Monk Hill Treatment System
Project Evaluation Summary

For the Consideration of an Amended Water Supply Permit for
The City of Pasadena Water and Power Department
Serving the City of Pasadena and Environs
Los Angeles County

February 11, 2011

Drinking Water Field Operations Branch
California Department of Public Health

1. INTRODUCTION

The City of Pasadena Water and Power Department (hereinafter, PWP) has submitted an application dated February 9, 2010, to the Department of Public Health (Department) to amend the existing domestic water supply permit to include treatment of contaminated groundwater at the new Monk Hill Treatment System (MHTS) and distribution of the treated water for domestic purposes. The groundwater source of the proposed project is a portion of the Monk Hill Sub-basin of the Raymond Basin. The production wells are located downgradient to Jet Propulsion Laboratory (JPL) which the United States Environmental Protection Agency (USEPA) placed on the National Priority List (NPL) of the Comprehensive Environmental Response and Liability Act (CERCLA). The groundwater in the area around the JPL is designated Operable Unit 3 (OU-3) and is known to contain contaminants, primarily perchlorate and carbon tetrachloride (CTC). The pumping and subsequent treatment of the groundwater is consistent with the groundwater cleanup plan developed by USEPA for the NPL site. Two other Operable Units exist for on-site groundwater (OU1) and on-site soil (OU2).

In the permit amendment application, PWP indicates that the 7,000 gpm water treatment facilities, known as the MHTS, would be supplied by four rehabilitated production wells: Arroyo Well, Well 52, Ventura Well, and Windsor Well (Monk Hill production wells). Depending on available water rights and system demand, PWP may operate the MHTS year round, or on a seasonal basis.

It should be noted that the proposed treatment technologies, removal of perchlorate using single use ion exchange resin, and absorption of organic chemicals using liquid phase granular activated carbon (LGAC), are established best available technologies, and have been successfully used at a number of other water systems. The same type of equipment has been successfully used since July 2004 at the Lincoln Avenue Water System, on water that is also drawn from the Monk Hill sub basin, downgradient of PWP's four Monk Hill wells, also for the removal of CTC and perchlorate.

For PWP, the primary contaminants of concern are CTC and perchlorate, but very low levels of other organic contaminants that are present will also be removed by the LGAC. The MHTS consists of four parallel pairs of ion exchange vessels for the removal of perchlorate. Each pair of vessels will operate in a lead-lag configuration. Following ion exchange treatment, there are five pairs of liquid phase granular activated carbon vessels for the removal of volatile organic chemicals (VOCs). Each LGAC pair will also operate in the lead-lag configuration.

Due to the nature of the contamination, a report entitled CDPH Policy Memorandum 97-005 Documentation, Raymond Basin, Monk Hill Subarea (hereinafter, referred as the 97-005 Technical Report) was prepared by the

Environmental Restoration Department of the Battelle Memorial Institute (Battelle) for the National Aeronautics and Space Administration (NASA) and submitted on behalf of PWP. The 97-005 Technical Report was prepared in accordance with the Department's Policy Memorandum No. 97-005 entitled "Guidance for Direct Domestic Use of Extremely Impaired Sources" and is available for public review and comment.

2. APPRAISAL OF SANITARY HAZARDS AND SAFEGUARDS

2.1 Evaluation of Policy Memo No. 97-005 Submittal

On November 5, 1997, the Department issued Policy Memo No. 97-005 to address projects involving the direct domestic use of extremely impaired sources. A copy of this memorandum is included in Appendix A of 97-005 Engineering Report. The purpose of this guidance is to set forth the position and process by which the Department would evaluate proposals, establish appropriate permit conditions, and approve the operation of an extremely impaired source for any direct potable use. The policy lists six areas that must be addressed in the permit application.

On behalf of the NASA Management Office at the JPL and the City of Pasadena, Battelle prepared the 97-005 Documentation (Technical Report) dated April 2010 in accordance with the policy. The document covers the Monk Hill Subarea of the Raymond Basin, with the emphasis on the four wells owned by PWP, which are closest to JPL. This technical report was submitted by PWP in support of PWP's permit amendment application for the Monk Hill Treatment System.

The technical documentation report covers these items:

1. Introduction
2. Source Water Assessment
3. Characterization of Raw Water Quality
4. Source Protection
5. Effective Monitoring and Treatment
6. Human Health Risks Associated with Failure of the Proposed Treatment
7. Identification of Alternatives to the Use of the Impaired Sources

Battelle was able to incorporate, utilize, and reference many of the studies and remedial investigation reports previously prepared under the CERCLA activities for the JPL Operable Units.

Each section of the 97-005 Technical Report is summarized and evaluated below.

2.2 Source Water Assessment

This section requires an examination of the vulnerability of the aquifer to contaminating activities, in terms of known and potential contaminant sources, the chemicals used or released, aquifer properties and capture zones of the proposed wells.

Battelle utilized information that had previously been developed on the aquifer characteristics, groundwater modeling, groundwater quality and chemical usage as a result of the USEPA's investigations and NASA's CERCLA related studies. Simplified fate and transport modeling was also conducted to predict if chemicals detected in JPL monitoring wells might reach the Monk Hill production wells at concentrations of concern.

Battelle's report provides:

- A hydrogeological description of the Monk Hill Subarea including the general depth and direction of groundwater flow.
- A discussion of the capture zones, including computer modeling and the associated maps.
- The locations of past known sources of contamination and of reported chemical usage.
- Identification of types of businesses with typical chemical usage.
- A summary of water quality throughout the contaminated area, including lists of all chemicals and water quality parameters which have been analyzed for in the CERCLA Remedial Investigation (RI) groundwater database and a list of chemicals used in the area.
- A discussion of estimated distributions and trends of perchlorate and VOCs including CTC, tetrachloroethylene (PCE) and trichloroethylene (TCE).

Evaluation of Source Water Assessment

Since 1988, NASA has been conducting environmental investigations to identify and define the extent of contamination on and around the JPL facility, and has initiated soil and groundwater cleanup programs to address site-related chemicals of interest, including CTC and perchlorate. In 1992, JPL was placed on the National Priorities List (NPL) and became subject to the provisions of CERCLA.

Groundwater flow beneath the JPL is generally to the southeast, under the Arroyo Seco and into the Monk Hill Sub-area of the Raymond Basin, and is significantly influenced by pumping of local production wells located east of the Arroyo Seco.

Groundwater beneath the JPL has been characterized as high in perchlorate and CTC with lesser amounts of other VOCs such as PCE, TCE and chloroform. Beginning in the late 1980s and continuing during the Remedial Investigation during the 1990s, NASA installed a system of groundwater monitoring wells on and around the JPL property. These monitoring wells are regularly monitored and a report is generated on a quarterly basis. Quarterly reports indicate that the most historically contaminated area is in the interior of the property, near MW-7, which was as high as 13,300 µg/L of perchlorate and as high as 208 µg/L of CTC. (Concentrations in the interior "source area" have greatly diminished since 2005 when the OU-1 biological treatment system began operation to extract, treat and re-inject the most contaminated groundwater.)

Other chemicals, such as 1,2,3-TCP, nitrosamines, 1,4-dioxane, and explosives, have been sporadically detected in on-site groundwater monitoring wells, often at low concentrations, and are unlikely to be detectable in PWP production wells. Nevertheless, monitoring and production wells will be checked for these contaminants in accordance with the approved Operations, Maintenance, and Monitoring Plan (OMMP), since the production wells' capture zones (especially for the Arroyo Well and Well 52) extend into previously contaminated areas on the JPL property.

The report also identifies 14 additional potential sources of chemical releases within the capture zones of the Monk Hill production wells. These are primarily comprised of automotive service/repair shops and dry cleaners and potential contaminants are chlorinated solvents and petroleum products. These chemicals are monitored under the required monitoring program and removed by the activated carbon if detected.

2.3 Characterization of Raw Water Quality

This section requires a thorough characterization of the raw water which would be entering the MHTS. Battelle's report provides:

- An evaluation of the raw water quality based on historical production well data. The report discusses perchlorate and VOC concentrations actually found in the four Monk Hill wells while they were in service between 1997 and 2002. The concentrations are graphed in Figures 3-1 to 3-4 of the 97-005 Technical Report. The production wells were taken out of service between 1997 and 2002, due to high perchlorate levels at which point sampling of those wells stopped.

- Estimates of the concentrations of chemicals in the influent streams using Arroyo and Well 52, the Ventura and Windsor Wells, Lincoln Avenue Water Company's Wells 3 and 5, as well as Rubio Cañon's Wells 4 and 7, and Las Flores Well #2. These are presented in Tables 3-11 through 3-15 of the 97-005 Technical Report.

For the combined Arroyo Well and Well 52, the identified chemicals of concern and estimated influent concentrations if just these two wells are operating are perchlorate, 62 µg/L, CTC, 2.9 µg/L, chloroform, 2.8 µg/L, and TCE, 3.6 µg/L.

A similar estimate for the Ventura/Windsor wells is perchlorate, 3 µg/L, chloroform, 0.7 µg/L, PCE, 0.7 µg/L, and TCE at 0.8 µg/L.

The MCLs for these chemicals are 6 ug/L for perchlorate, 5 ug/L for PCE and TCE, 0.5 ug/L for CTC, and 80 ug/L for chloroform.

- A discussion of the variability of chemical concentrations, including nitrate, based on historical production well data.

- Over the course of the CERCLA Remedial Investigation (RI), a database was created for the results of 26 RI monitoring wells on and around the JPL property. Battelle prepared a statistical summary of these results. The report discusses traces of other chemicals in monitoring wells (Table 2-6 of the 97-005 Technical Report) that might potentially reach the production wells. Battelle used this information to prepare a list of the contaminants that may potentially be present in the Monk Hill production wells.

- To assist in estimating the future concentration, variability and trends of perchlorate and VOCs in the production wells, Battelle also plotted the time series for these compounds in the monitoring wells (Figures 2-19 to 2-25 in the report). Also, Battelle grouped and plotted average annual concentrations of monitoring wells based on their locations, for example, Group C monitoring wells are near the JPL perimeter, upgradient of the Monk Hill Wells, and Group D monitoring wells are located off site, near the production wells.

  Battelle concludes, “The concentration trends observed in monitoring well Groups C and D would most likely reflect the trends in the capture zones of the production wells. As shown on Figure 2-25, concentrations are generally decreasing over time, but punctuated by occasionally elevated concentration spikes of perchlorate.”

  In addition, the patterns of fluctuating concentration seen in the past make it unlikely that more than one production well will exhibit a concentration spike at the same time. In any case, an increase in the influent concentration of contaminant would result in the absorptive media (ion exchange resin and granular activated carbon) becoming saturated quicker, and therefore necessitating an early change of media, without affecting the effluent quality.

Evaluation of Raw Water Quality Characterization

PWP's Monk Hill wells have not produced drinking water for 9 to 14 years; therefore, the raw water quality characterization provided in the 97-005 Technical Report is limited to data obtained prior to the wells' shutdowns between 1997 and 2002 and examination of trends in upgradient monitoring wells. The monitoring wells' time series show patterns of very high concentration spikes preceded and followed by periods of much lower perchlorate and CTC concentrations.

Particularly for the Arroyo Well, the limited perchlorate data (Figure 3-1 of the 97-005 Technical report) appears to represent a concentration spike from around 40µg/L up to 160µg/L and then quickly back down towards 40µg/L.

PWP has indicated their intention to operate all four Monk Hill production wells simultaneously, which will result in lower plant influent concentrations since the Ventura and Windsor wells are much less contaminated than the Arroyo Well and Well 52.

Using the historical average concentrations and considering the flow rate of each well calculates to an estimated influent of 37µg/L for perchlorate and 2µg/L for CTC. In their request for proposal, PWP had the equipment supplier design for 45µg/L perchlorate and for 2.7µg/L CTC.

Since the 97-005 Technical Report had very limited production well data for the Monk Hill wells from a decade ago, CDPH required extensive start-up monitoring of the production wells in order to provide good representation of current water quality. Start-up monitoring was conducted from December 2010 to February 2011. During this period, the four Monk Hill wells were detected in the range of 5 to 45 ug/L for perchlorate and below the detection limit for CTC. The combined plant influent concentrations when all four wells were in service and operating at their full capacities were 30 ug/L for perchlorate and non-detect for CTC. These current perchlorate and CTC levels were lower compared to the levels detected a decade ago prior to the shutdown of the wells. Furthermore, these levels are within the design parameters for the MHTS and as expected, the start-up monitoring results show that the MHTS is capable of reliably and effectively removing perchlorate and VOCs to below the detection limits.

In addition, NASA has been working to remove perchlorate and VOC contamination from areas on the JPL property that have had the highest concentrations (referred to as OU1). NASA has completed a soil vapor extraction program which has removed VOC vapors from the unsaturated zone around the center of the JPL property (OU-2). Since 2005, NASA has successfully operated a LGAC unit and a fluidized bed biological reactor to remove VOCs and perchlorate from shallow groundwater beneath an area near the north-central part of the property (OU-1). These remediation activities are expected to accelerate the overall cleanup and to lower the potential for high

levels of VOCs and perchlorate to reach the Monk Hill wells and other wells in the basin.

2.4 Source Protection

This section requires a program to control the level of contamination, both from any known existing sources and from any potential new contamination sources.

Battelle's report provides:

- A discussion of JPL's compliance with stringent waste disposal regulations, and steps to recycle and reduce waste.
- Actions taken to remove perchlorate and VOCs from groundwater beneath the JPL site (OU-1), and a soil vapor extraction system for removal of VOCs in the soil at JPL (OU-2).
- Actions by the City of La Cañada-Flintridge and by Metropolitan Water District (MWD) of Southern California
- Discussions of the Community Involvement Plan and the Federal Facilities Agreement.

The 97-005 Technical Report enumerates the various regulatory programs for the identification and remediation of groundwater contamination areas, management of hazardous wastes, storage tanks (both underground and aboveground), chemical spill prevention and response, storm water discharges, landfill and water and wastewater programs. PWP also participates in local water associations' activities and reviews city councils and the Los Angeles Regional Water Quality Control Board's (LARWQCB) agendas to keep informed on activities that could impact water quality in the Basin.

Evaluation of Source Protection

The most serious threat to the Monk Hill wells is the perchlorate and VOC plumes migrating from the JPL property. The remediation measures taken for OU1 and OU2 described in the report appear to be appropriate and adequate mitigation measures.

When establishing a new commercial or industrial water connection, PWP should also review such facilities for risks to the City's groundwater resources.

2.5 Effective Monitoring and Treatment

This part of the policy guidance requires that treatment processes are commensurate with the degree of risk associated with the contaminants and that the treatment must be reliable and optimized. Best available treatment technology (BAT) for the contaminant(s) must also be utilized. Other required elements are:

- No bypassing of the treatment process
- The use of multi-barrier treatment processes when appropriate
- Process optimization to produce water with the lowest concentration of contaminants feasible
- Appropriate performance, process monitoring, operations and reporting
- Surveillance monitoring between the contamination source areas and the extraction wells
- Blending of the treated water with other water sources prior to entry into the distribution system as an additional safety factor is recommended.

The 97-005 Technical Report includes:

- A description of the proposed treatment process for PWP's Monk Hill Wells
- A discussion of the performance standards which the plant will achieve
- A discussion of the operations and reliability features
- Process monitoring covering influent and effluent of the LGAC and IX
- Failure responses and shut down triggers
- A monitoring program covering the upgradient surveillance monitoring wells, the production wells, and the treatment plant as well as the finished water

The report also describes similar features at the Lincoln Avenue Water Company, and the LGAC treatment and blending for Los Flores Well 2. Treatment of Rubio Canyon wells is not currently necessary, but the wells are monitored closely and a contingency plan has been prepared.

Evaluation of Monitoring and Treatment Proposal

The MHTS was designed for the removal of perchlorate and VOCs (primarily CTC) using ion exchange and liquid phase granular activated carbon adsorption respectively, both of which are considered Best Available Technologies. Both ion exchange and carbon adsorption processes are proven effective treatment technologies with a long history of use within the water industry. Ion exchange for perchlorate removal has been reliably and successfully used in Southern California at least since 2002, and several perchlorate treatment plants have come online since then.

Start-up performance testing conducted from December 2010 to February 2011 successfully demonstrated that the MHTS is capable of reliably treating the water down to non-detectable levels for perchlorate and VOCs. PWP has provided the MHTS start-up performance test report which summarizes the start-up monitoring.

There are no major moving parts within the MHTS; booster pumps at the Ventura Booster Facility and the Windsor Well will provide enough pressure for the water to flow through the filters and treatment vessels to the Windsor Reservoir. Flow and pressures through the plant will be controlled by simple manual valves. The MHTS is equipped with numerous flow and pressure sensors and transmitters to local and remote alarms and any unusual signal would trigger investigation and shut down of the plant. Samples can be easily obtained during each step of the treatment process, so removal efficiency can be easily monitored.

Following removal of perchlorate and VOCs, gaseous chlorine and a liquid ammonia solution will be metered into the water to produce a chloramine disinfectant which is compatible with the chloramine concentrations used in the rest of PWP's water system. This treated water with a disinfectant residual will flow into the Windsor Reservoir prior to its distribution to PWP's customers. During times when the plant will be operating in a testing or maintenance mode, or if the water is not needed, PWP has the capability to send the treated water, without disinfectant, back to the Arroyo spreading basins for infiltration into the groundwater basin.

Both the ion exchange process for the removal of perchlorate and the granular activated carbon process for the removal of organic contaminants will use vessels in the "lead-lag" arrangement. For the ion exchange process, the total flow will be divided into 4 pairs of ion exchange vessels. Each pair of vessels will receive 25% of the total flow and water will first flow through the lead bed (1st bed) and then through the lag bed (2nd bed). This increases the reliability since the bulk of the contaminant would be removed in the lead bed, and the lag bed is to provide redundancy in case the lead bed does not function properly. When the first bed is exhausted, it is replaced with fresh resin, and the valves are adjusted so that the former lag bed now serves in the lead position, and the fresh bed serves in the lag position.

In addition, since only 25% of the water flows through any one pair of ion exchange vessels, in the unlikely event that there is a problem with one pair of vessels, it would only impact 25% of the flow, the remaining 75% would be treated normally. The LGAC would work similarly, but with 5 pairs of vessels, each pair treating 20% of the total flow.

Due to historical high naturally occurring nitrate levels in the Windsor and Ventura Wells, nitrate blending of the four Monk Hill production wells will be implemented in the Windsor Reservoir following the ion exchange and LGAC treatment processes at the MHTS. This blending treatment will reduce the nitrate level to below 36 mg/L (80% of nitrate MCL of 45 mg/L) in the Windsor Reservoir prior to distribution to the customers. This will be accomplished by blending lower nitrate level water sources (Arroyo Well and Well 52) with the higher nitrate level water sources (Windsor and Ventura Wells).

As mentioned above, several drinking water treatment plants are using ion exchange for perchlorate removal and activated carbon for organics removal. Specifically the Lincoln Avenue Water Company has been successfully using lead-lag ion exchange for perchlorate removal for about 5 years and parallel flow carbon absorption for organics removal for many more years. Although PWP's wells, especially the Arroyo Well, may have higher concentrations of perchlorate, the water characteristics of Lincoln Avenue's wells should be very similar to that of PWP's Monk Hill wells since both extract water from the same groundwater sub-basin, and are located only a short distance apart. Lincoln Avenue's successful experience with these treatment technologies gives further confidence that the MHTS will also be reliable and effective in producing safe drinking water for PWP's customers.

2.6 Human Health Risk Associated With Failure of the Proposed Treatment

The policy guidance calls for an evaluation of the risks of failure of the proposed treatment system and an assessment of potential health risks associated with such failure.

In the 97-005 Technical Report, Battelle has discussed potential failure scenarios and made assumptions about the frequency of occurrence. Health risk calculations were made for PWP, Lincoln Avenue, Las Flores, and Rubio Cañon systems.

For the health risk calculations, Battelle assumed a worst case scenario whereby only the Arroyo Well and Well 52 are supplying water to the MHTS with a combined perchlorate concentration of 62 µg/L and CTC and chloroform concentrations of 2.9 µg/L and 2.8 µg/L, respectively, and a total system failure occurs once every five years over a 20-year period. Battelle also used EPA's Regional Screening Levels (RSLs) for cancer and non-cancer endpoints, and assumed weekly sampling of plant effluent and a 7-day laboratory turn-around time, resulting in a 14-day maximum time span between failure and detection.

Battelle also explains why the estimations of exposure via drinking water to constituents of concern are conservative to be health protective:

- Influent concentrations will very likely decrease over the years of system operation.
- The calculation does not factor in any mixing of MHTS water with other water in the distribution system prior to reaching any customer.
- The likelihood of a complete system failure is extremely low given the redundancy in treatment plant design and the automation (alarms) and programming capabilities used in the design.

Evaluation of Human Health Risk Assessment

Battelle also incorporated US EPA's Regional Screening Levels (RSLs) in the calculations yielding an estimated cancer risk of 2×10^{-7} (2 additional cancer cases in 10 million individuals, assuming 70 years exposure) under the assumptions. Cancer risks less than 1.0×10^{-6} are considered the *de minimis* cancer risk by the EPA and mean that the excess risk posed by the contaminant is one in a million over an individual's lifetime risk of developing cancer. The non-cancer risk is estimated by the Hazard Quotient (HQ). The HQ for the MHTS is 4, which indicates a potential for non-cancer adverse risk. All individual HQs are less than 1, except for perchlorate which was 2.38.

A re-calculation using California Public Health Goals (PHGs) with the same operational assumptions resulted in an estimated cancer risk of 1.3×10^{-6} which is also considered *de minimis*, and an HQ of 11.9. The majority of the HQ in excess of 1 is due to perchlorate (HQ = 10.3).

The Department agrees that the exposure estimates are overly conservative and conclude that the overall health risks associated with the MHTS are minimized. In addition, actual influent concentrations are likely to be lower and potential exposure periods are likely to be shorter than those assumed because:

- PWP will not normally only use the Arroyo Well and Well 52.
- Remediation activities discussed under Source Protection have removed significant quantities of perchlorate and VOCs from soil and groundwater beneath the JPL property, which prevents these chemicals from reaching the production wells to the east. Contaminant concentrations will likely continue to trend lower.
- Battelle's assumption of a complete plant failure or bypass once every 5 years is extremely conservative. Other plants have operated for many years and never experienced such a failure. As discussed above, even if one pair of ion exchange vessels failed in lead-lag mode, the other 75% of the plant flow would be treated in the other pairs.
- Battelle also assumed 14 days of exposure between sampling and reporting of results. Since PWP operates its own certified laboratory, it will normally have only a 48 hour turnaround time. The permit amendment will require twice weekly perchlorate sampling of the plant effluent to minimize any chance of exposure. PWP has also indicated that preliminary results of rush samples can be obtained in 24 hours. In addition, PWP has established and will be required to maintain an arrangement with an outside laboratory as backup.
- The permit amendment will require that the MHTS is operated and daily inspected by experienced, knowledgeable certified water treatment operators in order to quickly detect any unusual flow or pressure readings that would indicate a severe problem. Flow rates,

pressures, and alarms are also transmitted by SCADA to a central monitoring station or operator on duty.

Normally, treatment plants are monitored weekly for the contaminants being removed. In this case, due to the potential for high perchlorate concentrations in the raw water, perchlorate should be monitored twice weekly, and the plant inspected daily. In the future, the Department could consider a reduction to weekly testing of perchlorate in the effluent, if influent levels are consistently and reliably below 18µg/L.

2.7 Identification of Alternatives to the Use of the Impaired Sources

The policy guidance calls for an identification of alternative sources of drinking water and a comparison of the potential health risks.

Evaluation of Alternatives to the Use of the Impaired Sources

Battelle's report discusses alternatives to the Monk Hill wells, evaluation of these sources in terms of water quality, assurance of supply, potential interruptions to service, and evaluation of alternate disposal of treated water, along with conclusions and recommendations.

The primary alternative to using groundwater extracted from production wells in the Raymond Basin, including water treated at the PWP, LAWC, Rubio Cañon Land and Water Association, and Las Flores Water Company, is the purchase and use of imported water from the MWD.

Battelle's report also discusses the policy of increasing the extraction of groundwater from new wells in the Raymond Basin, but many of the other existing wells in the basin already have detectable levels of contaminants and treatment is planned, so this is not a viable alternative resource to consider. Furthermore, the MHTS is necessary for containment of the contaminant plume originating from JPL and will prevent high concentrations of perchlorate and CTC from migrating to neighboring potable sources.

Battelle also compared water quality of other wells in the Raymond Basin, imported MWD water and the expected MHTS plant effluent, and concluded that the MHTS treated water will be better than or equal to the current tap water. The carbon treatment at the MHTS will remove precursors to disinfection byproducts and should result in lower concentrations of disinfection byproducts in the distribution system compared to MWD's filtered surface water.

In addition to allowing PWP to utilize its water rights in the Monk Hill sub-basin, the MHTS would provide a reliable source of water compared to MWD in case of major earthquake or of mandated cutbacks of MWD water.

2.8 Public Comment Period and Public Hearing

As part of the permitting process for extremely impaired sources, PWP is informing its customers about the proposed operation of the MHTS, the public comment period, and the repository locations of the project documents. This Project Evaluation Summary constitutes one of those documents. A public notice has solicited comments and instructed interested parties to submit written comments to the Department's Glendale office via either US mail or e-mail. The 30-day public comment period begins on February 11, 2011 and will end on March 13, 2011 at 5:00 p.m. Project documents, including the Department's Project Evaluation Summary, the 97-005 Technical Report, and the MHTS Start-Up Report, are available for review at the Pasadena Central Library, Altadena Main Library, as well as online at PWP's website. A public hearing will be held on February 24, 2011 from 7 to 9pm at the Altadena Community Center. CDPH will consider all public comments before deciding whether to issue or deny a permit amendment for the MTHS.

2.9 Overall Evaluation

The MHTS utilizes Best Available Technologies (BATs) for removal of VOCs and perchlorate. LGAC is considered a BAT for VOC removal. As designed and constructed, the LGAC vessels are capable of reliably removing VOCs to below the detection limits. The ion exchange process is a BAT for perchlorate removal. A similar system was constructed at the Lincoln Avenue's Wells 3 and 5 and several other sites within California. As designed and constructed, the IX system is capable of removing perchlorate to below the detection limit.

Start-up testing conducted from December 2010 to February 2011 has confirmed that the MHTS can treat all contaminants of concern to below the regulatory reporting levels. Data collected during the start-up testing demonstrate the facility could easily meet the nitrate blending goal. The long-term reliability and effectiveness of this treatment system should be confirmed over time through the monitoring program as also demonstrated at similar treatment systems elsewhere.

The MHTS is equipped with various instrumentation and alarm features to notify system operators of any failure that may occur in the treatment process. The treatment efficiency of each unit process can be easily monitored by sampling and analysis. The operational status of each unit process can be monitored on site or remotely. PWP has developed a comprehensive OMMP, including daily inspections, that outlines all operational requirements, maintenance procedures and monitoring requirements to ensure proper operations of all processes. Water quality monitoring requirements are outlined to ensure that treatment goals are met and that treated water meets all MCLs and NLs.

PWP has experienced and knowledgeable certified water treatment operators to oversee operations and maintenance of the MHTS. With all the reliability features, operations, monitoring and maintenance programs, and an extensive water quality monitoring program in place, the chances of a failure at the MHTS have been minimized. The MHTS should be able to reliably produce water that has no detectable perchlorate and VOCs and meets all other MCLs and NLs.

3. CONCLUSIONS AND RECOMMENDATIONS

The Department of Public Health finds that the sources of supply, treatment works, and operation as described in this report are capable of reliably producing a safe, wholesome and potable water supply. The quality of the water served and PWP's Monk Hill facilities and operations adequately meet State standards. Issuance of an amended domestic water supply permit to the Pasadena Department of Water and Power is recommended subject to the following conditions:

GENERAL

1. This document amends and adds to the domestic water supply permit issued to Pasadena Water and Power (PWP) for the City of Pasadena's public water system on November 9, 1999 by the Department, and the subsequent amendments on August 12, 2002, and January 15, 2003. If any condition of this amendment conflicts with the permit and its subsequent amendments, the conditions of this amendment shall be followed.
2. PWP shall comply with all the requirements set forth in the California Safe Drinking Water Act, California Health and Safety Code and any regulations, standards or orders adopted thereunder. All water supplied by PWP for domestic purposes shall meet all Maximum Contaminant Levels (MCLs) established by the State Department of Public Health.
3. If the water quality does not comply with the California Drinking Water Standards, treatment shall be provided to meet standards. The plans and specifications for the proposed treatment facilities shall be submitted to the Department for review and approval prior to construction.
4. The only sources approved for potable water supply are those listed in Tables 1 and 2.

Table 1. Groundwater Sources

Source	Primary Station Code	Status	Treatment
Arroyo	1910124-001	Active	Ion exchange for perchlorate removal and activated carbon adsorption for organics removal and chloramination at MHTS

Source	Primary Station Code	Status	Treatment
Bangham Well	1910124-028	Active	Blending Volatile Organic Chemicals (VOCs), perchlorate, and nitrate at Sunset Reservoir
Chapman Well	1910124-005	Active	Chlorination
Copelin Well	1910124-006	Active	Blending VOCs, perchlorate, and nitrate at Sunset Reservoir
Craig Well	1910124-007	Active	Chlorination
Eaton Canyon Well	1910124-009	Other	Pending return to Standby Status. See Provision No. 7 of 1999 permit.
Garfield Well	1910124-010	Active	Blending VOCs, perchlorate, and nitrate at Sunset Reservoir
Monte Vista Well	1910124-014	Active	Chlorination
Sunset Well	1910124-018	Active	Blending VOCs, perchlorate, and nitrate at Sunset Reservoir
Ventura Well	1910124-019	Active	Ion exchange for perchlorate removal and activated carbon adsorption for organics removal and chloramination at MHTS
Villa Well	1910124-020	Active	Blending VOCs, perchlorate, and nitrate at Sunset Reservoir
Well No. 52	1910124-021	Active	Ion exchange for perchlorate removal and activated carbon adsorption for organics removal and chloramination at MHTS
Windsor Well	1910124-022	Active	Ion exchange for perchlorate removal and activated carbon adsorption for organics removal and chloramination at MHTS
Woodbury Well	1910124-023	Active	Chlorination
Well 58	1910124-045	Active	Chlorination
Well 59	1910124-047	Active	Chlorination
Metropolitan Water District (MWD)-P1 Connection	1910124-033	Active	N/A
MWD-P2 Connection	1910124-034	Active	N/A
MWD-P3 Connection	1910124-035	Active	N/A
MWD-P4 Connection	1910124-036	Active	N/A
MWD-P5 Connection	1910124-037	Active	N/A

The following are the only approved interconnections for receiving water from other water systems:

Table 2. Interconnections with Other Systems

Water System	Location	Nominal Capacity (gpm)
Lincoln Avenue Water Company	Canyon Crest Road	500
Kinneloa Irrigation District	Kinneloa Canyon Road	1200
California American Water Company	Lamanda Park Reservoir	2500
Valley Water Company	St. Katherine Place	1500
Valley Water Company	Normandy Drive	1200
Foothill Municipal Water District	CalTrans Yard	4000

5. The only approved treatment facilities are those listed in Table 3. The treatment facility and distribution system shall be operated by personnel who have been certified in accordance with Chapter 13, Title 22, California Code of Regulations (CCR) - Operator Certification. The minimum certification requirements for the chief and shift operator(s) for each PWP treatment facility are listed in Table 3. For MHTS, PWP will meet T4 chief operator certification requirement within two years of receiving this permit amendment.

Table 3. Approved Treatment Facilities and Minimum Operator Certification Requirements

Treatment Facility	PS Code	Treatment Facility Classification	Min. Treatment Grade Required	
			Chief Operator	Shift Operator
Sunset Reservoir - Nitrate, perchlorate and VOCs blending for Bangham, Copelin, Garfield, Sunset, and Villa Wells	1910124-030 (Sunset Reservoir 1 effluent) 1910124-031 (Sunset Reservoir 2 effluent)	T3	T3	T2
Chapman Well – Chlorination	1910124-038	T1	T1	T1
Craig Well - Chlorination	1910124-039	T1	T1	T1
Monte Vista Well - Chlorination	1910124-042	T1	T1	T1
Woodbury Well - Chlorination	1910124-044	T1	T1	T1
Well 58 - Chlorination	1910124-046	T1	T1	T1
Well 59 - Chlorination	1910124-048	T1	T1	T1

Treatment Facility	PS Code	Treatment Facility Classification	Min. Treatment Grade Required	
			Chief Operator	Shift Operator
Monk Hill Treatment Facility (MHTS) – Arroyo, Ventura, Windsor Wells and Well 52 • Ion exchange (IX) for perchlorate removal • Liquid phase granular activated carbon adsorption (LGAC) for organics removal • Chloramination • Nitrate blending at Windsor Reservoir	1910124-051 (IX combined effluent) 1910124-050 (LGAC combined effluent) 1910124-025 (Windsor Reservoir Compliance Point for nitrate, perchlorate and VOCs)	T4	T4	T3

6. No changes, additions, or modifications shall be made to the sources or treatment mentioned in Conditions 4 and 5 unless an amended water supply permit has first been obtained from the Department.
7. PWP shall comply with Title 17, CCR, to prevent the water system and treatment facilities from being contaminated by possible cross-connections. PWP shall maintain a program for the protection of the domestic water system against backflow from premises having dual or unsafe water systems in accordance with Title 17. All backflow prevention devices shall be tested annually.
8. PWP shall monitor all active groundwater sources in accordance with the Vulnerability Assessment and Monitoring Guidelines issued by the Department or as specified in this permit amendment.
9. Pursuant to Sections 64590 and 64591, Title 22 of the California Code of Regulations, no chemical or product shall be added to drinking water as a part of the treatment process unless it has been certified as meeting the specifications of American National Standard Institute/National Sanitation Foundation (ANSI/NSF) Standard 60, and no indirect additive shall be used unless it has been certified as meeting the specifications of ANSI/NSF Standard 61. PWP may use an uncertified chemical, material, or product if the requirements specified in Section 64593 are met.

MONK HILL TREATMENT SYSTEM (MHTS)

10. Water leaving the MHTS shall not exceed any MCLs or Notification Levels (NLs) established by the Department. In addition, the MHTS should be operated to achieve a treatment goal of non-detect for perchlorate and VOCs.

11. The Arroyo Well, Well 52, the Ventura Well and the Windsor Well shall be the only sources for the MHTS. The entire flow from the wells shall be treated by all unit processes (ion exchange and granular activated carbon adsorption) of the MHTS prior to distribution as a domestic water supply. No treatment process shall be bypassed at any time.
12. The overall plant flow rate shall not exceed 7,000 gpm without written permission from the Department.
13. Except as specified in this permit amendment, the MHTS shall be operated in accordance with an Operations, Monitoring, and Maintenance Plan (OMMP) approved by this Department. All additions, deletions, or amendments to the OMMP shall be approved by the Department prior to implementation. PWP is responsible for ensuring that the OMMP is, at all times, representative of the operations, maintenance, and monitoring of the facility and appropriate changes to the OMMP are submitted to the Department for approval in a timely manner.
14. The MHTS shall be removed from service if concentrations of chemicals of concern in the plant influent significantly exceed the design concentration. PWP shall conduct an evaluation and make necessary operational adjustment, and/or plant modification, and obtain an approval from the Department before placing the treatment facility back into service. Permit amendment might be required depending on the extent of the required modification.

ION EXCHANGE SYSTEM

15. PWP shall operate and maintain the inlet filters of the ion exchange system in a manner to minimize the build-up of solids within the media beds.
16. Each pair of ion exchange vessels shall be operated at not less than 350 gpm (1 gpm/ft^3 of media) and not more than 2,000 gpm, with a planned design capacity of 1,750 gpm when the plant is operating at 7,000 gpm. The vessels shall be operated in a down-flow mode, with two vessels operated in series (lead-lag).
17. At least 353 ft^3 of virgin CalRes 2109 resin that meets the specifications identified in the approved OMMP shall be used in each ion exchange vessel. Any change in resin employed shall be approved in writing by the Department. Only resin certified as meeting NSF Standard 61 may be used.
18. After virgin resin is installed, PWP shall flush the resin and conduct nitrosamine monitoring, using EPA method 521, to characterize the duration and extent of nitrosamine formation. Based on the monitoring results, PWP may modify the resin installation and flushing procedures to minimize the risk of producing water with nitrosamines and revise the OMMP accordingly.

19. Compliance with the perchlorate MCL shall be based on the results of the samples collected at Windsor Reservoir (PS code: 1910124-025). PWP shall be deemed in violation of the perchlorate MCL if a sample, consisting of one result or the average of an initial result and a confirmation result, exceeds 6 µg/L. Department notification and Tier 1 public notification are required within 24 hours of a confirmed perchlorate MCL exceedence.
20. PWP shall ensure that the laboratory notifies PWP operators and management within 48 hours whenever the level of perchlorate in a single sample exceeds the MCL, and shall ensure that a contact person is available to receive such analytical results 24-hours a day. PWP shall also require the laboratory to immediately notify the Department of any perchlorate MCL exceedence if the laboratory cannot make direct contact with the designated contact person within 48 hours.

LIQUID-PHASE GRANULAR ACTIVATED CARBON (LPGAC) TREATMENT

21. When delivering treated water to the Windsor Reservoir and the distribution system, each train of LGAC vessels shall not be operated above its maximum design capacity of 1,400 gpm. In addition, they shall not be operated below 200 gpm. The empty bed contact time for each LGAC vessel shall be at least 7.1 minutes at all times. The vessels should be operated in a down-flow mode, with two vessels operated in series in each train.
22. The granular activated carbon utilized in the LGAC vessels shall be 40,000 pounds of virgin Filtrasorb 300 per vessel. Both the initial and replacement carbons shall meet the manufacturer's specifications. Any change of carbon specifications shall be approved in writing by the Department.
23. The replacement carbon shall be virgin or reactivated carbon that is NSF Standard 61 certified for use as drinking water system component.
24. PWP shall minimize system downtime by scheduling carbon changeouts in a timely manner. After changeout, PWP shall monitor for total coliform and HPCs.
25. The LGAC adsorption systems shall be maintained according to the manufacturer's recommendations.

NITRATE BLENDING

26. If any of the Monk Hill Wells exceeds 40 mg/L nitrate, PWP shall implement nitrate blending treatment in accordance with the approved OMMP.

27. PWP's blending plan shall include performing a daily blending projection, using the most recent wellhead water quality analysis results to determine the proper flowrate that shall be produced from each well, then control the pumping from each well so that the blended effluent is reliably below 80% of the nitrate MCL.

MONITORING

General

28. All water samples for compliance purposes shall be analyzed by a laboratory certified by the Department's Environmental Laboratory Accreditation Program (ELAP) for each analytical technique. If no certification is available for a particular compound, the method and detection limit shall be submitted for approval by the Department on a case-by-case basis.

29. Except for bacteriological analyses and constituents without chemical storet numbers, all water quality monitoring results obtained from a certified laboratory shall be submitted to the Department by Electronic Data Transfer (EDT) using the PS Codes listed in Table 4.

Table 4. MHTS Sampling Points

Location	Description	PS Code
Arroyo Well	Arroyo Well Discharge	1910124-001
Well 52	Well 52 Discharge	1910124-021
Ventura Well	Ventura Well Discharge	1910124-019
Windsor Well	Windsor Well Discharge	1910124-022
Combined IX Treated Effluent	Combined Ion Exchange Plant Effluent	1910124-051
MHTS Combined Plant Effluent	Combined Plant Effluent after LGAC and before Disinfection	1910124-050
Windsor Reservoir	Compliance Point for Nitrate, Perchlorate, and VOCs	1910124-025

30. The laboratory performing the analyses shall be instructed to report all calibrated peaks on gas chromatographic/mass spectroscopic (GC/MS) analyses. Uncalibrated peaks on chromatographic analyses shall be reported according to CDPH guidance documents Analysis and Reporting of Volatile Non-Target Organic Compounds in Extremely Impaired Water Sources and Recycled Water by Methods 524.2, and Analysis and Reporting of Non-Target Semi-Volatile Organic Compounds in Extremely Impaired Water Sources and Recycled Water Using Methods 3510C/8270 C.

    http://www.cdph.ca.gov/certlic/drinkingwater/Documents/Drinkingwaterlabs/nt-vocs.pdf and

http://www.cdph.ca.gov/certlic/drinkingwater/Documents/Drinkingwaterlabs/nt-svocs.pdf

If the TIC or unknown compound is repeatedly detected and not a one-time event, the Department may require and allow time for additional work to positively identify the compound(s) and/or additional testing of the MHTS plant effluent to verify removal of the compound(s).

Records of the mass spectra, sample date and sample location for all TICs and unknown chemical species described above shall be maintained by PWP.

31. PWP shall comply with any additional monitoring and treatment requirements the Department deems necessary based on any newly identified constituents. If necessary, the Department may modify the monitoring provisions specified herein based on additional information. PWP may request a modification of any monitoring provision based upon substantiating data at any time.

32. Where specified, low level analysis for 1,2,3-trichloropropane (1,2,3-TCP) shall be performed by an ELAP certified laboratory with the lowest achievable reporting limit.

33. When analysis for metals is required, PWP shall follow The Protocol for Characterizing Severely Impaired Water Sources Through Elemental Analysis located on the Department's website:

    http://www.cdph.ca.gov/certlic/drinkingwater/Documents/Drinkingwaterlabs/ProceduresforElementalAnalysis.pdf

    All detected metals shall be reported.

34. Prior to proceeding with the requirements for further monitoring following a detection of a chemical, PWP may first confirm the analytical result, as follows: Within seven (7) days (24 hours for LGAC ports, LGAC effluent and MHTS effluent) from the notification of an initial detection from a laboratory reporting the presence of one or more chemicals in a water sample, PWP may collect and analyze one or two additional samples to confirm the initial finding. Confirmation of the initial finding shall be shown by the presence of the chemical in either the first or second additional sample, and the detected level of the contaminant for compliance purposes, if applicable, shall be the average of the initial and the confirmation sample(s). The initial finding shall be disregarded if two additional samples do not show the presence of the chemical.

35. PWP shall be responsible for, and require, the timely notification from the laboratory by telephone or fax of analytical results, particularly those which trigger additional sampling within time limits.

Upgradient Surveillance Wells Monitoring

36. Monitoring wells MW-5, MW-10, MW-3 (screen 2), MW-4 (screen 2), MW-17 (screen 3), MW-18 (screen 4), and MW-19 (screen 2), shall be monitored annually for explosives, nitrosamines, fluoride, 1,4-dioxane, MTBE and related oxygenates, 1,2,3-TCP, total and hexavalent chromium, and triennially for semi-volatile organics (including PAHs, phthalates, PCBs, and phenol), total petroleum hydrocarbons, and 2,3,7,8-TCDD.

    Sampling should be coordinated with the long-term quarterly groundwater monitoring program implemented by NASA. Initial sampling shall be done within 120 days of issuance of this permit amendment.

Production Well Monitoring

37. Each of the four Monk Hill Wells shall be sampled in accordance with the most recent Vulnerability Assessment table issued to PWP by the Department.

38. Each of the four Monk Hill Wells shall also be sampled in accordance with the raw water monitoring scheduled outlined in the approved OMMP, which includes monthly monitoring of VOCs, nitrate, perchlorate, coliform bacteria and heterotrophic plate count (HPC).

    In addition, PWP shall test the production wells at least quarterly for chlorate and 1,4-dioxane.

    The four Monk Hill Wells shall also be tested for atrazine and simazine within 120 days of activation of the wells and every three years thereafter.

39. PWP shall begin initial radionuclide monitoring at each of the Monk Hill Wells within one quarter of initiating water service from the MHTS to the public.

40. PWP shall revise its raw water monitoring plan 1) if additional chemicals are detected in any upgradient surveillance well which might threaten the quality of the water produced by the Monk Hill Wells, 2) if new chemicals are detected in the production wells, or 3) if the monitoring data indicates a rapid change in a contaminant's concentration which warrants more frequent monitoring.

41. If any additional contaminant is consistently found in one or more of the surveillance wells, it should be tested for in the closest production wells. If the additional contaminant is detected in any of the production wells, it should be verified by sampling that it is removed by the treatment equipment.

Ion Exchange Treatment Monitoring

42. The perchlorate concentration of the plant effluent shall be below California's Detection Limit for Reporting (DLR).

43. In order to verify the removal efficiency of the IX System, weekly perchlorate samples must be collected at the combined influent to the IX vessels (the plant influent after the influent cartridge filters) and twice per week at the plant effluent (PS code: 1910124-051). If the influent concentration is reliably and consistently below 18µg/L, the combined effluent may be tested weekly.

44. If the influent concentration is reliably and consistently above 18µg/L, test each lead vessel's effluent (the cross-over point between the lead and lag vessels) weekly.

    In order to maintain the lag resin bed as a secondary protective barrier, change the resin in the lead vessel when the lead vessel effluent reaches the perchlorate MCL of 6 µg/L.

45. In order to reliably maintain less than 4µg/L at the MHTS plant effluent, the presence of perchlorate above 2µg/L at the plant effluent will warrant operational sampling from the effluent of each individual IX lag vessel, to identify any lag vessels that are discharging more than 2µg/L. Alternatively, PWP may test the lag effluent of each vessel pair weekly.

46. Any vessel pair found to be discharging more than 4µg/L from the lag vessel shall be taken out of service and the lag vessel switched to the lead position, and fresh resin placed in the former lead vessel.

47. HPC and coliform samples shall be collected monthly and following any changeout or prolonged shutdown at the combined IX plant effluent to ensure no bacteriological contamination is occurring in the IX process. The combined IX plant effluent shall be free of total coliforms. If coliforms are detected or HPC is greater than 500 cfu/mL, PWP shall inform the Department within 24 hours and begin weekly total coliform and HPC monitoring at the IX effluent. The Department may require additional investigation. PWP shall continue weekly bacteriological monitoring until otherwise instructed by the Department. If monitoring results indicate a sudden or significant increase in coliform bacteria or HPC, the Department may require PWP to shut down the treatment facility and disinfect the resin and vessel.

LGAC Treatment Monitoring

48. In order to verify the VOC removal efficiency of the LGAC System, weekly water samples for VOC by GC/MS analysis must be collected at the combined influent to the LGAC vessels and the plant effluent prior to chloramination (PS code: 1910124-050).

49. Concentrations of all VOCs in the MHTS combined effluent (PS Code: 1910124-050) shall be operated to achieve a treatment goal of below their respective Detection Limit for Reporting (DLR).

50. If any VOCs are detected in the MHTS combined effluent above their respective DLR, individual lag vessel effluents must be tested and if breakthrough in one or more of the lag vessels has occurred, the LGAC in the associated lead vessel shall be replaced and that vessel then placed in the lag position.

51. For operational control to ensure that VOCs are not detected in the plant effluent, monthly samples should be collected at the 25 percent bed depth port of each lead vessel. Once any VOC is detected at a 25 percent port, the 50 percent sampling port should be immediately sampled and analyzed and sampling of the 50 percent port should continue weekly until any VOC is detected. Upon detection at the 50 percent port, the 75 percent port and lead vessel effluent should immediately be tested. Upon VOC detection at the 75 percent port, LGAC vessel effluent must be sampled for VOCs weekly. Detection of any VOC at the 75 percent sampling point shall trigger PWP to arrange for the replacement of the lead LGAC bed, which will then become the lag bed.

    As PWP gains experience with the LGAC behavior and the actual levels of VOC, PWP may request a modification of the frequency of operational testing.

52. HPC and coliform samples shall be collected monthly and following any changeout or prolonged shutdown at the combined LGAC plant effluent (before disinfection) to ensure no bacteriological contamination is occurring in the LGAC process. The combined LGAC plant effluent shall be free of total coliforms. If coliforms are detected or HPC is greater than 500 cfu/mL, PWP shall inform the Department within 24 hours and begin weekly total coliform and HPC monitoring at the LGAC effluent. The Department may require additional investigation. PWP shall continue weekly bacteriological monitoring until otherwise instructed by the Department. If monitoring results indicate a sudden or significant increase in coliform bacteria or HPC, the Department may require PWP to shut down the treatment facility and disinfect the media and vessel.

Nitrate Blending Monitoring

53. Nitrate blend shall be operated to achieve a treatment goal of 36 mg/L and less than the nitrate MCL of 45 mg/L at the Windsor Reservoir effluent at all times. Nitrate blending monitoring shall be implemented in accordance with the approved OMMP.

MHTS Effluent Monitoring

54. In addition to the weekly testing of the MHTS effluent for nitrate, VOCs, and bacteria, and twice weekly testing for perchlorate, PWP shall sample and analyze the effluent for chlorate on a monthly basis.

OPERATION AND MAINTENANCE

55. The status of the production wells shall be recorded daily, and the treatment facilities shall be inspected daily, when in use, for any abnormal occurrences including, but not limited to, leaks, unusual noises, vibrations, pressure and flow readings. A checklist of items to be examined shall be filled out daily and maintained for a minimum of five years.

56. All instruments, including but not limited to chemical analyzers and flow meters, shall be calibrated at the frequencies and by the methods recommended by their respective manufacturers. Records for all instrument calibrations shall be maintained by PWP for at least five years and made available to the Department when requested.

57. Sampling ports for the wells, the LGAC vessels, the ion exchange vessels, and the reservoirs' inlets/outlets shall be maintained in good operating condition.

58. PWP shall update the OMMP to reflect the monitoring parameters, frequencies, and compliance locations as specified in this permit.

59. At the conclusion of the first year of operation, PWP shall prepare and submit to the Department an evaluation of the performance of the MHTS and any proposed revisions to the OMMP for review.

RECORDS AND REPORTING

60. A monthly report of the MHTS shall be submitted to the Department by the 20th day of the following month. As a minimum, the report shall include:

    a. A summary of analytical results received by PWP in the reporting calendar month, including any results from the upgradient monitoring wells enumerated in this permit amendment.

    b. A summary of the bacteriological quality of water leaving the Monk Hill Wells, ion exchange combined effluent, LGAC combined effluent, and the Windsor Reservoir.

61. PWP shall keep the following operational records for the MHTS:

    a) The daily operation, length of time in use, and production of the Monk Hill Wells;

    b) The range of flow processed by the LGAC and ion exchange vessels daily;

    c) Daily minimum and maximum disinfectant residual of the effluent leaving the Windsor reservoir;

62. The records shall also document any emergency and/or scheduled or unscheduled interruptions, including:
    a. Location of interruption,
    b. Cause of interruption,
    c. Date, approximate time, and duration of interruption,
    d. Precautions taken to minimize contamination of the supply and notification of the affected users, and
    e. Solution/resolution of the interruption and steps taken to prevent a reoccurrence.
63. Copies of reports, inspections and all records shall be kept for at least five years. Water quality records shall be kept for ten years.
64. Within 24 hours of receiving notification from the laboratory, PWP shall notify the Department of any exceedance of an MCL or NL in the finished water leaving the MHTS.
65. PWP shall prepare annual report to the Department, which shall include compliance with the permit provisions, the treatment plant's status, condition, and performance and any problems or difficulties and any proposed revisions to the OMMP for review. This report shall be due by March 30th of the following year.

    The annual report shall also provide an evaluation and technical review of the water quality data gathered from the upgradient surveillance monitoring wells listed in Condition 36, the Monk Hill production wells, the removal efficiency and reliability of the MHTS, and an evaluation of any changes in the characteristics of the contaminant concentrations and the possible impacts on the MHTS.