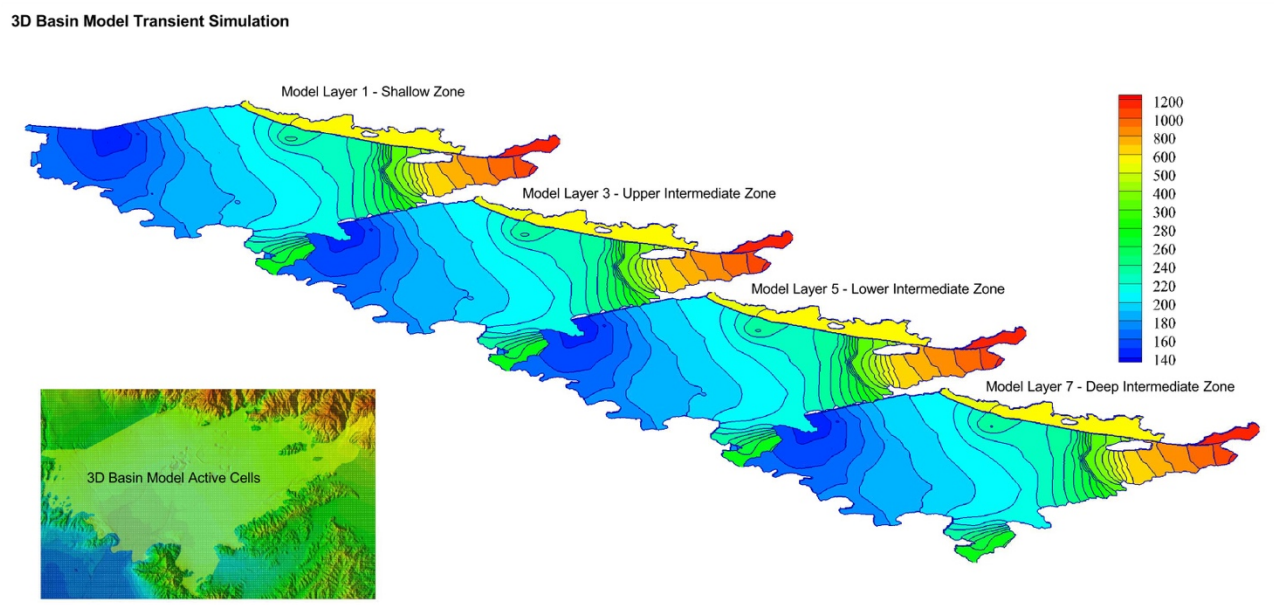

Figure 3. 3D Basin Model FY2009-10 Groundwater Level Contour Map of the Main San Gabriel Basin

Source: Main San Gabriel Basin Watermaster

There are a variety of types of computer models (e.g., steady-state or transient simulations of groundwater flow and/or fate and transport, in either two or three dimensions) that may be developed as part of this requirement. An example of output from a transient groundwater flow model simulation is illustrated on Figure 3. Each type of computer model has its own set of benefits and different types of computer model outputs. The computer model proposed to be used to develop a capture zone for planned drinking water wells should be reviewed with the regulatory agencies involved with groundwater basin cleanup and with DDW staff. It is ideal if the computer model is held in the public realm and widely used; however, local site groundwater models can also be utilized. The groundwater model should be based on site-specific conditions and calibrated such that modeled results reasonably replicate measured data (e.g., groundwater elevations). Any model should be developed and calibrated in accordance with best practices and best industry practice. The computer model should assume the drinking water well(s) will be operated continuously at the design capacity to develop the most conservative capture zone. However, understanding the impact of realistic operations is valuable.

4.1.1.2 Identification of Contaminant Sources

The capture zone(s) is then superimposed on a geographical map to help identify all Potential Contamination Activities (PCAs). The intent is to identify facilities or activities with the use or storage of chemicals (past, current, or future), which if released to the environment (either intentionally or

accidentally) could result in contaminating a water supply source. PCAs may be identified by using any or a combination of the following methods.

- Use the SWRCB's GeoTracker database.
- Any commercial or industrial facility located within the capture zone, as shown in Geo Tracker, should be identified (to the extent such data exist). The Geo Tracker site may provide information on chemicals historically used at each site and monitoring well data demonstrating chemicals detected in the soil and/or in the groundwater. For example, a gas station will be associated with compounds typically found in petroleum products, or a dry cleaner will be associated with certain VOCs.
- Review DTSC EnviroStor.
- Physically drive to the area.
- Request and review RWQCB site investigation reports.
- Request and review DTSC site investigation reports.
- Request and review USEPA site investigation reports.
- RWQCB, DTSC, and/or USEPA may have a tabular list of chemicals historically or currently used at the site – seek input as necessary from RWQCB, DTSC and or EPA case manager.
- Review existing drinking water well and/or monitoring well water quality data.
- Other methods such as non-drinking water or research methods presented to and approved by DDW.

Once available information has been reviewed, the PWS should develop a tabular list comprising the identified PCAs, all identified chemicals and contaminant concentrations that may impact the source water to the treatment facility. The locations of the potential contaminant sites and the existing contaminant plumes should be plotted in relationship to the drinking water wells and capture zone. Are data sufficient to fully delineate the extent of the contamination? It is critical that data demonstrate the lateral (north, south, east and west) and depth (vertical extent) of the contamination plume(s). This evaluation is generally deemed complete when the entire lateral extent of the plume is surrounded by monitoring wells showing "non-detect" for "man-made" contaminants.

The intent of this exercise is to be as exhaustive as possible to reasonably ensure all potential contaminants are identified such that appropriate treatment facilities can be designed.

4.1.2 Contaminant Assessment *[Section D.1.b]*

The drinking water source assessment component *[Section D.1.a]*, described above, provides a summary of the steps needed to identify sites within the capture zone and chemicals that may have been used (or are used) at each of those sites. The Contaminant Assessment represents a detailed investigation into potential contaminants that have been or may be detected in the proposed drinking water wells and ultimately will assist with determination of required treatment. To identify the treatment facilities that use the BAT, it is critical that existing and potential contaminants be identified, and an analysis be prepared to identify the likely maximum contaminant concentrations which may occur at the groundwater source of supply.

Ensure all potential contaminants are considered when evaluating PCA sites. As a starting point, the PWS should consider the following:

- Title 22 Chemicals with MCLs
- Chemicals with NLs
- Priority pollutants
- Chemicals included in the Unregulated Contaminant Monitoring Requirements (UCMRs)
- Chemicals of Emerging Concern

For each PCA site that has been located and plotted within the capture zone, the PWS should address the following:

- The PWS should consider the travel time from each PCA to the proposed drinking water well(s) and identify the time frame before each contaminant may impact the source water.
- The PWS should consider the fate and transport of each contaminant. As an example, it is possible the contaminant may have degraded to another compound (e.g., PCE degrades to TCE). In addition to particle tracking, a groundwater flow model may be utilized to identify the extent of the capture zone and the proposed location of new extraction/monitoring wells. This process will help characterize the water quality and hydrogeology of the region.
- The PWS should conduct a Tentatively Identified Compound (TIC) analysis on existing drinking water wells within the study area's long-term capture zone, with particular emphasis on drinking water wells that will contribute contaminated groundwater to the proposed treatment facility and upgradient monitoring wells. A TIC analysis uses the "library" within an analytical device to look for the chemical signature of 10,000s of chemicals. The purpose of a TIC analysis is to screen for the potential presence of chemicals that had not previously been identified. A separate analytical test method can then be used, if available, to confirm chemical identification and (for chemicals with analytical standards) to quantify the concentration of the chemical. Once verified and quantified, the water quality results can then be reviewed with DDW staff to determine next steps.
- The PWS should consult with DDW staff regarding acceptable analytical methods, but may consider using EPA method 524.2 (plus TICs) https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/recharge/Nt-vocs.pdf or EPA method 8260 (plus TICs) for VOCs and EPA method 8270 (plus TICs) for SVOCs www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/recharge/Nt-svocs.pdf. (Reference to the DDW website regarding TICs are provided.) These analytical methods should be discussed with and approved by DDW staff prior to conducting the TIC analysis.
- If a metal is a concern (e.g., arsenic), PWS should also perform the metal scan (elemental analysis), link below:

  https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/drinkingwaterlabs/ProceduresforElementalAnalysis.pdf
- The Process Memo 97-005 document should include separate maps/figures which show the capture zone for each wellfield, and in some cases, each proposed drinking water well. In addition, the Process Memo 97-005 document should include a figure showing the contaminant plume(s) within and in the vicinity of the capture zone for certain chemicals of concern.

4.2 STEP 2: Full Characterization of Raw Water Quality *[Section D.2]*

The primary goal of this step is to fully characterize the quality of the source water (i.e., extracted groundwater) to be provided to the treatment facility. The PWS will be required to determine whether

there may be variations in contaminant concentrations based upon seasonal pumping trends (more or less pumping), groundwater levels, long-term trends, and influences from other hydrogeological conditions (e.g., groundwater pumping and groundwater replenishment), which can influence the migration of the contaminant plume(s) within the long-term capture zone.

In addition, the PWS must demonstrate it has conducted a thorough search for potential contaminants which may be present in the Extremely Impaired Source to ensure appropriate treatment facilities will be designed and installed. (The following categories of contaminants should be evaluated (at a minimum) to provide “full characterization” of the raw water quality.)

4.2.1 Title 22 Drinking Water Regulated Chemicals

Title 22 Sections 64431 through 64444 contain a list of regulated chemicals which will form the basis of the PWS’s characterization of the raw water quality. These chemicals have MCLs.

Some data collected and analyzed pursuant to CERCLA or other regulatory requirements, often have detection levels higher than DDW requirements for DDW Title 22 compounds, and in some cases higher than MCLs. Typically, DDW should be consulted and requested to provide its required detection levels.

It is imperative that a PWS use DDW approved drinking water analytical methods and DLRs when available to fully characterize raw water quality. Improperly selected methods (e.g., methods intended for wastewater instead of drinking water) with detection limits which report “non-detect” at a concentration above the DDW DLR likely will not be deemed valid by DDW. The PWS should remember the full characterization of raw water quality will form the basis of selecting the treatment technology.

4.2.2 Other Categories of Chemicals

In addition to DDW Title 22 chemicals, the following categories should be considered regarding characterization the quality of the raw water:

- Chemicals for which drinking water NLs are established.
- Chemicals listed pursuant to the Safe Drinking Water and Toxic Enforcement Act of 1986, and amendments thereto (also known as Proposition 65).
- The microbiological quality.
- Priority pollutants.
- Measures of gross contaminants such as Total Organic Carbon (TOC).
- All compounds previously identified under the Drinking Water Source Assessment (pursuant to Section 4.1.1) and the Contaminant Assessment (pursuant to Section 4.1.2) above.
- Any additional compound identified as a contaminant or potential contaminant under the Contaminant Assessment.

The intent of this process is to conduct a thorough evaluation into possible contaminants and their concentrations.

4.2.3 Water Quality Data by Type of Source

The full raw water characterization should summarize the water quality data by type of source, consisting of the following (as defined in Section 3.1):

- Extraction Wells
  - Pumping wells designed for remedial actions and to maintain hydraulic capture of contamination
  - Perforations located at specific depths to optimize capture of contaminants
- Production Wells
  - Pumping wells designed to supply drinking water for municipal use
  - Perforations may be located at depth intervals that may make them suitable for use as part of a cleanup plan
- Monitoring Wells
  - Non-pumping wells typically constructed with one perforation interval spanning a short distance (e.g., 10 or 20 feet)
  - Typically used to measure depths to groundwater and to collect groundwater samples; these data are collectively used to characterize the aquifer
  - Groundwater elevation is calculated by subtracting the depth to water from a surveyed reference point at the top of casing
  - Inactive production wells (not pumping) may be used as monitoring wells but have the disadvantage of typically being constructed with long perforation intervals that may penetrate multiple aquifer zones that can misconstrue aquifer characteristics if not accounted for.

4.2.4 Differentiate Between Naturally Occurring and Man-made Contaminants

When the PWS prepares the full raw characterization of contaminants, it is critical for both the PWS and DDW staff to recognize some "contaminants" may occur in nature but may also be the result of a PCA. An example is arsenic. The PWS is encouraged to refer to the updated 2015 Process Memo for additional information regarding the calculation of background concentrations. In these cases, the PWS and DDW staff should consider the following:

- Prepare a contaminant plume map within the capture zone plus the surrounding area.
- Plot the highest water quality concentrations for each contaminant, over the past 10 years at each drinking water well and monitoring well.
- Plot the iso-concentration on the map to identify locations with concentrations which are statistically higher than background concentrations.
- If the contaminants are naturally occurring, background may be considered in calculating the MCL-equivalent, as discussed in Section 4.4.6.3.[6]
- If the contamination is man-made, the PWS may be required to install planned treatment, but may only be required to treat the groundwater to demonstrated background water quality (provided the background water quality is less than the MCL and does not cause the effluent to exceed an MCL-equivalent of 1).
- For select contaminants, the use of isotopic analysis can support the source determination.

[6] Note that for water sources not subject to the requirements of Memo 97-005, DDW may allow background constituents to be present at concentrations up to 80 percent of the MCL for that constituent.

4.2.5 Identify Contaminants in Drinking Water Wells

The PWS needs to clearly identify contaminants which are or may potentially be, detected in the drinking water wells to be included as part of the cleanup plan. Groundwater from these drinking water wells will be conveyed to the proposed treatment facility for treatment and ultimately to the potable water system.

This is one of the most critical aspects of the Process Memo 97-005 document process. Failure to identify contaminants may result in inadequate treatment and/or improper configuration of the treatment train.

4.2.6 Variability of Contaminant Concentrations

Once the PWS has determined the source(s) of the contaminants within the capture zone and fully characterized the raw water quality, the PWS should determine whether the contaminant concentrations may be influenced by 1) the hydrogeology, 2) seasonal conditions, 3) groundwater elevations, and/or 4) the pumping rate.

4.2.6.1 Seasonal and Long-term Variability

The PWS will be required to plot water quality data over time from the drinking water wells to determine variability over time. For example, concentrations may consistently be the highest (or lowest) during a certain time of the year, and this trend repeats over time. The PWS should identify trends with graphs and note in the Process Memo 97-005 document whether there is seasonal variability.

4.2.6.2 Variability with Groundwater Elevations

The PWS should plot data to determine if there is a relationship between water quality and groundwater levels. For example, do groundwater elevations and contaminant concentrations increase or decrease at the same time? Do they have an inverse relationship? The PWS should demonstrate this relationship on a graph and clearly state its findings in the Process Memo 97-005 document.

4.2.7 Variability with Changes in Regional Pumping

The PWS should recognize that there may be changes to the capture zone as a result of upgradient or cross gradient wells, within and adjacent to the capture zone, that may be removed from service. The PWS should recognize the water quality concentrations in the drinking water wells may be impacted by these changes. The PWS should attempt to identify in the Process Memo 97-005 document water quality impacts to the drinking water wells and the impact to the project.

4.2.8 Summary

The PWS has now completed the Drinking Source Water and Contaminant Assessment (Step 1) and Raw Water Quality Characterization (Step 2) sections. The PWS has clearly identified the contaminants of concern; the drinking water well capture zone and contaminant travel time; and variability with time, groundwater elevations, and pumping rate. The PWS now has a reasonable understanding of the Extremely Impaired Source and can begin planning for treatment (see Step 4) to safely and reliably remove the contaminants.

4.3 STEP 3: Drinking Water Source Protection *[Section D.3]*

This step addresses ongoing source water protection from future instances of groundwater contamination. **It is recognized that the PWS is not a regulatory agency and has no enforcement power.** However, the PWS should identify efforts it will undertake to monitor regulatory activities intended to prevent the level of contamination from rising and how the dependence on treatment will be minimized. This section of the report should clearly show the interagency actions and relationships, how they are anticipated to affect the proposed treatment, and ideally, maintenance of long-term relationships (and the key personnel positions that will be responsible) in order to identify any issues early that may affect the drinking water treatment facility. The PWS should take reasonable steps to coordinate with regulatory and municipal agencies to track the status of cleanup efforts at contamination sites and be aware of new commercial and industrial sites which may be a future source of contamination within the capture zone. The PWS should identify specific personnel to act as liaisons with agencies involved with permitting hazardous materials and wastes, remediation or cleanups, and the local health department or fire department. The PWS should coordinate with the following agencies:

4.3.1 USEPA

The USEPA is responsible for CERCLA activities as may be required for sites listed on the NPL. If the site (study area) is subject to USEPA oversight, the PWS should get on the USEPA's email list for upcoming coordination. The PWS is strongly encouraged to attend meetings and participate in planning. The PWS should describe its interaction with USEPA, if any, in this section.

4.3.2 Department of Toxic Substances Control (DTSC)

The DTSC is responsible for certain cleanup activities within California. The PWS should contact DTSC staff to determine whether it has any cleanup activities within the capture zone. Similar to USEPA, the PWS should get on the DTSC email list and attend/participate in planning meetings. PRPs may be identified by DTSC which may be responsible for funding some or all of the project costs incurred by the PWS. The PWS should describe its interaction with DTSC, the cleanup status, and future work.

4.3.3 RWQCB/State Water Resources Control Board (SWRCB)

The local RWQCB and SWRCB are responsible for site investigations and cleanup. Generally, the site investigations and cleanup are directly overseen by the local RWQCB, while the SWRCB sets policies, coordinates, and supports the investigation and cleanup process through the nine RWQCBs. It is likely the PWS has already used local RWQCB and/or SWRCB resources when conducting its Source Water Assessment and Contaminant Assessment in Step 1. The PWS should explain how it has interacted with the RWQCB and/or SWRCB (for example, use of the Geo Tracker website, attended public meetings, communicated with project managers, etc.) in the Process Memo 97-005 document.

4.3.4 Groundwater Basin Management Agencies

The Sustainable Groundwater Management Act (SGMA) was recently enacted to ensure the state's groundwater basins are managed sustainably by maintaining balanced levels of groundwater pumping and recharge to prevent overdraft conditions. Groundwater Sustainability Agencies (GSA) have been formed in most unmanaged basins to comply with SGMA. In addition, prior to SGMA, some basins (particularly those within southern California) had court adjudications that established a Watermaster to

manage groundwater rights for parties to the Judgments and to enforce sustainable groundwater management practices.

The PWS is encouraged to determine which groundwater agency exists in their basin, to review the agency's agendas, and to regularly attend meetings to remain updated on both cleanup activities, if any, and groundwater management agency actions. The PWS should provide a written description of the actions it has taken or plans to undertake to be an active participant to protect its groundwater sources regarding sustainable groundwater basin management and possible cleanup activities.

4.3.5 Review Proposed NPDES and WDR Permits

The RWQCB issues National Pollutant Discharge Elimination System (NPDES) permits and Waste Discharge Requirements (WDR) permits for discharges to surface and groundwater. The PWS should contact the RWQCB to be placed on an email list to obtain a copy of all future draft NPDES and WDR permits so the PWS has the opportunity to review the draft document(s), understand the potential impacts of the proposed discharges, and provide comments to the RWQCB, as necessary. The PWS should provide an explanation of its planned actions in the Process Memo 97-005 document.

4.3.6 Water System Source Protection Program

In addition to contacting and coordinating with regulatory and groundwater basin sustainability agencies, in some cases the PWS may be asked to develop its own Source Protection Program. This program may include, but not be limited to, the following:

- Review RWQCB site investigation reports
- Review groundwater basin sustainability agencies' activities.
- Review City Council agendas for possible new commercial/industrial development which may be a potential future source of contamination.
- Review RWQCB agendas and participate in meetings regarding activities within the PWS's service area and/or within the capture zone.
- Train PWS field personnel to recognize and report PCAs. PWS field staff are in a unique position to observe PCAs while conducting routine field work, such as meter readings, trips to the distribution facilities, and driving around the service area.
- Cross-connection Control Training. Similar to training field personnel, PWS staff who inspect and maintain cross-connection controls should be requested to be vigilant for PCAs.
- Participate in local water associations and workshops. These forums may be a good source of information whereby either individuals or agencies are aware of PCAs and can share information.

4.3.7 Identify Source Water/Hot Spot Treatment

There may be instances where PRPs are conducting unique "hot spot" treatment whereby a specific, highly contaminated groundwater source is treated and discharged under an NPDES or WDR permit. Ongoing knowledge of the activity will provide useful information regarding groundwater quality and their potential water quality impact to the proposed project.

4.4 Step 4: Effective Treatment and Monitoring *[Section D.4]*

Now that the PWS has conducted the Source Water Assessment/Contaminant Assessment and Raw Water Quality Characterization, the PWS should consider BAT(s) that are capable of removing the contaminants that require treatment to non-detectable concentrations or other appropriate levels as required by DDW.

4.4.1 Selection of Treatment Technology

The PWS should use the information previously collected to identify the preferred treatment technology for each contaminant based on the type and concentration of the contaminant. At this point the PWS should contact technology vendors with the contaminant information and request quotations for the treatment technology. The vendors should be notified of possible multiple contaminants and be requested to work with each other to develop the optimal treatment facility configuration. When selecting treatment processes, possible unintended consequences, such as byproduct formation or corrosion need to be considered, which may require a change in the order of the treatment unit processes or adding additional unit processes. As shown in Figure 4, treatment systems may require multiple treatment processes to address contaminants present in groundwater.

Figure 4. Valley County Water District's Lante Treatment Plant uses multiple treatment processes to address contaminants in groundwater

Source: Google Earth

4.4.1.1 Rationale for Selection of the BAT

DDW staff will not provide a recommendation of the treatment vendor or technology. The PWS should provide a clear description of the treatment technology selection process. As part of the rationale for the selection, the PWS should address the following:

- Best Available Treatment Technology – The PWS should utilize proven and reliable treatment technologies. For the targeted contaminants with BAT identified in USEPA or DDW regulations, the PWS should utilize these technologies. The PWS should demonstrate the proposed treatment represents the most effective and reliable treatment technologies based on the water quality characteristic of the proposed water supply. In addition to the BATs listed in the regulations, DDW maintains a summary of accepted technology.

- DDW will advise the PWS whether or not a treatment technology is acceptable. The PWS should select the treatment technology capable of treating the intended contaminant(s) to the lowest concentration feasible. For the contaminants with cancer risk (such as VOCs or SOCs), the typical target is to treat to below the DLRs, considering the accumulative effect. For contaminants with non-cancer risk, treatment to background concentrations may be acceptable if the concentrations are below the MCLs and the MCL-equivalent remains below 1 (see Section 4.4.6.3). *It should be noted that DDW may require a treatment system to be sized and operated to remove all contaminants to levels below their respective DLRs.* The PWS should engage in discussions with DDW early in the project to gain consensus on treatment objectives.
- Consequently, for each treatment technology, the target contaminant must be identified along with the design concentration. The design concentration is typically the highest actual or expected concentration, based on a statistical evaluation. This is a critical component of the treatment facility selection because the treatment facility must be able to treat the contaminant to below the DLR or other appropriate concentration at all times. Failure to achieve this requirement may cause the treatment facility to be shut down, which may further impact the PWS source reliability, the ability to meet demands, and the ability to comply with cleanup goals assigned to PRPs.
- Identify the contaminant(s) to be treated by each treatment technology. Most treatment technologies are specifically designed to be effective in removing only certain types of contaminants. The PWS should provide a tabular summary of the contaminants, design concentrations and treatment technology selected. The PWS should also provide documentation from the vendor that the treatment facility will remove target contaminants to below DDW DLRs or other appropriate concentrations. Additional resources to ensure treatment effectiveness could be literature reviews and bench/pilot studies.
- DDW encourages the blending of the treatment plant effluent with water from other sources, if available, prior to entry into the distribution system, to provide additional safety factor. This blending is a risk reduction measure (see Section 4.5.2: Health Risk Evaluation) and is not typically considered as a part of the treatment train. Under certain circumstances, a “controlled blending treatment” may be allowed as a part of treatment train. For example, nitrate blending has been allowed at a few sites based on the following considerations: (a) the nitrate pollution was due to past agricultural practices which longer exist in the region, (b) adequate water quality monitoring data demonstrate that nitrate concentrations are relatively stable, (c) nitrate pollution is not related to the activities of the responsible parties, (d) the project proponent is able to bring in water for blending from an area without nitrate pollution, (e) the flowrates from each source can be easily controlled and adjusted, (f) nitrate concentrations from all sources are monitored closely, (g) reliability features are provided such as an on-line nitrate analyzer and alarms with automatic treatment plant shutdown feature, and (h) the water system has the capability to handle a short-term shutdown without affecting water supply. The PWS should consult with DDW before pursuing a blending treatment.

The PWS should also consider the potential adverse water quality effects of these treatment technologies to ensure concurrent compliance with the total coliform rule, disinfectant/disinfection by-product rules, lead and copper rules, and secondary standards (such as color, turbidity, and odor) and to not introduce more toxic treatment byproducts into the drinking water systems. In some cases, pretreatment or post treatment may be required.

4.4.1.2 Rationale for Order of Operation

The PWS should coordinate with its treatment facility vendor(s) to ensure all vendors are aware of the entire treatment train. In many cases, one contaminant, or the chemical added to remove one contaminant, may interfere with the removal of another contaminant. Each PWS will have its own unique set of contaminants that will need to be evaluated. Depending on the configuration of the proposed treatment processes, a pilot study may be needed. If a pilot study is being conducted, DDW should be consulted on the pilot study test protocol. The PWS must provide a written summary of the rationale for the proposed order of operation of its treatment facility with supporting documentation from the vendor(s).

The PWS should consider the potential byproducts from each treatment unit process and the impact on the corrosivity of the plant effluent to prevent unintended consequences (i.e., introducing toxic by-products into drinking water systems; causing red water episodes or lead and copper leaching).

4.4.1.3 Provide a Process Flow Diagram

The PWS should include a process flow diagram showing the source(s), the proposed treatment facilities in order of operation, wet wells, booster pumps, chemical injection points, static mixers (if any), reservoirs and water quality sampling points. The process flow diagram will help identify the planned order of treatment and will help identify potential deficiencies in the treatment train. An example of a process flow diagram is included in Appendix C. DDW will likely require the treatment of the entire flow from an Extremely Impaired Source to achieve the lowest concentrations feasible.

4.4.1.4 Multi-barrier Treatment

For Process Memo 97-005 sources, DDW is likely to require multi-barrier treatment. As stated in the policy, multi-barrier treatment may be appropriate under the following conditions:

- The primary treatment is not sufficiently reliable;
- The primary treatment is of uncertain effectiveness;
- There is no direct way to measure the contaminant;
- The health effect of the contaminant is acute; and/or
- Very large reductions in contaminant concentrations are required.

The PWS should work closely with DDW to determine the applicability of multi-barrier treatment.

Examples of multi-barrier treatment include air stripping followed by liquid-phase granular activated carbon (LGAC) treatment for high concentrations of multiple VOCs, lead-lag LGAC vessels for VOCs, or lead-lag ion exchange vessels for perchlorate treatment.

As an incidental benefit, multiple barriers, such as lead/lag LGAC vessels or lead/lag ion exchange vessels, may allow the PWS to more fully and efficiently use media (LGAC or resin), thus potentially saving on operation and maintenance costs, and those savings may ultimately exceed the cost of the second barrier.

For some constituents, such as NDMA and 1,4-Dioxane, it may not be possible to have a secondary barrier. In that case, the PWS and vendor must demonstrate there is adequate reliability in the event a portion of the treatment facility may not perform as designed, or in the worst case, fail.

In some cases, treatment facilities that have been designed and intended for one contaminant may incidentally remove additional contaminant(s). This circumstance is not intended to represent a multiple barrier. In this situation, the PWS should consult with DDW and receive written confirmation that these circumstances will be allowed as a multiple barrier. DDW will only accept a technology as a secondary barrier if that technology has the ability to provide significant reduction in the concentration of a targeted contaminant in the raw water. The following are a few examples of incidental additional treatment.

- Air strippers are intended for treating most VOCs but are only capable of removing limited concentrations of 1,2,3-TCP; unless the limited reduction is sufficient with respect to influent concentrations, air stripping would not be an acceptable secondary barrier for 1,2,3-TCP. BAT for 1,2,3-TCP is LGAC.
- UV/hydrogen peroxide is designed to remove NDMA through photolysis and 1,4-dioxane through advanced oxidation. Although this process is also capable of removing oxidizable organic chemicals, the treatment system may need to be optimized to also provide a significant reduction of the targeted organic chemicals (e.g., the power input and the amount of hydrogen peroxide needed for NDMA and 1,4-dioxane treatment may not be adequate to also address targeted organic chemicals). The treatment system would still need to include BAT for VOCs, which includes air stripping and/or LGAC, as the primary barrier for VOC treatment.

4.4.2 Performance Standards of Treatment

By this time, the PWS will have already had discussions with the DDW and should have agreed upon performance standards for the treatment facilities, including the following:

- Identify the contaminant(s) of concern and associated design-basis/influent concentration(s).
- Clearly note that all contaminants of concern will be removed to the anticipated treatment goal concentrations.
- Develop a treatment facility startup water quality test plan to demonstrate that the treatment technology and programming operate as designed and to finalize treatment goals that will be included in the Water Supply Permit.

4.4.3 Operation, Maintenance, and Monitoring Plan (OMMP)

The PWS is required to develop an OMMP for the drinking water wells and treatment facility. **The components of the OMMP are described in greater detail in Section 5 of this User Guide. The PWS typically includes the OMMP by reference in this section but the PWS should consult DDW for concurrence.**

In general, the OMMP will include the following:

- Description of the proposed treatment facility.
- Treatment facility operating procedures, including startup, shut down, normal operation, reliability features, such as alarms and automatic shutdown functions, and replacement of media, including both the criteria for the timing of the replacement and the procedures.

- Water quality monitoring and testing. This will include a process diagram of the treatment facility identifying all sampling locations.
- Description of the maintenance activities, including calibration of the flow measurement equipment, on-line analyzers, chemical dosing equipment, etc.
- Description of the safety plan and operation procedures.
- Description of reporting and record collection.
- Short term and long-term shutoff procedures and the restart procedures.
- Operations staffing (number of staff and grade of certifications), and responsibilities.

In general, the OMMP should identify and describe the following:

- Drinking water wells.
- Inflow/outflow from each treatment facility component, e.g., LGAC vessels, ion exchange vessels, and UV vessels.
- Compliance and treatment system performance monitoring sampling locations including inter-stage between the treatment facility components, if present.
- A summary of the anticipated effluent concentration(s) for the targeted contaminant(s) from each treatment process.
- A description of the fully treated water inflow to the surface water reservoir, if applicable.
- A description of disinfection and discharge of the treated water to the PWS distribution system.

4.4.4 Reliability Features and Water Quality Monitoring

The PWS should include a description of the reliability features designed and built into the treatment facility. In addition, a quick laboratory turn-around time compliments the reliability features at the treatment facility and is essential for a good operations and monitoring plan to ensure proper treatment and to quickly catch issues. The PWS is encouraged to discuss the proposed laboratory turn-around times for the various contaminants with DDW. Reliability features at the treatment facility include, but are not limited to, the following:

- Multiple treatment barriers
- Blending (as applicable)
- Alarms. This is a detailed description of all alarms and automation provided within the treatment facility. **The OMMP should provide detailed information and may be incorporated by reference.**
- A description of Supervisory Control and Data Acquisition (SCADA) and other automation to operate the treatment facility, monitor the operations and provide data to the treatment facility operator.
- Nitrate and other analyzers which provide real time monitoring and report to SCADA, if needed. The OMMP should provide detailed information and may be incorporated by reference.
- A description of up-gradient monitoring (sentinel) wells. These wells are typically located within the 2- to 5-year capture zone (see Section 4.1.1.1.1). The location of the treatment facility, capture zone, and monitoring wells should be shown on a figure. The travel time from the up-gradient wells to the treatment facility should also be clearly stated.

- Response Plan. The PWS must include a response plan for operators in the unlikely event of a failure of the treatment facility objectives. This includes notification of DDW staff, elected officials, and PWS customers, if required by DDW.
- Compliance Monitoring and Reporting. The PWS is to develop a Compliance Monitoring program, which is to include a description of:
  - Title 22 sampling
  - Monthly or quarterly monitoring at the raw water sources
  - Weekly monitoring at treated water locations
  - Monitoring of partially treated water after each stage
  - Monitoring the fully treated water
  - Collection of TIC samples from the raw water and fully treated water on an annual basis
  - Up-gradient monitoring wells sampling
- Preparation of a Notification Plan. The Notification Plan is to include the names and contacts for the PWS and DDW staff assigned to the PWS in the event of a potential treatment facility issue or failure.
- Water Quality Surveillance Plan. This is the up-gradient monitoring plan, which will be used to maintain information on the up-gradient water quality. This plan will be modified and extended to account for the continued monitoring and reporting, as necessary, once enhanced treatment for a particular system component is no longer needed (see Section 9.5).

4.4.5 DDW Evaluation of Proposed Treatment and Monitoring

DDW will evaluate the description of the proposed treatment and monitoring, provided by the PWS, that includes the following information regarding performance standards:

- Identify the contaminant concentration in the treated water to assure compliance with the treatment objective;
- The treatment objective for all contaminants should be optimized to the lowest concentrations feasible and must assure compliance with the MCL at all times;
- In addition to the treatment objective optimization for regulated contaminants, treatment should also be optimized to reduce the concentrations of unregulated contaminants below NLs, where NLs have been established; and,
- A suitable monitoring plan must also be provided that addresses sample collection (minimally) at, and upgradient to, the water source, influent to the treatment system, and effluent from the treatment system. Details regarding the analytical method(s) and sampling frequency much also be provided. If available, a field measurable indicator of treatment efficiency and effectiveness, either of the entire treatment process or a component, should also be provided.

Treatment facilities treating water from an Extremely Impaired Source containing specific contaminants for which the MCL is higher than the public health goal (PHG), which is typical, should be designed and operated to meet or be as near as possible to the PHG where this can be accomplished in a cost-effective manner. The PWS should discuss this treatment with DDW staff and recognize DDW will provide final determination on level of treatment to ensure public health concerns are addressed.

4.4.6 Evaluation of Treated Water Goals

The 2015 Draft revised Memo suggests DDW staff may use the MCL-equivalent concept to evaluate if the treatment along with the effluent goals proposed for contaminants by the water system and its consultant are adequate. It is a practical method for DDW staff to ensure that the cumulative risk of multiple contaminants anticipated to be encountered under normal operating conditions has been reasonably addressed by the project proponents/applicants. The goal here is to keep the concentrations of contaminants as low as possible, evaluating them in terms of MCL-equivalents. When an MCL is not available for a contaminant, a surrogate MCL value will be used for that contaminant during the MCL-equivalent calculation (Equation 1):

$$\text{MCL-equivalent} = \sum \frac{(targeted\ contaminant\ concentration\ of\ treatment\ plant\ effluent)}{(MCL\ or\ surrogate\ MCL\ for\ contaminant)}$$

Equation 1. MCL-equivalent formula.

The MCL-equivalent calculation should be performed separately for cancer and non-cancer endpoints. If the MCL-equivalents are 1 or lower for both the cancer and non-cancer endpoints, DDW staff may consider the proposed treatment is adequate in providing extra caution for the protection of public health.

Note that it is important to first understand the regulatory process in California used to develop MCLs for contaminants in water supplies; a helpful summary is provided in Appendix I.

4.4.6.1 Surrogate Values

Surrogate values are based on non-regulatory thresholds, which were not developed in consideration of technological feasibility. As such, they are advisory in nature, and DDW must use its judgment in interpreting calculations based on surrogate levels. The following procedures describe how to determine the surrogate MCL for a non-regulated contaminant:

- For non-regulated contaminants (i.e., contaminants without an MCL) that have DDW NLs, the surrogate value is equal to either one-tenth of the contaminant's Response Level (0.1 × RL) or the NL.
  - The RL is the level at which DDW recommends removal from service of the source that contains the contaminants. The RL is equal to a 10-4 risk level for contaminants considered to pose a carcinogenic risk, and 10 times the NL for non-carcinogens. Consequently, the surrogate values to use for chemicals with RLs correspond to 10^{-5} risk for carcinogens and to the NL for non-carcinogens.
  - NLs are the health-based advisory values calculated by OEHHA using standard risk assessment methods. At times, the NL for a contaminant is higher than the health risk-based level, due to analytical limitations. Because analytical capability is one of the factors to be considered when an MCL is developed, the NL is used as the surrogate value in the MCL-equivalent calculation when (0.1 × RL) is lower than the NL. Please note that DDW reviews laboratory analytical capabilities periodically, and the NLs may be lowered to values closer to the health-based advisory values based on the outcome of the review. For example, the NL for 1,4-dioxane was changed from 3 ppb to 1 ppb after such a review in 2010.

- For non-regulated contaminants without DDW NLs but with USEPA Health Advisory Levels (HA), the surrogate value is equal to 10^{-5} cancer risk level (that is, one-tenth of the contaminant's HA for a carcinogen, which is the concentration of a contaminant in water corresponding to an estimated lifetime cancer risk of 1 in 10,000 or 10^{-4} cancer risk level). For non-carcinogens, the Lifetime HA may be used as the surrogate. The Lifetime HA is the concentration of a chemical in drinking water that is not expected to cause any adverse non-carcinogenic effects for a lifetime of exposure.
- Where NLs/RLs or USEPA HAs do not exist, risk assessments following standard procedures can enable the determination of the surrogate MCL value for the calculation.

4.4.6.2 Exceptions

There may be times a non-regulated emerging carcinogen is difficult to treat with the drinking water treatment technology commonly used today, and a newer and more costly treatment technology needs to be utilized. In this case, one may allow the 10-4 cancer risk level to be utilized for the MCL-equivalent calculations, because a 10-4 cancer risk level is the upper bound of the range typically considered as an acceptable health risk level.

Additionally, the DDW has the flexibility to consider other aspects of the PWS treatment system, including blending and background concentrations of certain contaminants. Background concentrations can be incorporated into the MCL-equivalent process under certain circumstances, as discussed in Section 4.4.6.3. As discussed in Section 4.4.1.1, blending will be considered by the DDW as a process supplementary to the treatment system itself.

4.4.6.3 MCL-Equivalent Calculation

The MCL-equivalent process includes preparing a list of regulated and unregulated contaminants identified as likely to be present in raw water. Once contaminants are identified, the proposed treatment process for each contaminant is identified. It is easier to assess treatment requirements when one contaminant must be treated than when multiple contaminants must be treated, particularly when different treatment processes are required. For example, a treatment system that must comply with performance standards for multiple contaminants using disparate treatment technologies (e.g., metals and VOCs, which would require multiple and independent treatment processes) will be more difficult to assess than a treatment system for multiple contaminants that can be treated using a common treatment technology (e.g., multiple VOCs that can be removed with LGAC). In many cases, empirical or pilot study data will be required to demonstrate treatment efficacy, results of which should be used to support the anticipated effluent concentration(s) included in the MCL-equivalent evaluation.

The MCLs, NLs, and RLs are established based on either the cancer (chronic) or non-cancer risk levels (acute or chronic), whichever is lower. The MCL-equivalent for the cancer endpoint is the sum of all ratios for the identified contaminants with MCLs, NLs, or RLs derived from the cancer risk levels. Following the same process, the MCL-equivalent for the non-cancer endpoints can be calculated. Each calculated MCL-equivalent for cancer- and non-cancer-causing contaminants should be 1 or less to be considered acceptable, although DDW may allow for flexibility as described in Section 4.4.6.2. Consequentially, most contaminants will require treatment to levels below the MCL in order to maintain a given MCL-equivalent value.

A PWS can consider that it has developed a prudent and practical approach to the level of treatment and has provided extra caution for the protection of public health when known contaminants will be

reduced to an MCL-equivalent of 1 or lower (ideally, as close to zero as possible) for the mixture of contaminants being treated, consistent with Section D.4.c of Process Memo 97-005. The MCL-equivalent calculation procedure also helps to identify the contaminant which has the greatest contribution to the MCL-equivalent and may be useful to the PWS to help focus the need for additional treatment.

In summary, the MCL-equivalent assessment should include (in a table or tables):

- A list of chemicals that will be or are likely to be present in water delivered to consumers under normal operations and the maximum anticipated concentrations. (NOTE: exposures from treatment failures are discussed in Section D.5 of Process Memo 97-005.)
- The MCL or the surrogate level for contaminants without MCLs (e.g., 0.1 RL, NL, USEPA HA, or other appropriate risk assessment for the contaminant), and its DLR.
- The maximum anticipated concentration of each contaminant in the influent and effluent.
- The ratio of the anticipated effluent concentration of each contaminant to its MCL or surrogate level. Chemicals should be separated to distinguish whether the primary health concern is due to acute exposures (e.g., nitrate and perchlorate) or chronic exposures (e.g., arsenic, hexavalent chromium, and others).
- For each class of chemical (i.e., cancer and non-cancer risks), the ratios should be summed.

As an example, Table 1, presents treatment system effluent water quality information for a hypothetical Extremely Impaired Source that contains perchlorate, nitrate, TCE, arsenic, hexavalent chromium, NDMA, 1,4-dioxane, PFOA, and PFOS. Anticipated effluent concentrations (treatment goals) are compared to the MCL or surrogate MCL associated with each contaminant to calculate a ratio. For the example provided in Table 1, the contaminant effluent concentrations reflect a proposed treatment train of ion exchange for removal of perchlorate, LGAC for removal of TCE, PFOA, and PFOS, and advanced oxidation for destruction of NDMA and 1,4-dioxane.

Table 1: Compare contaminants in treated water with their MCLs (or surrogate MCLs)

Contaminant	Maximum Effluent Concentration	MCL (or surrogate MCL*)	Concentration/MCL	Ratio
Acute, Non-Cancer Endpoint				
Nitrate (as NO_3)	30,000	45,000	30,000/45,000	0.7
Perchlorate	ND	6	0/6	0
TOTAL – MCL-equivalent (acute effects)				**0.7 ≤ 1**
Cancer Endpoint				
Regulated Contaminants				
TCE	ND	5	0/5	0
Arsenic	7	10	7/10	0.7
Hexavalent Chromium	6	10**	6/10	0.6
Non-Regulated Contaminants				
NDMA	0.01	0.03*	0.01/0.03	0.3
1,4-Dioxane	0.8***(=ND)	3.5*	0/3.5	0
PFOA	ND	0.0051*	0/0.0051	0
PFOS	ND	0.0065*	0/0.0065	0
TOTAL – MCL-equivalent (chronic effects)				**1.6 > 1**

Concentrations are in units of μg/L.

* One-tenth of the RL is used as the surrogate MCL. When the value of one-tenth of the Response Level is lower than the NL, the NL is used as the MCL surrogate.

** The MCL for hexavalent chromium of 10 μg/L was repealed in September 2017 due to a court order. DDW is in the process of adopting a new MCL.

*** Is below a level considered reliably detectable by DDW; therefore, the maximum concentration is considered ND and the ratio is set to zero.

Note: Values should include one significant figure.

The process to develop Table 1 is illustrated in the following flow chart (Figure 5):

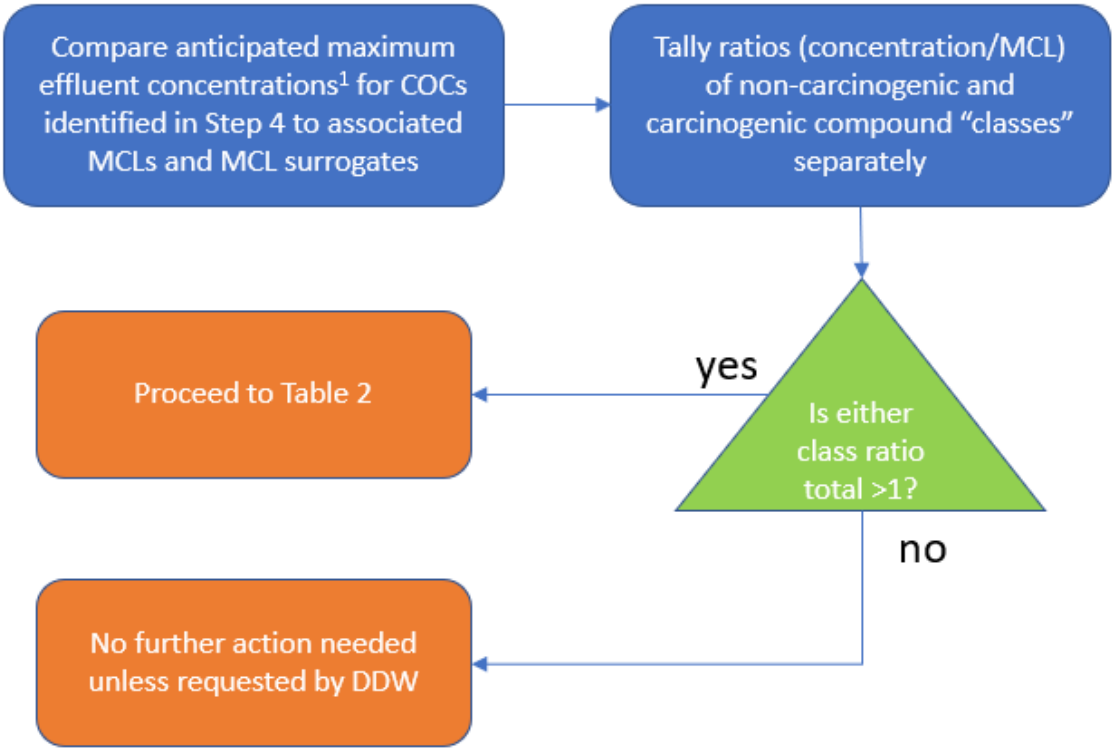

Figure 5. Flow chart describing the process to develop and use Table 1

Achievement of the anticipated effluent water quality, as included in Table 1, is contingent upon implementing a proper OMMP. The OMMP should describe a contingency plan to handle any water quality changes that are not adequately addressed by treatment. In the example shown in Table 1, ratios from the acute group contaminants total 0.7, so additional treatment may not be warranted because the MCL-equivalent is less than or equal to 1. However, the total ratio from chronic group contaminants is 1.6, so additional analysis is warranted to determine if additional treatment would be necessary to achieve an MCL-equivalent equal to or less than 1.

Concentrations used in the MCL-equivalent calculation may be based on the maximum treatment system effluent concentration expected within the first 5 years of operations of the treatment system, as re-evaluated every 5 years thereafter, or as stipulated in the amended Water Supply Permit. Maximum effluent concentrations should be estimated conservatively for each contaminant; if the proposed treatment system cannot achieve complete removal, use empirical or pilot study data to estimate the maximum effluent concentration after partial removal.

As discussed in Section 8.2, every 5 years during the life of the project, raw water quality for 5 and 10 year capture zones should be updated based on the most current water quality data and the MCL-equivalent calculation should be reevaluated and included in the annual summary report of operations. Reevaluation of the MCL-equivalent will be also required whenever there are new chemicals detected

or there is an increase in concentration for any existing contaminant that would not be reliably removed by the treatment system and would result in an MCL-equivalent above 1. Additionally, the MCL-equivalent should be recalculated when a new or revised MCL, NL, RL, PHG or EPA HA is published.

Removing a contaminant to below its DLR in the effluent results in a ratio of zero. If feasible, additional and/or modified technologies may be included in the treatment train such that concentrations of all contaminants are reduced to below their respective DLR values.

Whether a contaminant can be demonstrated to be naturally occurring should be discussed with the DDW. Such contaminants may be addressed in the MCL-equivalent process by applying a background credit. The background credit is defined as the background concentration (up to 50% of the associated MCL[7]) that is subtracted from the anticipated effluent concentration.

In contrast with Table 1, where the chronic MCL-equivalent exceeds 1 because of the untreated arsenic and hexavalent chromium, accounting for background levels for naturally occurring contaminants can be an effective means to reduce the MCL-equivalent. In this case, background credits of 5 ppb and 4 ppb could be applied to arsenic and hexavalent chromium, respectively, with no additional treatment. In doing so, the chronic MCL-equivalent can be reduced from 1.6 to 0.7, which DDW considers acceptable.

[7] Note that for water sources not subject to the Memo 97-005 process, treatment may not be needed for a contaminant associated with a non-cancer risk that is naturally occurring (e.g., nitrate) and detected at a concentration below 80% of its MCL.

Table 2: Consider background levels of naturally occurring contaminants in delivered water and apply credit

Analyte	Maximum Influent Conc.	DLR	Maximum Effluent Conc.	MCL	NL	RL	Surrogate MCL***	Known Bkgd. ****	Allowable Bkgd.	Max. Effluent Conc. Minus Bkgd. Credit	Chronic MCL Ratio	Acute MCL Ratio
Nitrate	30,000	2,000	30,000	45,000								0.7
Perchlorate	5	4	ND	6								0
TCE	15	0.5	ND	5							0	
Arsenic	7	2	7	10				7	5	7-5 = 2	2÷10 = 0.2	
Cr(VI)	6	1	6	10**				4	4	6-4 = 2	2÷10 = 0.2	
NDMA	10	0.005*	0.01		0.01	0.3	0.03				0.01÷0.03 = 0.3	
1,4-dioxane	3	1*	ND		1	35	3.5				0	
PFOA	0.01	0.004*	ND		0.0051	0.01	0.0051				0	
PFOS	0.01	0.004*	ND		0.0065	0.04	0.0065				0	
Sum of MCL Ratios											**0.7 < 1**	**0.7 < 1**

Concentrations are in units of µg/L.

* Because DDW does not have DLRs for unregulated chemicals, DDW established these values as the level considered reliably detectable in drinking water.

** The MCL for hexavalent chromium of 10 µg/L was repealed in September 2017 due to a court order. DDW is in the process of adopting a new MCL.

*** One-tenth of the RL is used as the surrogate MCL. When the value of one-tenth of the Response Level is lower than the NL, the NL is used as the MCL surrogate.

**** Background concentrations vary with location and must be discussed and agreed upon with the DDW.

The process to develop Table 2 is illustrated with the following flow chart (Figure 6):

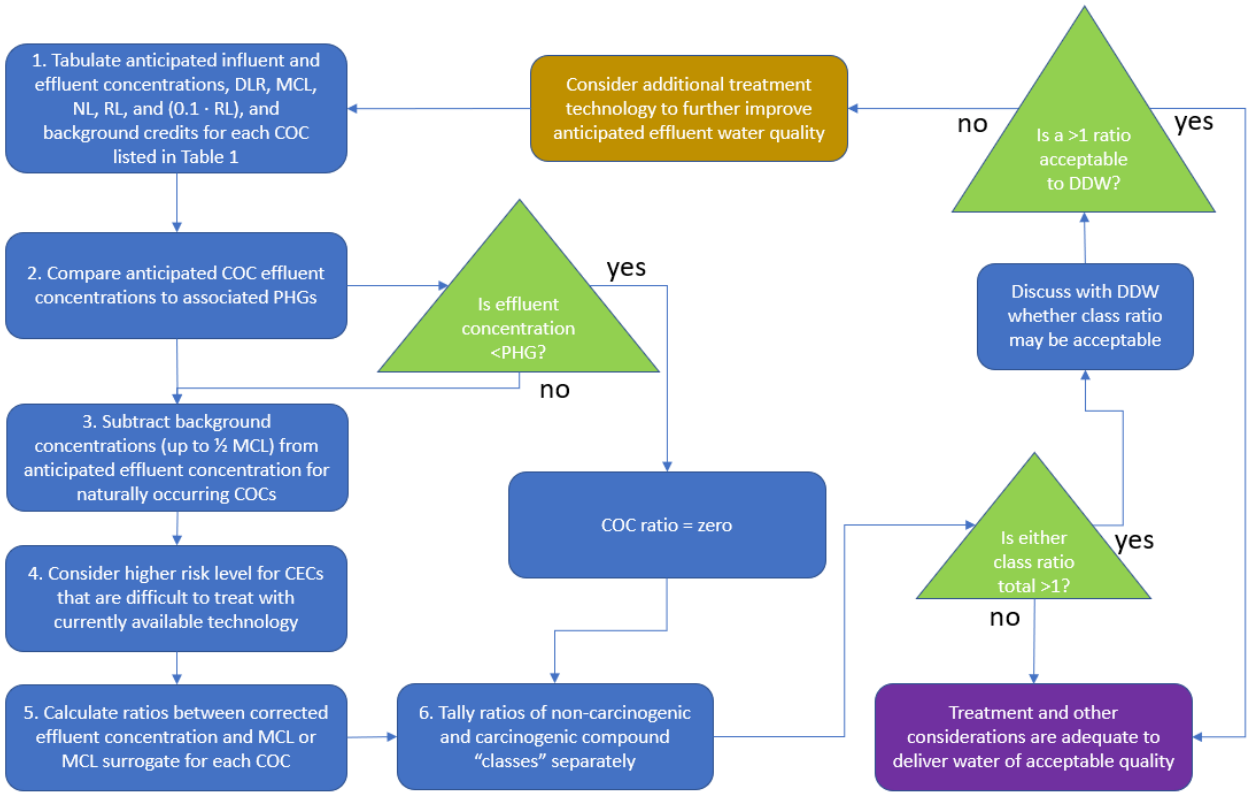

Figure 6. Flow chart describing the process used to develop and use Table 2

After background concentrations are taken into account, the sum of the concentration ratios of 0.7 MCL-equivalents for the chronic/cancer health risks is below the 1 MCL-equivalents treatment requirement and, thus, additional treatment would not be warranted for these or other contaminants. Nonetheless, DDW recognizes that additional treatment for contaminants that pose a chronic health risk (e.g., arsenic, hexavalent chromium, and 1,4-dioxane) would further reduce the MCL-equivalent value; as such, implementing additional treatment (e.g., modifying the OMMP) is encouraged if lower concentrations can be easily attained.

4.5 Step 5: Human Health Risks Associated with Failure of Proposed Treatment *[Section D.2]*

The PWS must make a request to DDW, through the Process Memo 97-005 document, to treat an Extremely Impaired Source and use it for potable supplies in the PWS distribution system. The PWS and DDW should bear in mind that despite treatment facility testing, demonstrated performance of the software/alarms/SCADA, there still remains the possibility for human error. For example, when making repairs, it may be possible for a valve (or other equipment) to be installed incorrectly, thus allowing partially treated water to unintentionally continue through the treatment train and into the distribution system. Consequently, the PWS needs to conduct an "evaluation of risk failure," and subsequent "health risk evaluation" assuming treatment failure.

4.5.1 Risk of Failure Evaluation

The PWS must review all components of the treatment facility, including the source of supply, treatment equipment, wet wells, boosters, controls, alarms, SCADA, and reservoirs. This may be performed through the development of a "fault tree," whereby a diagram is prepared for each component of the treatment process. The PWS then assumes one or more errors (or a fault) has occurred and, using the fault tree diagrams and "if/then" statements, the PWS will progress forward until a solution is found. This detailed thought process is intended to diagnose and resolve problems within the treatment facility. The most conservative scenario when preparing the fault tree diagnosis is to assume complete failure of all treatment processes at the same time. (An example of a fault tree is included in Appendix D). This exercise will help the PWS with diagnosing future problems while the treatment facility is in permitted operation as well as help with instrumentation programming.

4.5.2 Health Risk Evaluation

The purpose of this evaluation is to ensure that the failure of proposed treatment for the extremely impaired source(s) would not cause unacceptable health risk. The PWS and DDW need to recognize there may be (however unlikely) the possibility of a failure. Understanding this as a possibility, the PWS must evaluate the potential health impacts to its customers of receiving partially treated or untreated water. The assumptions to be used in this analysis should be discussed with DDW staff before the evaluation is prepared. For chemical contaminants, the treatment failure assessment should focus on health risks associated with short-term exposures that may arise from treatment failures. Naturally occurring contaminants such as arsenic and hexavalent chromium need not be included in the treatment failure-related evaluation provided that:

1. They have been addressed in Section 4.d (DDW Staff Evaluation of Treated Water Objectives or Goals) and have been shown to be present primarily at background levels, and

2. They are not included in the extremely impaired source's list of chemicals that requires treatment to meet MCLs.

As a starting point, the PWS may wish to consider a failure once every tenth year over a 20-year time frame. Twenty years can be used as a place holder for the life of the treatment facility. Additionally, potential health risks should be evaluated in the case of one failure event versus the health risks from multiple failure events.

The PWS must evaluate human health risks associated with contaminants (as identified in Step 4) that a customer would be exposed to for the duration of a failure. In doing so, the PWS may evaluate the impacts to customers using the following assumptions:

- The PWS service area is exposed to all contaminants simultaneously, representing a complete failure of the treatment facility. This is the most conservative approach. The logic is that if the public exposure to all contaminants does not trigger an insurmountable health impact, then exposure to fewer contaminants also will not trigger a health concern.
- Alternatively, the PWS may evaluate the health risk posed by the failure of individual treatment processes, in consultation with DDW staff. The scenario evaluated should represent a likely treatment failure mode, reflecting experience and data for treatment technologies and similarly engineered projects. Systems with multiple treatment technologies may require multiple failure evaluations,

representing various combinations of technologies that may fail together. Event Tree Analyses may be useful in these circumstances.

- The evaluation should assume the exposure is the time longest period of time to detect the failure including the time from sample collection to receiving the analytical result (includes travel time, and longest holding and lab turn-around times). At that point, the PWS should consider the length of time a customer may exposed, the assumed exposure rate compared to the lifetime exposure rate, the potential health impact, and the target organs. An example of such a tabulation is included in Appendix E. In addition, the analysis should consider different scenarios such as: 1) the current water quality concentrations, 2) the design concentrations, and 3) additional factors supplement to the treatment system that may reduce risk to human health (e.g., blending, see Section 4.4.1.1). This is one of the more critical aspects of the Process Memo 97-005 document. DDW staff must be satisfied that an unanticipated, complete failure of the treatment system will not pose unacceptable health risks to PWS customers before the system could reasonably be anticipated to be shut down. For each scenario, the PWS should address the cancer and non-cancer risks to the PWS customers.
- For chemical constituents, the assessment should tabulate the following:
  - Associated MCL, NL or USEPA Health Advisory Level, and PHG for each contaminant. The PHGs for carcinogens are set at the 10^{-6} lifetime cancer risk level, and the PHGs for non-carcinogens are set at the no observable adverse effect level, divided by appropriate uncertainty factors, and multiplied by the relative source contribution. Each PHG document generated by OEHHA generally evaluates cancer and non-cancer endpoints separately. Refer to OEHHA's PHG document for each constituent for the purpose of the risk assessment process.
  - If a PHG is not available, include a PHG-like value (e.g., lifetime 10-6 risk cancer risk level) associated with each contaminant. The PHG-like value should be determined from other sources in the following order (if available): DDW NLs, Proposition 65 cancer risk values, reference dosages from EPA's Integrated Risk Information System, and EPA's Preliminary Remediation Goals. To learn more on how to determine the PHG-like value, please refer to Section 5 of the Process Memo 97-005-R2020.
  - The calculated risk from the exposure attributed to each contaminant:
    - For carcinogenic contaminants, for example, exposure to 50 ppb of a contaminant that has a PHG (10^{-6} risk) of 5 ppb as part of a failure that occurs on an average of 1 day per year for a 70-year period (i.e., lifetime) equates to a risk of 0.027 x 10^{-6}, per the following equation (Equation 2):

$$\frac{50\ ppb}{5\ ppb} \times \frac{1\ day}{365\ days} \times 10^{-6} = 0.027 \times 10^{-6}$$

Equation 2. Risk calculation for carcinogenic contaminants.

    - Risk associated with non-carcinogenic contaminants is expressed as the Hazard Index (HI), which is defined as the ratio between the concentration a human is exposed to and the PHG or PHG-like value (in the same units). For example, exposure to 60 ppb of perchlorate would result in an HI of 60 (i.e., 60 ppb perchlorate ÷ 1 ppb PHG). Note that the perchlorate PHG was revised from 6 ppb to 1 ppb in 2015 (OEHHA, 2015).
  - The sum of cancer and non-cancer risks.

An assessment should be repeated for each scenario of treatment failure, unless each scenario results in the same exposures.

Importantly, calculated risks that, if they occurred over a lifetime, would exceed the range of lifetime cancer risk usually considered acceptable by Public Health or environmental regulatory agencies of 10^{-6} to 10^{-4}, or that exceed a cumulative HI of 1 for a given organ system, do not necessarily mean the project will or must be rejected. To provide perspective, at times the MCLs for contaminants are set at health risk levels outside the range typically considered “acceptable.” For example, the arsenic MCL is actually set at the lifetime cancer risk level of 2.5×10^{-3} due to the cost associated with currently available treatment technologies. The PWS needs to disclose the numerical public health risk and identify the category of risk to public health (carcinogenic, mutagenic, etc.) associated with exposure to the contaminant. The PWS may describe the limit of the currently availably treatment technologies and additional efforts, such as blending provided after treatment (as described in Section 4.4.1.1) to reduce the risk.

However, when the risks of adverse health effects, including infection risks, from treatment failure are excessive, additional treatment safeguards, additional monitoring, additional alarms, or additional maintenance inspections, must be used for the protection of public health. If one or more of these safeguards is not implemented, the proposal must be rejected.

4.6 Step 6: Summary AND next steps

The PWS has now completed all aspects of the Process Memo 97-005 document. If conducted correctly, the PWS should have submitted all of the required Process Memo 97-005 sections to DDW; received comments and provide a redraft(s); and received written confirmation that each section is deemed complete by DDW.

The PWS must bear in mind that confirmation from DDW that the sections are complete does not automatically result in final DDW approval and issuance of an amended Water Supply Permit. DDW staff will consider multiple factors in issuing a Water Supply Permit, including the information in the Process Memo 97-005 document; treatment facility testing and water quality results; and public comments at the Public Hearing which may also include comments on the Process Memo 97-005 document. In addition to the Process Memo 97-005 document the following shall also be completed prior to DDW issuing an amended Water Supply Permit: CEQA documentation, a permit application submitted to DDW, and a public hearing, if determined necessary by DDW. These elements are discussed in more detail in the following sections.

Section 5

Process Memo 97-005 – Ancillary Documents

5.0 Background

In addition to the work associated with the Process Memo 97-005 document itself, there are numerous ancillary documents that must be prepared and reviewed/approved by DDW prior to any decision on issuance of an amended Water Supply Permit for operation of the proposed treatment facility.

Many of these documents may be prepared concurrent with the Process Memo 97-005 document. It should be noted that for some of the documents listed below, such as CEQA, DDW typically verifies that it has been completed. Other documents, such as NPDES and WRD permits, are not part of this process but may be needed to operate the remedy/treatment facility.

The PWS should coordinate with DDW regarding preparation of these documents, timing, and DDW's expectations.

These ancillary documents are described in the following sections:

5.1 California Environmental Quality Act

CEQA may be required for construction projects including drinking water wells, pipelines, and treatment facilities. The PWS is encouraged to retain a consultant familiar with CEQA requirements. The PWS and DDW should agree whether the proposed project will be included as a categorical exemption, a Negative Declaration, a mitigated Negative Declaration or a full Environmental Impact Report. The CEQA document will need to be completed, along with a Notice of Determination, and all documents provided to DDW.

5.2 Application for Water Supply Permit Amendment

The PWS must file an application for a Water Supply Permit Amendment with DDW. The application should describe the proposed new facilities and explain the planned use of the facilities. It should describe the proposed changes to the distribution system to use the Extremely Impaired Source, including construction of new sources or modification to existing sources, treatment facilities, and new transmission pipelines. If a new well is proposed, it must meet the requirements of Title 22, CCR, Section 64560, New Well Siting, Construction, and Permit Application.[8] The application for a Water Supply Permit amendment should also include all available supplemental information including, but not limited to, the Process Memo 97-005 document, the design drawings for all aspects of the new facilities, and source water quality characterization.

[8] Note that projects implemented under CERCLA are exempt from the need to obtain this permit but are still required to demonstrate equivalence with the permit requirements.

5.3 Preparation of an OMMP

Section 4 herein includes a reference to the OMMP and notes many of the requirements for Section 4 may be addressed by referencing the OMMP. The OMMP should be prepared using straightforward, lay person terms so that the OMMP can be provided to any authorized treatment facility operator employed by the PWS for reference on all aspects of the treatment facility. Detailed vendors' operations and maintenance manuals are to be included in the appendix to the OMMP.

Due to the length of some of these vendor documents, DDW may allow the PWS to include only the cover page and table of contents of each manual and allow the detailed manuals to be stand-alone documents. The OMMP will include identification of drinking water wells and early warning (up-gradient) monitoring wells. (The early warning wells are also included and discussed in Section 4.4.4 herein.) Each component of the treatment system will need to be identified along with sampling points (which are often labeled as SP-_ to identify locations for sample collection).

A brief summary of the contents of a typical OMMP is included in Appendix F. This outline is intended as a starting point for discussions with DDW and will need to be adjusted to suit the particular circumstances of each treatment facility. Ask DDW staff whether they can provide copies of an existing OMMP for a more detailed understanding of the types of information required when preparing your OMMP**.** In general, an OMMP should address the following:

5.3.1 Description of the Treatment Facility

This section will include an overview of the sources of supply, treatment systems (including design considerations), disinfection, storage, and the controls/SCADA.

5.3.2 System Operating Procedures

This section will include detailed information on how each component of the treatment facility operates, including design features, operating scenarios, and descriptions of programmable logic controls (PLCs) or other sensors to monitor the status of the treatment facility components. The PWS must also describe treatment facility procedures to be used during operation, including pre-startup, startup, normal (typical operation), alarms, maintenance, shutdown, and media replacement. Finally, the procedures should include a list of approved operations (which should be periodically updated in coordination with DDW) and contact information for technical assistance and vendors.

5.3.3 Water Quality Monitoring and Testing

This section will identify drinking water wells and early warning (up-gradient) monitoring wells. Each component of the treatment system will need to be identified along with sampling points (which are often labeled as SP-_) to identify locations for sample collection.

The PWS may consider labeling the sampling points at the treatment facility site exactly the same as those identified in the OMMP to avoid confusion when sampling.

This section of the OMMP will also identify the sampling analytes, frequency, and location for each component of the treatment facility, analytical methods required by DDW, and sampling techniques. This task also is included in Section D.4 of Process Memo 97-005.

This information should be included in the OMMP to reduce the possibility of a mistake by the operator and/or sampler.

5.3.4 Reporting and Records

This section of the OMMP notes the need to maintain operational and maintenance records. Typically, the PWS will include the reporting forms to be used by the operators as part of an appendix for convenient reference. The section should also consider the potential for unintended or incidental waste residual (e.g., radioactivity accumulation on media) and the proper waste handling, disposal and documentation of such waste.

5.3.5 Future OMMP Revisions

The PWS should recognize that at any time following the issuance of an amended Water Supply Permit by DDW, **any** proposed modification to the treatment facility and/or ancillary components will require the PWS to submit another application for a Water Supply Permit amendment (see Section 5.2). Subsequently, DDW may require an update to the OMMP to reflect the proposed change(s). In addition, the PWS may submit a request to DDW to modify the Water Supply Permit requirements based on updated water quality, including potential operation of the sources, but without treatment. DDW staff will consider the requested change, along with data submitted, prior to rendering its decision.

5.4 Treatment Facility Compliance/Startup Testing PLAN

The PWS will be required to demonstrate the completed treatment facilities, sources and instrumentation will operate as designed, and that there are no anomalies with the construction, facility operation, instrumentation, programming and alarms. For this reason, the PWS should develop a Treatment Facility Compliance/Startup Testing Plan which should consist of the following, as a minimum.

- Describe all aspects of the treatment facility. Much of this information may be taken from the OMMP text. The stand-alone document will help DDW staff to review and understand the components of the treatment facility.
- Identify all of the sampling ports within the treatment facility including sources; prior to and following treatment processes; inter-stage within an individual treatment process (e.g., LGAC or ion exchange); and before and after the reservoir (or discharge to the distribution system).
- Identify the proposed sampling which the PWS believes will demonstrate the adequacy of the treatment system. This section should include the sampling points, contaminants to be sampled, the analytical test methods, the proposed flow rate, and duration of the testing event.
- Include the proposed sampling frequency and clearly outline the treatment goals for each treatment process.

DDW typically will review and subsequently consider permitting a source/treatment facility at the same flow rate as the demonstrated test. For example, the PWS should be cognizant of testing at a flow rate of 1,000 gpm and requesting a permit to operate at 2,000 gpm. DDW may request the test flow rate be 2,000 gpm.

The PWS should consider including the following as part of its startup test plan: (DDW may also request the PWS conduct water quality testing for pH and treatment disinfection by-products which inadvertently may be formed as a result of removing other contaminants.)

- Drinking water well (raw water)
- Discharge from each treatment unit process
  - LGAC
  - Ion Exchange
  - Ultra-violet light (UV)
  - Reverse Osmosis (R.O.)
  - Other
- Discharge of fully treated water.
  - For DDW
  - For RWQCB
- Conduct sampling
- Multiple times per day initially.
  - Daily.
  - Weekly if extended startup testing.
- The PWS should tabulate all water quality results in an electronic format and submit those results to DDW for review. The results must demonstrate the treated water concentration of all contaminants meet the treatment objectives. Following DDW review and approval, the PWS should prepare a concise written report summarizing the water quality testing, the results, and the PWS conclusions. In the event there are areas of non-compliance, this should be clearly brought to DDW's attention along with implemented or proposed corrective actions.

5.4.1 Regulatory Discharge Reports

The PWS must remember to obtain applicable permits from agencies (RWQCB, the local County, local sanitation district) to make discharges both during start up testing and on-going operations. The PWS will also need to prepare a quarterly report to RWQCB (and possibly other agencies) regarding the discharges. RWQCB will likely require a quarterly report even if there were no discharges.

5.5 TREATED WATER DISCHARGE PERMIT – START-UP PERIOD

Although not a component of Process 97-005, the PWS should keep in mind that, until the DDW provides an amended Water Supply Permit, all discharges from the source(s) and the treatment facility must be discharged in accordance with appropriate regulatory requirements. Consequently, the PWS may need to obtain the appropriate permits, which may include but are not limited to the following, to properly discharge water during the startup period:

5.5.1 RWQCB

The PWS should contact its local RWQCB to discuss the proposed discharges. A discharge to surface water may be associated with an NPDES permit or a WDR permit. The PWS may be required to prepare an application package which includes a description of the treatment facility and treatment process and a summary of the instantaneous discharge flow rates, including the daily volume of water and the anticipated duration of the discharge. The PWS will be asked to explain why the treated water cannot be discharged in another manner, including for off-site treatment or irrigation use.

The NPDES/WDR discharge limits in many cases may be more restrictive than DDW Title 22 requirements (e.g., chlorine residual, chloride and selenium, among others). The PWS must be aware of these requirements when designing its treatment facility and planning discharges.

The PWS should allow two to three months following submittal of an application to its RWQCB and be prepared to pay the applicable fees. Following request of the NPDES/WDR, the PWS will be required to comply with the terms of the permits, including quarterly reports, even if there are no discharges.

5.5.2 County

The PWS may be required to obtain a permit for discharges into storm channels and other stormwater conveyance facilities. The PWS should contact the local county (often the Flood Control District or equivalent) to determine if a permit is required. In the event an application is required, the County may require the NPDES/WDR permit accompany the County application. Similar to the RWQCB, the PWS should be prepared to pay all applicable fees to the County.

5.5.3 Local City

The PWS may be regulated by the City within which the treatment facility or discharge is located. The PWS should contact the City to determine whether a permit may be required. The PWS should be aware that many cities may be subject to the provisions of a Municipal Separate Storm Sewer System (MS4) permit from local RWQCBs which obligate the cites to monitor and eliminate non-stormwater discharges to storm channels unless the discharger is able to provide a separate RWQCB permit.

The PWS must bear in mind that all discharge permits must be in place before any discharges are considered.

Section 6

DDW Review of Process Memo 97-005

6.0 Background

The PWS has now completed, submitted and received an approval from DDW staff to proceed with each component in the Process Memo 97-005 process. The relevant documents include the following:

- The Process Memo 97-005 document is now deemed complete by DDW following review and approval of each section. The final draft should be placed into a binder for ease of review by the public. This final draft should include all text, tables, figures, and appendices referenced in the report.
- The CEQA documentation has been completed, approved by the lead agency, and a Notice of Determination has been filed.
- The PWS has submitted an application to DDW for an amended Water Supply Permit.
- The PWS has submitted and received approval from DDW on all plans/design drawings for the sources, treatment facility and transmission pipelines.
- The PWS has submitted the OMMP to DDW and received approval.
- The PWS has conducted startup testing, submitted a report on the findings and received DDW approval.

6.1 DDW Decision Process

It is at this point that DDW staff must make one of the following decisions.

- **The submittals are complete, acceptable, and a public hearing will not be required.** Under this scenario, DDW may determine the proposed use of an Extremely Impaired Source does not rise to the level requiring public approval. DDW staff will then proceed to prepare the draft Engineers Report and amended Water Supply Permit.
- **The submittals are all complete and acceptable, a public hearing will be required,** based on one or more concerns DDW staff may have regarding public acceptance. Under this scenario, DDW staff will coordinate with the PWS to hold a Public Hearing.
- **DDW may determine that there are new data or unforeseen circumstances which make the prior submittals unacceptable or incomplete.** Specific examples are not provided, but the PWS should recognize DDW has the authority to require additional information prior to making a determination on the adequacy of the 97-005 package.
- A Project may be found unacceptable by DDW based on new information that invalidates DDW's approval of previously submitted materials, such as new detections that suggest the human health risk is not adequately minimized by treatment (even in consideration of supplemental measures), the risk of treatment failure not adequately minimized through good engineering practices, reliability features, or redundancies.

- **DDW staff should recognize it has previously approved all components of the Process Memo 97-005 package described in Section 4 of this User Guide. DDW should be prepared to provide written clarification to the PWS of the shortcomings or incomplete aspects.**

Section 7

Public Hearing

7.0 Compilation of Documents

DDW staff have approved all the Process Memo 97-005 components and have allowed the process to proceed to a Public Hearing. At this point the public will be able to hear and see presentations by DDW, the PWS and regulatory agencies on the merits of the proposed project to clean-up and use an Extremely Impaired Source. The PWS should proceed with the following:

- Place all documents in binders to facilitate public review. Binders are preferable in that it allows the public to remove, copy and replace individual pages, if needed. The public should not be allowed to remove documents from a public repository. In addition, the PWS may wish to consider preparing a PDF copy of all the materials which then may be provided to those which make a request for such documents. The PWS should make arrangements to have the documents available at multiple sites including, but not limited to, the PWS office, a PDF copy on the PWS website, a public library within the PWS service area, and the DDW office.
- The PWS and DDW should agree upon a time for the Public Hearing and the language for the notice. The PWS will have the responsibility of posting the notice of public hearing and in a local newspaper, at the PWS office, and on other agreed upon social media sites. The PWS should coordinate with DDW and legal counsel regarding the length of time to be provided for public review of the 97-005 documents, but a typical time frame is 30 days. The PWS should also provide written notice of the availability of the 97-005 documents, and the public hearing date and time, in a local newspaper. The initial notice should precede the 30-day comment period and a second notice should also be provided.

7.1 Public Hearing Presentation

The PWS, in consultation with DDW staff, should coordinate the Public Hearing and presentations. The presentations should be presented in a PowerPoint format and should be informative yet concise. **There is a fine line between presenting too little information which leaves the audience with questions/concerns and a lengthy presentation during which the audience loses focus on the facts the PWS is presenting.**

It is recommended a senior level DDW representative familiar with Process Memo 97-005 moderate the entire Public Hearing. PowerPoint presentations should be provided by DDW, the PWS, the primary regulatory agency overseeing the regional clean-up efforts, and the local groundwater management agency. The PWS should obtain the PowerPoint presentations from all presenters and review them with DDW. The presentation should use consistent terms when referring to names, locations, and facilities and should present a uniform message. Again, all presentations should be informative, yet concise. The Public Hearing presentation should be revised and refined at least twice to eliminate areas of potential confusion and to determine the approximate length of the Public Hearing. Language

used in the PowerPoint, and by the presenters, should be non-technical and easily understood by the public. The PWS should use the Public Hearing as a forum to present to the public the reason for doing the project and the consequences of not doing the project. The PWS may emphasize that the groundwater treatment project is freeing up the ability to use groundwater basins for storage and development of new supplies. During the Public Hearing there will be the opportunity for the public to provide written and oral comments.

There is no obligation to respond to comments during the Public Hearing, but the public should be reassured all comments relevant to the project will be addressed in writing.

Section 8

DDW Evaluation

8.0 Introduction

DDW has had an opportunity to adequately review all of the Process Memo 97-005 documents along with ancillary reports, and the opportunity to hear and review public comments. DDW has reviewed the calculated health risks to the PWS customers in the event of complete treatment facility failure. In addition, it has reviewed the safety features and alarms built into the treatment facility and has considered water quality data from standup testing. It is at this point that DDW staff will make its decision to issue and amended Water Supply Permit and **allow** the PWS to operate the treatment facility and serve water to its customers. Alternatively, the DDW may choose to **deny** the application for the treatment facility.

8.1 Approval

DDW may choose to approve the application for a treatment facility. In this case, the PWS must wait for the signed amended Water Supply Permit before the treatment facility can be started and potable water be provided to PWS customers. This is the optimal and preferred outcome for the following reasons:

- The contaminants are being removed from the groundwater basin and treated.
- The groundwater supplies are preserved and put to beneficial use.
- The PWS resumes use of its source of supply and provide water supply redundancy for its distribution system.
- The PRP fulfills its responsibility to provide source remediation but has a beneficial end use for the fully treated water that is consistent with SGMA and groundwater management for the impacted groundwater basin.
- DDW has been assured the public will receive a safe and reliable source of supply.
- The regulatory agency is satisfied that the PWS has implemented a cleanup plan in a timely manner.

8.2 ADAPTIVE MANAGEMENT PROCESS

Once the amended Water Supply Permit has been issued, it is likely that changes in groundwater quality conditions, refinements in analytical capabilities, or improvements in remediation technology(ies) will warrant reevaluation of the Water Supply Permit to maintain the protection that was assured during the permit application process. An effective means to achieve this goal includes revisiting the Permit via an adaptive management process that:

1. Is comprehensive, flexible, and iterative;
2. Accounts for uncertainty in treatment system performance regarding permitted treatment goals;
3. Includes objectives that reflect both technical and non-technical challenges;

4. Addresses multiple contaminants and treatment barriers, and changes in technologies and regulatory requirements over time;
5. Includes scheduled evaluations of treatment system performance that may result in modifying the treatment system, implementing other contingency actions, and/or changing the requirements included in the amended drinking water permit.

The essence of the adaptive management process is illustrated in the following flow chart (Figure 7):

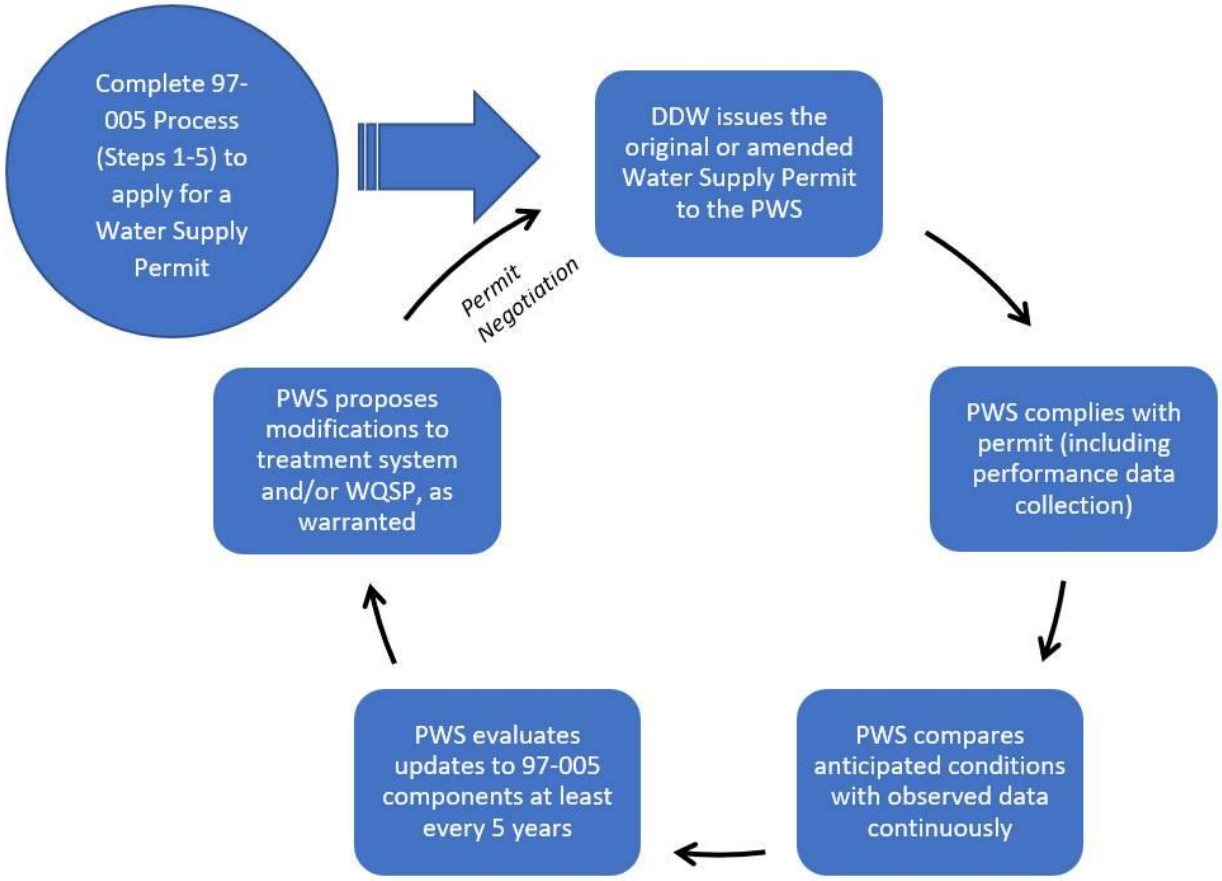

Figure 7. Flow chart describing the adaptive management process associated with the 97-005 Policy

The PWS will be responsible for evaluating treatment system performance monitoring data (i.e., equipment effectiveness and data sufficiency), data from the Water Quality Surveillance Plan (e.g., groundwater data from upgradient monitoring wells), regulatory changes (e.g., new chemicals of emergent concern, new or changed MCLs), and changes in remediation technology to assess the element(s) of the 97-005 Policy that may need to be revised/updated. Although formal action is required every five years, data should be evaluated continuously such that permit modifications could occur more frequently, if warranted. This process is equivalent to updating the Conceptual Site Model as part of a remediation investigation, with the goal of achieving the objectives originally identified in the 97-005 process or identifying objectives that need to be modified.

Once revised 97-005 materials have been provided by the PWS, the DDW will review all materials and will provide a revised amended Water Supply Permit as warranted after first consulting with the PWS. A revised Permit may include modifications to the OMMP to optimize treatment system performance, changes to the WQSP to ensure that sufficient data are being collected and that risks to human health are minimized, discontinuance of treatment system components that may no longer be needed, or other changes as discussed in Section 9 herein.

8.3 Denial

In the event DDW receives sufficient public comments and response regarding concerns for the potable use of the treated water, DDW may choose to deny the request for an amended Water Supply Permit. Furthermore, public comment is not the only reason that DDW may deny the permit amendment application. If the water system provides insufficient justification that the potential for human health risk is minimized by the proposed treatment and the risk of treatment failure is likewise minimized, then DDW may ultimately deny the permit amendment regardless of public comments. The PWS must recognize this is a real possibility and understand it is based on the need to ensure the public will receive a safe and reliable water supply at all times. In this case the following would occur:

- The PWS may need to seek an additional, alternative source of supply. The PWS may need to coordinate with the PRP to fund the additional costs of the alternative source of supply.
- The PRP and the regulatory agency must be aware that produced groundwater may be subject to the groundwater management agency's assessments.
- The PRP will need to negotiate with the groundwater management agency to determine the degree by which assessments will be applied, if applicable.

Section 9

Reconsideration of Process Memo 97-005 Process

9.0 Introduction

DDW established the Process Memo 97-005 process to ensure there is a uniform process to satisfactorily identify potential contaminants in an Extremely Impaired Source, identify the treatment process and the safety features associated with those treatment processes and to demonstrate the sources will be safe and reliably treated for potable use. Assuming the Process Memo 97-005 evaluation was thorough and accurate, typically there is no need to reopen the Process Memo 97-005 process. However, it is possible DDW may require further future evaluation. Some potential examples are:

9.1 A New Contaminant Is Detected that Cannot Be Removed by the Existing Treatment Process (Es) to an Appropriate Level

In this case, DDW may request the PWS to reinvestigate the source water assessment (Step 1) and/or the water quality characterization (Step 2) to determine the source and extent of the new contaminant and possibly other contaminants that were not originally identified. Additional investigation may be required to assess the circumstances by which the contaminant(s) may have been “missed.” Depending on findings from reinvestigating these and possibly additional steps, it is possible DDW may require another public hearing, but that is not a certainty.

9.2 A New Extremely Impaired Source Is Added to the Treatment Facility but Originates from a Different Aquifer

Similar to addressing a new contaminant, the PWS may be required to reevaluate the source water assessment (Step 1) to ensure the different aquifer has been thoroughly evaluated. DDW may also require the reevaluation of additional Steps and/or a new public hearing to consider a substantive change to a source of supply.

9.3 There Is a New NL or MCL for a Contaminant that Historically Had Not Required Treatment and the Existing Treatment Facilities Are Not Capable of Treating that Contaminant

Similar to addressing a new contaminant, the PWS may be required to reevaluate the unit treatment processes to ensure compliance with MCLs. It is also possible DDW may require a new public hearing if there is a substantive change to a source of supply. In this case, DDW may require the reevaluation of effective monitoring and treatment (Step 4) and/or may require another public hearing.

9.4 There Is a New NL or MCL for a Contaminant that Had Previously Required Treatment

Because NLs and MCLs are subject to change over time, such changes may result in portions of the Process Memo 97-005 investigation being reopened, including revisions to the OMMP and/or water quality surveillance plan, with the potential result of changes to the amended water supply permit.

9.5 Treatment Goal Has Been Met for a Constituent Requiring a Specific Treatment System Component

Some treatment systems subject to a Process Memo 97-005 investigation are associated with site-specific remediation efforts, rather than naturally occurring, non-point contaminant sources. As such, as the site-specific remediation efforts progress, one or more treatment goals may be achieved that makes further operation of a specific component of the treatment system unwarranted. In the event a PWS believes there is compelling evidence to discontinue operation of one or more of the treatment processes, then it should submit an application to DDW to remove those treatment facilities from operation. As an example, the PWS may present evidence a contaminant has not been detected for a certain extended period of time. DDW will review the application and evidence and may require another public hearing and/or a modified OMMP and/or water quality surveillance plan if further amending the water supply permit is deemed warranted. Historically high contaminant levels may decline to concentrations below the DLR and therefore the PWS may request that the formerly contaminated drinking water well(s) to be taken out of treatment.

9.6 Abbreviated Process Memo 97-005

If an abbreviated Process Memo 97-005 evaluation had been performed, and subsequently additional constituents, elevated levels of existing constituents, or new sources of contamination are identified, it may be appropriate to re-visit the evaluation.

9.7 Discontinuance of Required Treatment

Whether a portion, or all, of the Process Memo 97-005 process may need to be reevaluated in order to discontinue treatment will be determined by DDW on a case-by-case basis and may result in an amended Water Supply Permit.

Section 10

LIST OF ISSUED PERMITS

DDW has approved 29 amended water supply permits that were subject to the Policy Memo 97-005 process since its adoption in November 1997. A list of these permits is included in Appendix G and has been updated through June 2020. The PWS may wish to contact DDW at any point to request an updated list.