BEFORE THE STATE WATER RESOURCES CONTROL BOARD

In the Matter of the State Water Resources Control Board (State Water Board) Hearing to consider Monterey Peninsula Water Management District's (MPWMD) Petitions to Change Permits 7130B and 20808 (Applications 11674B and 27614)	Hearing Date: September 24, 2007 Carmel River in Monterey County

TESTIMONY OF JOSEPH W. OLIVER

SENIOR HYDROGEOLOGIST

MONTEREY PENINSULA WATER MANAGEMENT DISTRICT

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I, Joseph W. Oliver, provide the following prepared testimony under penalty of perjury, under the laws of the State of California, in relation to Petitions for Change to Permits 7130B and 20808 (Applications 11674B and 27614) of the Monterey Peninsula Water Management District (MPWMD or District) pertaining to the MPWMD Phase 1 Aquifer Storage and Recovery Project (ASR Project).

Q1. PLEASE STATE YOUR NAME AND PERSONAL QUALIFICATIONS

1. My name is Joseph W. Oliver. My education includes a bachelor's degree in geology, and master's degree in geology, specializing in hydrogeology, from Indiana University. I am a registered Professional Geologist (No. 4604) and Certified Hydrogeologist (No. 164) in California, and a Certified Professional Hydrogeologist (No. 964) with the American Institute of Hydrology. My professional membership includes the National Ground Water Association and the California Groundwater Association. I have 28 years of professional experience in the field of ground water hydrology, working for government agencies and private industry. I have been working at the Monterey Peninsula Water Management District (MPWMD) for the past 22 years, where I am presently employed as the Senior Hydrogeologist. My resume is provided as **<u>Exhibit JO-1</u>**.

2. During my tenure with the MPWMD, I have been involved in analysis and development of the ground-water resources within the District, with particular emphasis on the Monterey Peninsula Water Resources System (MPWRS). The MPWRS includes the Carmel River Alluvial Aquifer and the coastal portion of the Seaside Ground Water Basin. A map

depicting the MPWRS is included as **Exhibit JO-2**. I have authored or co-authored numerous technical documents related to the ground water resources of the District, and have served as project manager on all hydrogeologic investigations conducted for the District since 1985.

Q2. PLEASE PROVIDE AN OVERVIEW OF THE BACKGROUND LEADING TO DEVELOPMENT OF THE MPWMD PHASE 1 AQUIFER STORAGE AND RECOVERY PROJECT.

3. Over the past ten years, the MPWMD has been evaluating the feasibility of a ground-water injection and recovery project in the Seaside Basin. This project concept, also known as Aquifer Storage and Recovery (ASR), in the simplest terms, relies on diversion of seasonally excess winter flows from the Carmel River Basin to artificially recharge the Seaside Basin. The project concept promotes the conjunctive use of the area's water resources, and has the potential to significantly reduce impacts associated with low-flow season production from the California American Water (CAW) Carmel River Basin sources.

4. In 1996, the District Board of Directors adopted a Water Augmentation Plan that would rely on development of new water supplies that did not include a new mainstem dam on the Carmel River. This directly resulted from the District-wide ballot measure in November 1995, which did not authorize the District to move forward to secure funding for the New Los Padres Reservoir Project. Accordingly, it was decided that the District should begin exploring the ASR concept in the Seaside Basin in a stepwise fashion, to ensure the feasibility of the ASR technology in the local hydrogeologic setting. When the MPWMD Board directed that staff should focus on non-dam water supply alternatives, it also indicated that staff should take action, as needed, to preserve and protect the federal, state, and local permits that had been obtained for the New Los Padres Reservoir Project, including Permits 7130B and 20808.

5. In late 1996, the District initiated an ASR-testing program in the Seaside Basin, beginning with a demonstration test at an existing inactive CAW well in the coastal area of the basin. This testing was conducted at the CAW Playa #4 well, and consisted of a short-term injection test to better assess the hydraulic response to injection in this area of the basin. Based on the successful results from this demonstration test, the District next began searching for a location to conduct more rigorous injection testing in the shallower of the two principal aquifers in the basin, the Paso Robles Formation. If ASR was determined to be feasible using the Paso Robles Formation as the target aquifer for injection, then capital and operation costs of a full-scale project would theoretically be less than a similar project using the deeper of the two principal aquifers, the Santa Margarita Sandstone.

6. In 1997, the District secured approval to install a test well in an unused portion of the Mission Memorial Park cemetery in Seaside. This site was strategically suitable due to its location between two of CAW's two largest production wells in the basin, the Ord Grove #2 and Paralta wells, where over time a large ground-water trough had developed due to the concentrated pumping in this area of the basin. The Paso Robles Test Injection Well (PRTIW) was constructed in 1998, and rigorous injection testing was conducted at the well over the next two injection seasons. The PRTIW is 12 inches in diameter and 460 feet deep. As a result of this testing, it was determined that while ground-water injection into the Paso Robles aquifer was feasible in the basin, the limiting hydrogeologic characteristics of this aquifer were not favorable for full-scale ASR project development. This was primarily due to the inability "backflush" the well (i.e., pump in recovery mode) at the desired rates for efficient ASR operations. Backflushing of ASR wells is crucial to a successful program in order to prevent well and aquifer "clogging" due to build-up of fine particulate matter that can be swept into the well during injection. Under recommended ASR operations, wells should be backflushed at twice the rate of injection, to reduce the potential for loss of long-term well performance due to clogging. Based on the results of injection testing at the PRTIW, it was determined that the maximum capacity of

backflushing for Paso Robles aquifer wells in this area would likely not exceed 350 gallons per minute (GPM), thereby limiting injection rates at individual wells to approximately 175 GPM. A full-scale ASR project would, therefore, require a large number of Paso Robles aquifer ASR wells, in an area where potential new well locations are few and challenging to acquire.

7. As the next step, the District began negotiations to secure a site on former Fort Ord property to construct an ASR test well into the deeper Santa Margarita aquifer, which had not yet been explored for ASR testing. The Santa Margarita aquifer has more favorable hydrogeologic characteristics, but ASR wells would be more expensive to construct and operate than the Paso Robles aquifer wells. In 2000, the District secured approval for an available site within a former ammunition firing range that had been cleared of unexploded ordnance. This site was also strategically located within the area of the large ground-water trough near the two highest-pumping CAW production wells. The Santa Margarita Test Injection Well No. 1 (SMTIW No. 1) was constructed in 2001; it is 18 inches in diameter and 720 feet deep. Extensive injection testing was conducted at the well from 2002 to 2007. The locations of the SMTIW #1 and PRTIW wells are shown on the map in **Exhibit JO-3**. This testing demonstrated that injection and recovery rates of 1,000 GPM and 2,000 GPM, respectively, are attainable at this facility. During this period, a total of 1,279 acre-feet (AF) of treated water was diverted from the CAW's sources in Carmel Valley for injection at the SMTIW No. 1 well. The combined injection diversions for both the PRTIW and SMTIW No. 1 wells have totaled 1,875 AF to date (**Exhibit JO-4**). These diversions for injection testing were conducted under temporary permits issued by the State Water Resources Control Board (SWRCB) on an annual basis to support this important injection testing program in the basin. All of water that was injected into the Seaside Basin was treated water and was provided by CAW to MPWMD at no cost. A listing of the individual temporary permits is shown in **Exhibit JO-5**. A summary of expenditures by the District on the Seaside Basin ASR program through Fiscal Year 2006 is provided in **Exhibit JO-6**. Note that this total expenditure of $1.98 million is for costs

associated with the testing, engineering design, and construction of facilities, but does not include staff labor or permitting and environmental review costs.

8. In 2004, the District began the process of expanding the ASR testing program to include a second well at the Santa Margarita Test Well site. Necessary land acquisition and land use approvals were completed in 2005 and 2006, and the new ASR well, SMTIW No. 2, was constructed in early 2007. This new well is larger and deeper (i.e., 22 inches in diameter and 790 feet deep) than SMTIW No.1, and preliminary testing results indicate that injection and recovery capacity goals of 1,500 GPM and 3,000 GPM, respectively, will be attainable at this facility. Associated facilities for this new ASR well are currently being constructed by the District, and when complete will add an estimated $3.26 million to the cost of ASR program (**Exhibit JO-7**).

Q3. PLEASE PROVIDE A BRIEF DESCRIPTION OF THE PHASE 1 ASR PROJECT FACILITIES.

9. The Phase 1 ASR Project consists of two injection/recovery wells, SMTIW No. 1 and 2, and associated pipelines, electrical, backflushing and water treatment facilities. The proposed phase 1 ASR Project would be limited to a maximum annual diversion of 2,426 AF, and a maximum instantaneous diversion limit of 3,000 GPM (6.7 cfs). Based on the proposed operations plan, the maximum annual recovery would be limited to 1,500 AF. The Phase 1 ASR Project is geared toward near-term environmental protection and more efficient operations using existing resources. There is no water supply increment identified for new construction or intensified water use. At this time, the SMTIW No. 1 well is fully-equipped and ready for project operation; at the new SMTIW No. 2 well, installation of the permanent pump, motor and ASR downhole "flow control valve" is planned for this year, as well as construction of underground pipelines to enable injection at this facility during the upcoming Water Year 2008 season.

Q4. PLEASE PROVIDE AN OVERVIEW OF THE SEASIDE GROUNDWATER BASIN.

10. The Seaside Groundwater Basin underlies an approximately 19-square mile area at the northwest corner of the Salinas Valley, adjacent to Monterey Bay. The general location of the Seaside Basin and its four subareas are shown in **Exhibit JO-8**. The Seaside Basin underlies a hilly coastal plain that slopes northward toward the Salinas Valley and westward toward Monterey Bay. The physiography is characterized by young active dunes near the coast and more mature dunes to the east of Seaside on former Fort Ord. Land surface elevations range from sea level at the beach to approximately 900 feet near the eastern boundary of the basin.

11. **Geology:** The geologic structure of the Seaside Basin is characterized by structural deformation that has resulted in varying thickness and depths of the various stratigraphic units across the basin. Basin structure is relatively well understood in the Laguna Seca and Coastal Subareas, where wells are numerous. Subsurface information in those areas reveals a complex arrangement of faults, anticlines, and synclines. Basin structure is poorly understood in the northern and interior parts of the basin occupied by the former Fort Ord military reservation. The southern boundary of the Seaside Basin is the trace of the Chupines Fault, where non-water bearing Monterey Shale is uplifted to near or above sea level. The western boundary of the basin has typically been designated as the interface between the aquifer system and Monterey Bay. This designation has been one of convenience, because little or no information is available regarding the offshore extent of the onshore aquifers or the nature of their connection with the ocean. The eastern and northern boundaries of the Seaside Basin are less clearly defined. The understanding is that the northern and eastern boundaries follow a groundwater flow divide that separates groundwater flowing toward the Salinas Valley from groundwater flowing toward the coastal Subareas of the Seaside Basin.

12. **Subdivisions of the Basin:** Traditionally, the Seaside Basin has been subdivided into several subbasins or subareas for hydrologic analysis. These divisions reflect a combination of hydrogeologic and jurisdictional boundaries, and the configuration of the subarea boundaries has evolved slightly over time. The current subarea names and locations are shown on **Exhibit JO-8**. A hydrogeologic boundary created by the Laguna Seca anticline divides the basin into the Northern and Southern Subbasins. Each of the two subbasins is further divided into Coastal and Inland Subareas. The dividing line follows General Jim Moore Boulevard (previously North-South Road), which was formerly the jurisdictional boundary between the Fort Ord military base and the communities of Seaside and Del Rey Oaks. The Southern Inland Subarea is also known as the Laguna Seca Subarea. The Phase 1 ASR Project site is located in the Northern Subbasin, just east of the boundary between the Coastal and Inland Subareas.

13. **Hydrogeologic Units:** The Seaside Basin consists of a sedimentary sequence of water-bearing materials that overlie the low permeability Monterey Shale, which is considered the effective base of freshwater in the basin. The formation directly overlying the Monterey Shale is the Santa Margarita Sandstone and its corresponds to the Santa Margarita aquifer. This sedimentary unit is a loose to weakly cemented sandstone with a stratigraphic thickness of approximately 200 feet. The Santa Margarita aquifer is the target aquifer for the proposed Phase 1 ASR Project. Overlying the Santa Margarita aquifer is a formation referred to as Tertiary and Quaternary "continental deposits". This formation consists of a complex sequence of interbedded sand, gravel, and clay deposits. These deposits are more than 600 feet thick in some portions of the basin. The water bearing portions of this formation are thick lenses of sand and gravel of limited areal extent and as a group are commonly referred to as the Paso Robles aquifer. The uppermost formations in the basin are the Aromas Sand and Older Dunes. These surficial deposits are of minor importance to groundwater resources in the basin as they are unconfined, in direct hydraulic communication with the ocean, and are only saturated in the extreme coastal portion of the basin.

14. **Groundwater Levels:** **<u>Exhibits JO-9 and JO-10</u>** show contours of groundwater elevation in the Paso Robles and Santa Margarita aquifers in Fall 2002, respectively. As shown, the elevation contours for the Paso Robles and Santa Margarita aquifers near CAW's Paralta and Ord Grove production wells are approximately 20 and 40 feet below sea level, respectively

Q5. PLEASE DESCRIBE THE IMPACTS TO THE SEASIDE GROUNDWATER BASIN ASSOCIATED WITH THE PHASE 1 ASR PROJECT.

15. The impacts to the Seaside Groundwater Basin from the construction and operation of the proposed Phase 1 ASR Project are described in the Draft and Final Environmental Impact Report/Environmental Assessment (EIR/EA) that were published in March and August 2006, respectively. These documents are included in the hearing record together as **<u>Exhibit SWRCB-1</u>**. Specifically, Chapter 8 of the EIR/EA, *Surface and Groundwater Hydrology and Water Quality*, describes the Seaside Basin, discusses potential impacts from the Proposed Phase 1 ASR Project, and identifies appropriate mitigation measures. Potential impacts include changes in groundwater storage, levels, and quality, as wells as possible hydrofracturing and effects on other groundwater users in the Seaside Basin. As indicated in the EIR/EA, all of the potential impacts from the construction and operation of the proposed Phase 1 ASR Project on the groundwater resources in the Seaside Basin are considered beneficial or less than significant. The key long-term impacts are described below.

16. **Long-Term Changes in Seaside Basin Groundwater Storage:** As described in the EIR/EA, MPWMD and CAW would extract, over time, the same amount of groundwater that is injected, i.e., approximately 920 AFY. During consecutive wet years, however, the injected water will accumulate in storage. This accumulated storage, which is an <u>incidental</u> benefit of the proposed Phase 1 ASR Project, is depicted in **<u>Exhibit JO-11</u>**, which shows the simulated end-of-year usable storage in the Coastal Subareas of the Seaside Groundwater Basin under No-Project and Phase 1

ASR Project conditions. As simulated, end-of-year usable storage with the Phase 1 ASR Project is an average of approximately 1,300 AF greater than with the No-Project alternative, with the difference ranging from as little as 360 AF in WY 1991 to as much as 2,710 AF in WY 1983.

17. **Long-Term Changes in Seaside Basin Groundwater Quality:** As proposed, treated potable water from CAW's Carmel River sources, i.e., wells, would be provided for injection and storage in the Seaside Basin. To determine the effects of ASR operations on water quality in the Seaside Basin, a series of geochemical modeling tasks were performed using historical data from CAW's treated water distribution system and recent aquifer test results from the SMTIW No. 1. The results of the analyses indicated that no adverse chemical reactions were likely to occur during injection, storage, or intermixing within the Santa Margarita Sandstone aquifer. In addition, the analyses suggested that the observed redox reactions will benefit native groundwater quality through the oxidation of reduced species. As noted in the EIR/EA, the proposed Phase 1 ASR Project will be operated in compliance with SWRCB's anti-degradation policy (Resolution 68-16) and applicable regulations regarding drinking water quality.

18. **Effects on Other Seaside Basin Groundwater Users:** It is anticipated that long-tem injection of supplies will benefit existing groundwater users within the basin through reduced pumping lifts and associated costs.

Q6. PLEASE DESCRIBE THE MEMORANDUM OF AGREEMENT WITH CAW FOR ASR OPERATIONS AND MAINTENANCE.

19. In order to define and clarify the means by which MPWMD and CAW will cooperate and operate existing and proposed ASR facilities to augment the supply of water to the Monterey Peninsula area for the benefit of CAW ratepayers and MPWMD constituents, MPWMD and CAW executed an ASR Management and Operations Agreement in March 2006 (**Exhibit DF-2**). This agreement was developed to satisfy permitting requirements of the California Department

of Health Services (**Exhibit JO-12**), expand and clarify the operations of the existing ASR facilities, and accelerate implementation of future ASR facilities. The agreement includes sections on pending and future water rights for the ASR Project that will be jointly held by MPWMD and CAW.

Q7. PLEASE DESCRIBE THE BACKGROUND LEADING TO ADJUDICATION OF THE SEASIDE BASIN.

20. As discussed in SWRCB Order 95-10, CAW's historical production from the Coastal Subareas of the Seaside Groundwater Basin during the 10-year period from 1979 through 1988 period averaged approximately 2,200 AFY, ranging from a minimum of 1,333 AF in WY 1979 to a maximum of 3,465 in WY 1987. During the 10-year period from 1996 through 2005, following adoption of SWRCB Order 95-10 that directed CAW to "maximize production from the Seaside aquifer for the purpose of serving existing connections, honoring existing commitments (allocations), and to reduce diversions from the Carmel river to the greatest practicable extent", CAW's average annual production from the Coastal Subareas of the Seaside Groundwater Basin increased to approximately 3,700 AFY, ranging from a minimum of 3,003 AF in WY 2005 to a maximum of 4,319 in WY 1996. This approximate 70% increase in CAW pumping from the Coastal Subareas (1,500 AFY), coupled with increased non-CAW groundwater production in the Coastal and Laguna Seca Subareas, led to depleted groundwater storage, lower water levels, and concerns regarding seawater intrusion.

21. **Exhibit JO-13** shows long-term water levels from two of MPWMD's coastal monitoring well network. The plots show water levels in the Paso Robles Formation (upper line) and Santa Margarita Sandstone (lower line) for MPWMD's FO-07 and PCA-East monitoring wells for the period between July 1994 and July 2006. FO-07 is upgradient from CAW's Paralta production well and PCA-East is downgradient of CAW's Paralta well. The plots show the

dominant effect that production from CAW's Paralta well has had on water levels in the Santa Margarita Sandstone and illustrate the overall downward trend in water levels over time.

22. In August 2003, concerned about possible overdraft conditions and the status of its appropriative rights in the Seaside Groundwater Basin, CAW filed a compliant against the other pumpers in the basin and requested an adjudication of the basin. Specifically, CAW requested a determination of the basin's safe yield, a declaration of each party's respective production right, a declaration, as part of a physical solution, of each party's respective storage rights, and appointment of a Watermaster to administer the Court's judgment.

23. In December 2005, the matter went to hearing and a final Decision was issued in March 2006 (**Exhibit DF-3**). The Decision determined that the Seaside Basin was in overdraft, with current basin production (approximately 5,600 AFY) exceeding the estimated safe yield of the basin (3,000 AFY) by approximately 2,600 AFY. The Decision also established a Watermaster Board and specified a "ramp down" schedule to bring the current "Operating Yield" for the basin (5,600 AFY) into balance with the estimated "Natural Safe Yield" of the basin (3,000 AFY) over time. Each of the parties was allocated a share of the Operating Yield. For example, for the first three-year period, CAW was allocated 3,504 AFY of production rights from the Coastal Subareas and 345 AFY of production rights from the Laguna Seca Subarea.

24. The Decision also found that the public interest is served by augmenting the total yield of the Seaside Basin through artificial groundwater recharge, storage, and recovery. In this regard, the Decision determined that the right to store and recover water from the Seaside Basin should remain a public resource and should be governed by the Seaside Basin Watermaster, subject to specific provisions. The Watermaster is required to determine the Total Usable Storage Space in the basin and assign individual producers' storage allocations. Notably, the Decision found that MPWMD's statutory right to store water is preserved and is not in conflict with the Physical Solution or appointment of a Watermaster. The power of the Watermaster to enjoin unauthorized storage is limited to storage by producers, and does not extend to storage by MPWMD. The

Decision provides that MPWMD may store water in the Seaside Basin for the benefit of the District. For management purposes, the District will advise the Watermaster as to the nature and scope of its storage activities.

Q8. PLEASE DESCRIBE THE DISTRICT'S ROLE WITH THE SEASIDE BASIN WATERMASTER MONITORING AND MANAGEMENT PROGRAM.

25. As part of the Seaside Basin Decision, the Watermaster was directed to prepare a comprehensive Monitoring and Management Plan (MMP) for the Seaside Groundwater Basin. As directed, the MMP would include a number of actions, including an exploratory borehole drilling program, geophysical surveys, new monitoring wells, design and implementation of a piezometric and water quality monitoring program, development and implementation of a management plan, and development of criteria for use by the Watermaster in determining any modification of the Operating Yield. The District's role in preparing the Seaside Basin MMP is described in **Exhibit JO-14**.

Q9. PLEASE DESCRIBE YOUR CONTACTS WITH THE CARMEL RIVER STEELHEAD ASSOCIATION REGARDING THE PROPOSED PHASE 1 ASR PROJECT.

26. On June 12, 2007, I, along with MPWMD Water Resources Manager, Darby Fuerst, and MPWMD Senior Fisheries Biologist, Kevan Urquhart, presented an overview of the proposed Phase 1 ASR Project to the Carmel River Steelhead Association at their regular monthly meeting. The presentation was made at CRSA's request and included a lengthy question and answer period. A copy of the PowerPoint presentation is included as **Exhibit JO-15**.