July 16, 2012

Central Coast Regional Water Quality Control Board (CCRWQCB)

Subject: Comments regarding update of the LOWWP Recycled Water Management Plan (RWMP), Dewatering Plan, and seawater intrusion mitigation scheduled for September 6, 2012.

Dear Board Members,

The Los Osos Sustainability Group is providing the following comments regarding the Recycled Water Management Plan, the Dewatering Plan and unmitigated adverse impacts from the LOWWP on the Los Osos basin and related resources. Because these plans and the project do not mitigate for impacts on the critical seawater intrusion problem, the project is likely to result in further loss of the basin from seawater intrusion and could lead to reliance on imported water or desalination to support the current population in the Los Osos area. The very high cost of the project makes developing supplemental water sources economically infeasible (They may also be technically, legally, and/or socially infeasible.). Therefore, the CCRWQCB, County, and other agencies must take all available actions to ensure the basin is a sustainable sole source of water for the people and environmental resources depending on the basin. Avoiding unmitigated impacts—rather than attempting to respond to them with "adaptive management"--is essential because seawater intrusion is very difficult to reverse. If the project causes it to get worse in the lower aquifer or to begin in the upper, the impacts will jeopardize the sustainability of the basin Furthermore, the avoiding severe adverse impacts on high value sensitive habitat including wetlands and creeks is essential. The following are some of the major unmitigated impacts, recommendations to avoid or minimize them, and information agencies must have to help ensure the LOWWP supports the sustainability of the Los Osos area.

Unmitigated groundwater impacts

1. **Adverse groundwater impacts on the upper aquifer from dewatering have not been addressed or mitigated.** Dewatering could reduce recharge of the upper aquifer substantially. Based on the CDM "Dewatering Plan," the LOSG estimates that dewatering will remove 1000 to 2000 acre feet (AF) of potential recharge to the aquifer during the two years of project construction. According to the EIR, total recharge of the upper aquifer is about 3000 AFY. Dewatering, combined with reduced recharge from the project and more pumping from the upper aquifer (which experts agree is urgently needed to address seawater intrusion in the lower aquifer) will likely have adverse impacts on the upper aquifer and could cause seawater intrusion. The upper aquifer is said to be only "relatively stable" in the 2005 Seawater Intrusion (SWI) study. In fact, the County dewatering plan indicates that pumping high groundwater in the Cuesta-by-the-Sea area will cause seawater intrusion. (See page 7 of CDM Report where it states: "When dewatering areas closer to the coast, higher pumping rates may be needed, as more groundwater is available in these locations through inflow of seawater.")
2. **The adverse groundwater impacts on the aquifers from less than reported conservation have not been addressed.** Conservation was supposed to provide back up for Broderson leach fields and a margin of safety for seawater intrusion mitigation as the project removes an important source of recharge to the basin (septic systems). However, less than half the conservation reported in the purveyor/County conservation plan is currently available. Most has already occurred due to tiered rate structures that purveyors implemented in 2008 and 2009--although SWI continues to progress.

3. **The adverse groundwater impacts on the aquifers from a recycled water plan that uses recycled water high in salts, does not maximize seawater intrusion mitigation, and is likely to be underused have not been addressed**. Because the program will apply most of the water to farms not in the urban portion of the basin, and the RWMP states that recycled water may be provided to farmers in addition to the water they are currently using (i.e., would not offset current pumping), the recycling program provides very little, if any, seawater intrusion mitigation. The EIR estimates that the seawater intrusion mitigation factor for agricultural recycled water use east of Los Osos Creek (in the "Creek Compartment" of the basin) will be 10%, or $1/10^{th}$. In other words, for every 10 gallons applied, one gallon will go toward reducing seawater intrusion. Furthermore, the estimated seawater intrusion benefit from offsetting pumping East of Los Osos Creek is an indirect, uncertain benefit based on modeling, so reuse in this area may provide no seawater intrusion mitigation--or mitigation may be delayed many years. The County plans to use less than 100 AFY or recycled water in the urban portion of the basin west of Los Osos Creek (40-50 AFY at schools and 50 AFY at Sea Pines Golf Course). Water must be applied in the urban part of the basin to offset pumping from the upper and lower aquifer to mitigate for project impacts for the recycled water program to have a direct and immediate benefit on seawater intrusion. Moreover, due to the influence of the serious seawater intrusion problem on the domestic water supply, the salt content of the recycled water will be high, making it less desirable for farmers and other potential users including schools. At a minimum, use of the recycled water will require period flushing of soils will potable water, reducing the program's potential to reduce pumping (i.e., mitigate for seawater intrusion). As a result of these factors, and regulatory requirements, the program is likely to be under used like San Luis Obispo City program.
4. **Adverse groundwater impacts resulting from Broderson leach fields (the main SWI mitigation measure) have not been addressed.** Conservation and recycled water use were supposed to provide back up (redundant) mitigation for seawater intrusion to account for the uncertainty of the leach fields to mitigate for seawater intrusion, However, conservation and recycled water use have less than half the mitigation potential needed to replace Broderson, and certainly do not provide a 2:1 margin of safety as claimed. Broderson is supposed to replace 450 AFY of the 750 AFY of the groundwater removed with septic systems. If they don't work as hoped, conservation and recycled water use, at most, replace (or offset) 200 AFY of the water removed from the urban portion of the basin with the project. In fact, not all the groundwater removed with septic systems will be replaced or offset even if Broderson works perfectly (i.e., 450 AFY + 200 AFY = 650 AFY replaced or offset). Broderson leach field disposal will be tested at half capacity for two years, it could cause salt build up in the soil or increased liquefaction risk due to mounding water downhill, and feasible mitigation measures (e.g., adaptive mitigation) is not available. If the leach fields don't work, seawater intrusion impacts from the project will not be not mitigated, and there would be no place to dispose all the treated effluent. Further, if the leach fields significantly increase liquefaction risk down slope, a decision is likely to be made that operation of the leach fields continues despite the risk to life and property because there is no alternative location to dispose of the water. It is still difficult to believe that the engineers have provided no backup plan; whereas system safety factors for critical project systems (i.e., systems that cannot fail without severe consequences) are customarily at least 2 times (i.e., require100% redundancy or back up) and often 3 times (require 200% back up). The safety factor for this project is less than 1 because groundwater impacts are is not fully mitigated.

5. **Adverse impacts from having no feasible adaptive mitigation measures have not been addressed.** The County RWMP states that pumping will be cut back in areas where seawater intrusion is occurring. However, ensuring (forcing purveyors and private well owners as needed) to cut back when and where necessary to address signs of seawater intrusion is not provided for in project measures. Furthermore, no other feasible measures are available to curb seawater intrusion if the project makes it worse in the lower aquifer or starts it in the upper.
6. **Adverse impacts on wetland and other ESHA from having no feasible measures to replace groundwater flows removed with the project have not been addressed.** Because the project does not restore the groundwater removed from the urban area with the project, it is also is likely to adversely impact wetlands and other ESHA along the estuary, as well as Los Osos and Willow Creeks. However, the project provides no feasible measures to maintain groundwater flows to habitat when adverse effects from the project develop.
7. **Adverse impacts on the basin, estuary, and public health and safety from cumulative and socio-economic impacts, due to the future costs and other impacts of essential water delivery system improvements, effective sewer maintenance, adaptive project mitigation, storm water management upgrades, earthquake-related repairs to the sewer, and the potential need for supplemental water, have not been addressed.** These necessary future projects have been foreseeable since the beginning of LOWWP review, but the County and other reviewing agencies did not address the effects in combination with the project. They are certain to result in adverse impacts on environmental, social, and economic resources, in combination with the very expensive sewer system.

These are the main unmitigated environmental impacts, but they are serious ones. As a result, serious harm to the basin water supply and habitat will not be avoided or even minimized. The following are some recommendations for addressing these serious impacts although the impacts should have been addressed and mitigated though project and mitigated development during the EIR and project permitting process..

Recommendations to address unmitigated impacts

1. A coordinated, comprehensive basin-wide management plan with basin-wide conservation (water use efficiency), nitrate and septic system management, storm water management (low impact development or LID) is imperative. It must be implemented with an ordinance that sets specific, measurable, and enforceable objectives. It must identify specific mitigation adaptive mitigation measures for the project and specific measures and timelines for reversing seawater intrusion (within a one to two year timeframe). A purveyor basin plan has not been produced after about four years of negotiations, and it will not apply to private well use. Furthermore, a purveyor plan will not set specific, measurable, and enforceable objectives that require purveyors to cut back pumping when and where needed. Such plan with specific objectives and measures will require the County to assert its right to implement a basin-wide plan and ordinance with enforceable measures. The CDP (e.g., Condition 5, the Recycled Water Management Plan) does not now identify specific, measurable, and enforceable mitigation measures for adverse project impacts on seawater or habitat (from reduced groundwater flows). Such measures must be identified and required as part of a basin-wide plan. If the County does not implement such basin-wide plan with an ordinance; then the Coastal Commission and CCRWQCB must take action to ensure it happens, e.g., with amendments to the CDP per Condition 7 of the Final CDP and/or legal action as needed (e.g., petitions to participate in the adjudicated basin

process). Also, consistent with Condition 6of the CDP. the basin plan must include a provision that future building will occur only if conclusive evidence (i.e., actual well tests) show that seawater intrusion has been reversed over a period of time. The plan must also set a safe yield for the basin to be achieved prior to any development, which has a generous margin of safety built in that assures water reserves in the basin to respond to droughts and climate change. Keith Wimer of the LOSG has suggested the safe yield is set at least 25% lower than the previous "safe yield" estimate of 3200 AFY for the entire basin--about 2400 AFY. This is a starting point, but it is not certain even this safe yield will reverse seawater intrusion and provide the margin of safety needed.. The management plan must also include provisions for monitoring and managing pumping from private wells to ensure an exact measurement of water production in the basin, and it must include a septic system and salt and nutrient management plan for the entire basin. Finally, it must be a coordinated effort with the CCRWQCB, California Coastal Commission, and other agencies. The CCRWQCB should develop a Watershed Management Plan for the Los Osos Valley Watershed that includes/incorporates the basin-wide plan, and it must set water quality objectives for chlorides (an indicator of seawater intrusion) aimed at reversing seawater intrusion and restoring chloride concentrations to historic levels The watershed plan, basin-wide plan, water quality objective and specific action plans (to reverse seawater intrusion) should be incorporated into the Regional Basin Plan.

2. To address the unmitigated impacts from dewatering, agencies should 1) request the County to provide a worse-case scenario of impacts from dewatering that identifies adverse impacts and costs from dewatering, along with measures to address the worse-case impacts, 2) test wells should be installed in locations near the estuary, and, 3) based on worse-case projections and tests, , a small-pipe low pressure project component should be used in lieu of gravity collection in high groundwater areas.
3. To address the unmitigated conservation-related issues, a thorough review of current baseline indoor-outdoor water use should be conducted, and the most cost effective indoor-outdoor program should be developed and implemented, based on the review. The conservation plan developed for purveyors and the County by Maddaus Water Management, which the County is using to satisfy conservation-related CDP conditions, overstates current water use within the Urban Reserve Line by about 20% (2050 AFY per the plan versus about 1650 AFY actual use per purveyors) and the plan most-likely overstates indoor versus outdoor water use. As a result, it substantially overstates the potential for the project to reduce water use and the potential for conservation to mitigate for LOWWP seawater intrusion impacts. It also only speculates as to which conservation measures will be the most effective for Los Osos, based on an opinion survey of ISJ members (purveyor and County representatives). The LOSG sponsored a review of the Maddaus Plan by Peter Mayer of Aquacraft, a nationally recognized conservation expert. Aquacraft recently completely a comprehensive review of California residential water use. Mr. Mayer indicates that indoor water use appears to be overstated, and he recommends (among other measures) a detailed evaluation of current water use in the Los Osos basin, in order to develop the most effective program possible. The CDP (Special Condition 5) states that seawater intrusion mitigation will be maximized to achieve the "health and sustainability" of the basin, using the $5 million allocated for conservation. Therefore, all the $5 million should be used to implement a comprehensive program both indoor and outdoor (even if it involves spending some money to help purveyors implement the most effective measures.).). Mr. Mayer recommends a rate structure based on individual water budgets as the most effective measure for reducing water use. He further indicates that water use in the area can easily be reduced to an average of 42 gallons per capita per

day (gpcd) with the $5 million—i.e., substantially below the 50 gpcd identified as a target in LOWWP conditions.. Mr. Mayer also stresses that private well use in the basin must be monitored and private well owners provided incentives to maintain conservation levels of water use. (See attached Mayer review.)

4. To address the unmitigated recycled water use issues, the County should provide worse-case scenarios, along with specific measures for how the County will address worse-case scenarios. There should also be town hall meetings with stakeholders present, including County, CCRWQCB, and Coastal Commission representatives, to answer all questions related to recycled water use and to discuss options such as agricultural exchange (the exchange of well water from the Creek Compartment for recycled water to offset pumping in the urban area). Based on the information, options including an enforceable ordinance requiring recycled water use throughout the basin and agricultural "exchange" should be explored and developed, along with reuse sites that will offset pumping in the urban portion of the basin. These measures are necessary to maximize seawater intrusion mitigation and comply with the CDP (Condition 5)..
5. To address the unmitigated impacts related to Broderson leach fields, the County should provide the worse-case scenario, along with measures for addressing the scenario. Such measures should be enforceable and incorporated into the basin-wide plan.
6. To address the unmitigated impacts related to cumulative and socio-economic impacts, the County should provide the worse-case scenarios, along with measures for addressing worse-case scenarios. Such measures should be enforceable and incorporated into the basin-wide plan.
7. **What the Coastal Commission can do.** The Commission can enforce the CDP conditions (Special Conditions 5, 6, and 7by ensuring that building does not occur in the Los Osos area until actual well tests show seawater intrusion has been reversed, and conservation and recycled water use programs "maximize" seawater intrusion mitigation and basin protection. The Commission can further require the County to implement an enforceable basin-wide management plan with an ordinance to enforce CDP measures. If necessary, these requirements should be implemented with addendum s to the CDP per Special Condition 7.. It can also implement enforcement actions if the County does not meet conditions, and it should communicate with CCRWQCB and work with the Board to implement measures consistent with the CDP, along with a basin-wide plan that has specific objectives and time tables to ensure a sustainable Los Osos basin.
8. **What the CCRWQCB can do.** It can develop a comprehensive watershed management plan for the Los Osos Valley watershed and the Los Osos basin that sets water quality objectives (e.g., for chlorides, which is an indicator of seawater intrusion) and it can develop action plans to achieve the objectives, incorporating the objectives and plans into the Regional Basin Plan. It can also indicate its willingness to participate with the County and Coastal Commission in the implementation of a basin-wide management plan, consistent with the LOWWP CDP's requirement that conservation, recycled water use, and other measures maximize seawater intrusion mitigation and habitat protection. An important part of the plan would be a nitrate and nutrient plan that has this emphasis and focuses on reversing seawater intrusion within a given timeframe. It further can require a septic system management program for properties outside the prohibition zone. It can require the County to avoid water quality degradation from the project including from the dewatering plan (i.e., degradation from inducing seawater intrusion), and it can pursue enforcement and/or legal action to ensure chloride water quality objectives are met. It further can continue to request and advocate for the State Water

Resources Control Board (SWRCB) to take all necessary action, including legal action to ensure seawater intrusion is reversed and the basin is sustainable resource (including participation in the adjudicated basin process).

Information needed

The Coastal Commission and CCRWQCB must have some essential information in order maximize the potential for a sustainable water supply and resources in the Los Osos area. The LOSG has found that the County has not been forthcoming or up-to-date with information critical to key decisions about the project and basin. One reason the County has offered for not providing us information in the past is that some of it is privileged since the information (studies and data) is being developed within by the County and water purveyors in the adjudicated basin process. The process is proceeding under a cooperative agreement between purveyors and the County, referred to as an interlocutory stipulated judgment (ISJ). However, since such information is critical to making decisions about the management of the water supply, all of it must be made available to agencies and the public as soon as it is developed.

The following is some of the essential information (i.e., questions that should be answered) in order for the Coastal Commission, CCRWQCB, and other agencies to help avoid serious harm to the basin and resources from the project, while maximizing the potential for a sustainable water supply.

1. What is the current water use (residential, commercial, and institutional indoor and outdoor) based on current purveyor pumping figures, and what are the particular water use patterns within the basin? (As explained in #3 on Page 4 of this letter, a thorough evaluation of water use levels and types(residential, institutional, and commercial), businesses, and schools should be completed to determine the most effective conservation program. The evaluation should be based on first-hand information such as residential surveys. Peter Mayer recommends such review as a starting point for an effective plan—see Mayer review attached.)
2. What is the current status of seawater intrusion in the upper and lower aquifer based on water quality tests at supply and test wells?
3. Are the collection system pipes going to be chemically sealed in high-groundwater areas per the CDP to avoid high levels of inflow and infiltration, ultimately leading to systems overflows and potentially seawater contamination of recycled water?
4. What is the worse-case scenario from dewatering and how is the potential for seawater intrusion (especially in the upper aquifer) and harm to habitat (especially wetlands along Morro Bay Estuary near dewatering sites) mitigated?
5. What happens if farmers do not sign contracts for recycled water use, or schools decide not to use the program? What is a worse-case scenario from an underused recycling program and what are the backup plans to mitigate for seawater intrusion and for treated effluent disposal?
6. What is the worse-case scenario if Broderson fails to work as planned (e.g., must be cut back or shut down due to salt build up in the soil and aquifers, or disposed water mounds destabilizing soil under homes and increasing liquefaction risk)? How will the County respond?
7. What is the worse-case scenario from cumulative and socio-economic impacts? How will project costs affect implementation of critical water system upgrades and purveyor conservation measures, unfunded adaptive project mitigation measures, the high levels of project maintenance needed to

avoid leaks and overflows, storm water management upgrades to reduce pollution of the estuary, system repairs after earthquakes, and supplemental water supplies (if needed)? How will the community and/or County fund these necessary environmental protection measures?

8. What specific mitigation measures will the County implement if seawater intrusion is found to get worse in the lower aquifer or start in the upper aquifer with the project? How much seawater intrusion would occur before the measures take effect?
9. How will the County accurately monitor and manage water use on properties using private wells (e.g., what programs will they put into effect to acquire accurate data and how will private well owners be encouraged to participate)?
10. What is a safe yield for the basin that builds in a margin of safety (establishes reserves) and ensures a sustainable water supply for the current population, given the severe (and underestimated) seawater intrusion problem in the past and climate change projections for the future, e.g., less frequent, more violent storms and rising sea levels (which increase the potential for seawater intrusion)?

Conclusion

The LOWWP is intended to make the Los Osos basin a sustainable water supply and to protect sensitive habitat and public health and safety, yet it will likely have adverse impacts on these resources due to unmitigated adverse impacts. In addition to direct impacts on seawater intrusion and habitat from reduced groundwater flows/levels, the project's high costs make optimum system maintenance and adaptive mitigation unlikely. These adverse impacts, which were not addressed during project review, are realities that decision makers must acknowledge and address now to avoid severe impacts to the extent possible and to maximize the potential for basin sustainability. Basin sustainability is essential for the sustainability of all resources in the area, including habitat of state and national significance, the community of Los Osos, and the economy of the area. Therefore, all possible actions must be taken to ensure seawater intrusion is reversed and the basin is managed in a manner that ensures supplemental water is not needed to support the current population, and resources will be protected and preserved despite the inadequate project mitigation measures currently in place.

We thank you for making the sustainability of Los Osos area resources a priority.

Sincerely,

Keith Wimer Elaine Watson Larry Raio Chuck Cesena

Los Osos Sustainability Group

July 16, 2012
Central Coast Regional Water Quality Control Board (CCRWQCB)

Subject: Comments regarding update of the LOWWP Recycled Water Management Plan (RWMP), Dewatering Plan, and seawater intrusion mitigation scheduled for September 6, 2012.

Dear Board Members,

On behalf of the Los Osos Sustainability Group, I would like to submit the following comments regarding the proposed dewatering plan as a part of the current Los Osos Water Recycling Facility (LOWRF) construction activities.

Excerpted from RWQCB STAFF REPORT FOR REGULAR MEETING OF SEPTEMBER 6, 2012 Prepared on June 14, 2012, Page 3.

Dewatering – As part of collection system construction, the County anticipates the need to dewater excavations during pipe and lift station installation activities. Water Board staff approved the County's enrollment in the General Construction Storm Water NPDES Permit on May 21, 2012. As required by the coastal development permit (CDP), the County developed a dewatering plan for water quality protection. Prior to the development of the dewatering plan, Water Board staff issued a letter to the County outlining the factors it needed to consider (refer to Attachment 2). A copy of the county dewatering plan can be found at the following internet link.
http://www.slocounty.ca.gov/Assets/PW/Design+Division/300448.08.01.BC+-+Appendix+D.pdf
This report has a preliminary recommendation to use a four-stage approach. The first stage is to use water for construction use (dust control, etc.) since no groundwater retention sites will be available when work starts. *Will require more disposal than this, much will have to be treated and go to the bay until other sites are available. It is estimated that construction water use is only 0.02 AFD, the minimum required is 2.7 AFD for a single area and a maximum of 5.8 AFD for a single area. Once the pumps start going, they can't be stopped until the water is below required depth. Without any retention basins available, this water will have to be disposed of in the bay. Before the water can be put into the bay, it will have to be treated. This means treatment plant will have to be constructed and designed to treat 6 AFD of water to the quality allowed for water disposed in the Nation Estuary.* Stage two would continue to utilize construction use and would add the new Mid-Town retention site and the existing retention basin sites for groundwater disposal while the Broderson leachfield system and the recycled water pipeline from the treatment plant to the Broderson effluent disposal site are being constructed. *The new Mid-Town retention may not work. After the first use, the basin will silt up and percolation will be drastically reduced. This has been apparent in all retention basins in Los Osos that have no vegetative cover established on them (see discussion below).* During stage three, when the Broderson leachfield site and the

recycled water pipeline have been constructed, both the Mid- Town retention site and the Broderson leachfield site will be operational and construction of the gravity collection system and pump stations and force mains can then proceed with the necessary dewatering. The intent would be to pump discharged groundwater to the Mid-Town and public retention basins for land disposal and Broderson for back-up. If the Mid-Town site does not work as planed, Broderson cannot back it up because it doesn't have the volume to handle even the minimum estimated discharge requirement for a single area of 2.7 AFD. Discharge to the Mid- Town and existing public retention sites augmented with the Broderson leachfield site appears to be a viable and cost-effective means to dispose of the anticipated flows. Do we know what the volumes of the existing public retention sites are? I did not see any values for these in the CDM report. Without this information, we don't really know how viable a plan this is if the Mid-Town site does not work as planed. Flow estimates range from approximately 620 to 1,300 gpm (2.7 AFD) for one dewatering area, and 2,500 to 4,900 gpm (5.8 to 21.5 AFD) for four concurrent areas throughout construction. Groundwater production in excess of 6,500 gpm would require a fourth stage involving agricultural reuse along Clark Valley Road. This water will not recharge our basin. This would be necessary only if the groundwater production exceeds what could be disposed of with the combined capacity of the construction use plus Mid-Town and existing retention sites plus Broderson leachfield site. Treatment and disposal to the storm drains are a possible optional disposal method.

End of comments from RWQCB STAFF REPORT FOR REGULAR MEETING OF SEPTEMBER 6, 2012, Prepared on June 14, 2012, Page 3.

My calculations:
Using the estimated areas given on page 6, Table 1 of the County CDM Dewatering Plan and assuming that water does not infiltrate laterally to these sites but only vertically, I calculated the volume of water in the soil to be pumped. I assumed 30% voids in the soil, which is conservative for unconsolidated dune sands (35-40% is more likely). I also calculated values for two scenarios: or water is pumped from 10 feet of saturated soil. The CDM plan estimates that 75% of the pipes have less than 5 feet of water over the invert of the pipe, but it states that water needs to be removed to a minimum of 2 feet below the bottom of the pipe. Therefore, if there is five feet of water over the pipe, a minimum of 7 feet of water will have to be removed. It is unclear from the report what the average depth of water is for the other 25% of the pipe that is deeper than 5 feet which makes it difficult to calculate these volumes. The County should be asked this question. I calculated the volumes of water to be pumped at approximately 550 AF when water is pumped from 5 feet of saturated soil and approximately 1100 AF when water is pumped from 10 feet of saturated soil. Again this assumes that water is not infiltrating laterally to these areas, which we know will occur. The County assumes a hydraulic conductivity of 10 to 50 feet per day. I have personally performed hundreds of percolation tests in Los Osos and have found the percolation rate to be between 1 to 4

minutes per inch. (This is also the assumed percolation rate that the Water Board used for designing septic systems under Resolution 83-12.) Using these rates, we could expect water to move at a rate of 30 to 120 feet per day, which is roughly twice as fast as the County's values. Whichever rate is used, it is clear that water will be entering the dewatering sump pits at a relatively fast and constant rate. It is my opinion that they will have to be continuously pumped until the entire "lake" or high groundwater area is below the specified depth. Assuming this happens, I took the high groundwater map from the Fugro Los Osos Water Quality Sampling Report, February 2, 2012 (attached) showing the water levels and areas with depth to water less than 10 feet delineated in blue. I numbered these areas #1, #2, #3, and #4 and calculated the approximate volume of soil in the areas (see attached excel spreadsheet). Using the same calculation method as I did above, I calculated the volumes of water to be pumped at approximately 900 AF when water is pumped from 5 feet of saturated soil and approximately 1800 AF when water is pumped from 10 feet of saturated soil. These values also assume that these are the only areas of high groundwater. I have drilled hundreds of piezometer wells in Los Osos, and it is my experience that there are other areas of perched water outside of these mapped areas that will be encountered. The County should be asked what their estimate of the quantity of water to be pumped is and show the basis for their calculations.

I also used the CDM's estimated pumping rates and calculated the maximum and minimum volumes of water on a given day, expressed in Acre Feet (AF). I think it is important to use consistent values in calculations so that easy comparisons can be made, and Acre Feet is used almost exclusively throughout project documents. I also calculated the volumes of the receiving areas and expressed them in Acre Feet for easy comparison. The two main receiving areas are Broderson (2.5 AFD) and Mid-Town retention basin (49 AFD) (safety factor 2 or 25 AFD (safety factor 4), with construction only accounting for 0.02 AFD. My concern with Broderson is that it was supposed to be tested and monitored at half capacity or approximately 225 AFY or 0.16 AFD.

Some questions that the County should be asked include the following:

1. If Broderson is used at the proposed dewatering capacities and pumping continues for a year (The plan estimates two years' of dewatering could be needed.) 2 years of dewatering) it could receive up to 900 AFY or over twice the maximum rated capacity of Broderson. 2. Are they going to install groundwater monitoring downslope to monitor the effects of dewatering? 3. Is the usefulness of Broderson going to be diminished for its intended purpose before it even goes online? 4. Will the leach fields have to be re-excavated/replaced earlier than expected?

The Mid-Town site is another concern. Even with a safety factor of 4, this site is expected to take 25 AFD or the equivalent of 6 feet of water over the 4 acre retention

basin per day. At this time, the basin is completed and it is just an excavated hole in the native sand. It is my experience with these types of basins, that after the first day, once the water enters the unprotected basin the silts and clays (fines) will become suspended and then settle out depositing a thin layer of fines on the surface of the basin effectively changing the hydraulic conductivity of the basin by a factor of 100, 1000, or more. This is evidenced over and over in newly excavated catchment basins on the sides of our roads, that after rains, they become muddy ponds. The areas that have weeds and grasses established on them drain very well and require little to no maintenance. This is because the silt deposits can't form a uniform thin layer over the bottom of the basin that basically stops percolation to a crawl. A silt layer as thin as 1/8 inch is enough to do the damage. The last rain we had this year ponded water on the Mid-Town site for weeks and we only had ¼ inch of rain.

From page 7 of CDM report:

"The soils in the study area are a mix of alluvium and sand dune deposits. The hydraulic conductivity range of 10 ft/d to 50 ft/d was used to test the sensitivity of the calculated dewatering to this parameter." *How was this determined? No references to lab or field tests. Ask the County. There appears to be uncertainty with these values as mentioned in the next sentence on page 7..* "In addition to the uncertainty of hydraulic conductivity, the thickness of the aquifer was tested over a range of 40 to 60 feet based on site geologic data to test the sensitivity of the calculated dewatering to this parameter," and further down where it is stated "A value of 1,250 ft, or approximately double the drawdown target radius, was used for the limit of the drawdown cone in the single well calculation. In reality, the effect of dewatering may extend beyond this limit."

My calculations, based on percolation tests, puts the values in the 30-120 ft/day range as discussed above

Based on my calculations my major concerns are the following:
1. when Area #1 (from attached high groundwater map) is dewatered, there will be an immediate adverse impact on the wetlands near Willow and Los Osos Creeks and other ESHA along the estuary, due to major reductions in perched groundwater flows.

2. when Area #4 (from attached high groundwater map) is dewatered, there will be an immediate adverse impact on the wetlands near Willow and ultimately other ESHA along the estuary, due to major reductions in perched groundwater flows.

3. Areas #2 and #3 (from attached high groundwater map) is dewatered, there will be an immediate adverse impact on the wetlands and ESHA along the estuary, due to major reductions in perched groundwater flows. I am also very concerned that seawater intrusion will be immediate along these areas. The County seems very aware of this as mentioned in the CDM Report where it is stated "When dewatering areas closer to the coast, higher pumping rates may be needed, as more groundwater is available in these

locations through inflow of seawater." the County only seems concerned with this problem from a dewatering objective but shows no concern regarding its adverse effects on the environment. What will happen to the plant life along the edge of the bay when this once fresh water turns brackish or full on seawater? Where is the pumped water going to be placed? It obviously can't be put on land as it will destroy the soil and contaminate the water. The only alternative is to pump it into Morro Bay National Estuary, but if it is pumped into the estuary, it will more than likely have to be treated to meet water quality standards. If the pumps are going at full capacity they will be pumping 5.8 AFD in a single area. What is the cost and practicality of treating this much water on a daily basis for who knows how long. And how is this water going to be disposed of in the bay at these volumes without stirring up the bay muds and causing harm to the estuary. Where is the plan for disposal to the bay when ultimately we know this will be the only solution? What is the process and likelihood of getting permits for bay disposal?

4. The water removed with dewatering water will not recharge the basin.. Obviously, any water pumped to the bay will be wasted and removing recharge of the basin could make the seawater intrusion problem worse.

5. Use of the Mid-Town site as a disposal site (if it even performs as planned) will result in a very large volume of water flowing laterally downhill into the estuary and/or Cuesta by the Sea neighborhood.. With depth to groundwater of only 20 feet (see high groundwater map attached) and the amount of water being put into the ground, the whole column of soil will likely become saturated from the surface down to the existing groundwater elevation. If the Mid-Town site is used to near capacity, there will be about 5 feet of water per day placed in the 4-acre site. Assuming the volume of the voids in the soil is about 1/3 the volume of the soil, 5 feet of water will saturate 15 feet of soil. In under 2 days, the entire column of soil be saturated. This saturated zone has nowhere else to go but to follow gravity downslope. This could also add more water to the area that they are trying to dewater and cause a vicious circle. It's only approximately 3000 feet from the area they are dewatering, and if the water travels between 50 to 100 feet per day in the unconsolidated native Baywood Sands, it will only take 30 to 60 days to reach Cuesta by the Sea. If the Mid-Town site is used for retention before the Cuesta by the Sea area is dewatered, this creates a whole new problem.

This dewatering plan provides information that could have been made available at the time of the EIR, but it was not. The potential impacts and unanswered questions from this dewatering plan begs for a supplemental EIR (SEIR). The plan makes it clear that conventional gravity collection systems, requiring exact gradients, open trenching, and dewatering should never have been planned for these high groundwater areas. At least one of the firms chosen to submit a bid on the basis of its RFQ interview, proposed low pressure pipes in these areas. The project should not go forward with this plan until all of these questions can be answered with a high level of certainty as to potential

impacts, including worse-case impacts, mitigations, and cost. It is still possible to install a low pressure component of the project in high groundwater areas.

I would be happy to discuss any of these issues in person if you were receptive to that.

Larry Raio
Los Osos Sustainability Group

DEIR Appendix D-2

Reduced by dewatering

Table 8 – Current Basin Balance Conditions

COMPONENT OF WATER BUDGET	PERCHED AQUIFER	CREEK VALLEY AQUIFER	UPPER AQUIFER	LOWER AQUIFER
PERCOLATION FROM PRECIPITATION AND IRRIGATION	736	430	1,489	0
SEPTIC RETURN FLOW	631	30	606	0
SUBSURFACE OUTFLOW	0	0	- 1,310	0
SUBSURFACE INFLOW	0	167	112	0
LEAKAGE OR SUBSURFACE CROSS FLOW IN	0	117	788	1,248
LEAKAGE OR SUBSURFACE CROSS FLOW OUT	- 815	- 456	- 882	0
SEAWATER INTRUSION	0	0	0	469
LOS OSOS CREEK INFLOW	0	665	0	0
LOS OSOS CREEK OUTFLOW	0	- 77	0	0
WELL PRODUCTION	0	- 870	-803	-1,717
WARDEN DRAIN	0	- 6	0	0
WILLOW CREEK OUTFLOW AND EVAPOTRANSPIRATION	- 552	0	0	0
AQUIFER INFLOW	**1,367**	**1,409**	**2,995**	**1,717**
AQUIFER OUTFLOW	**- 1,367**	**- 1,409**	**- 2,995**	**- 1,717**

Reduced by project

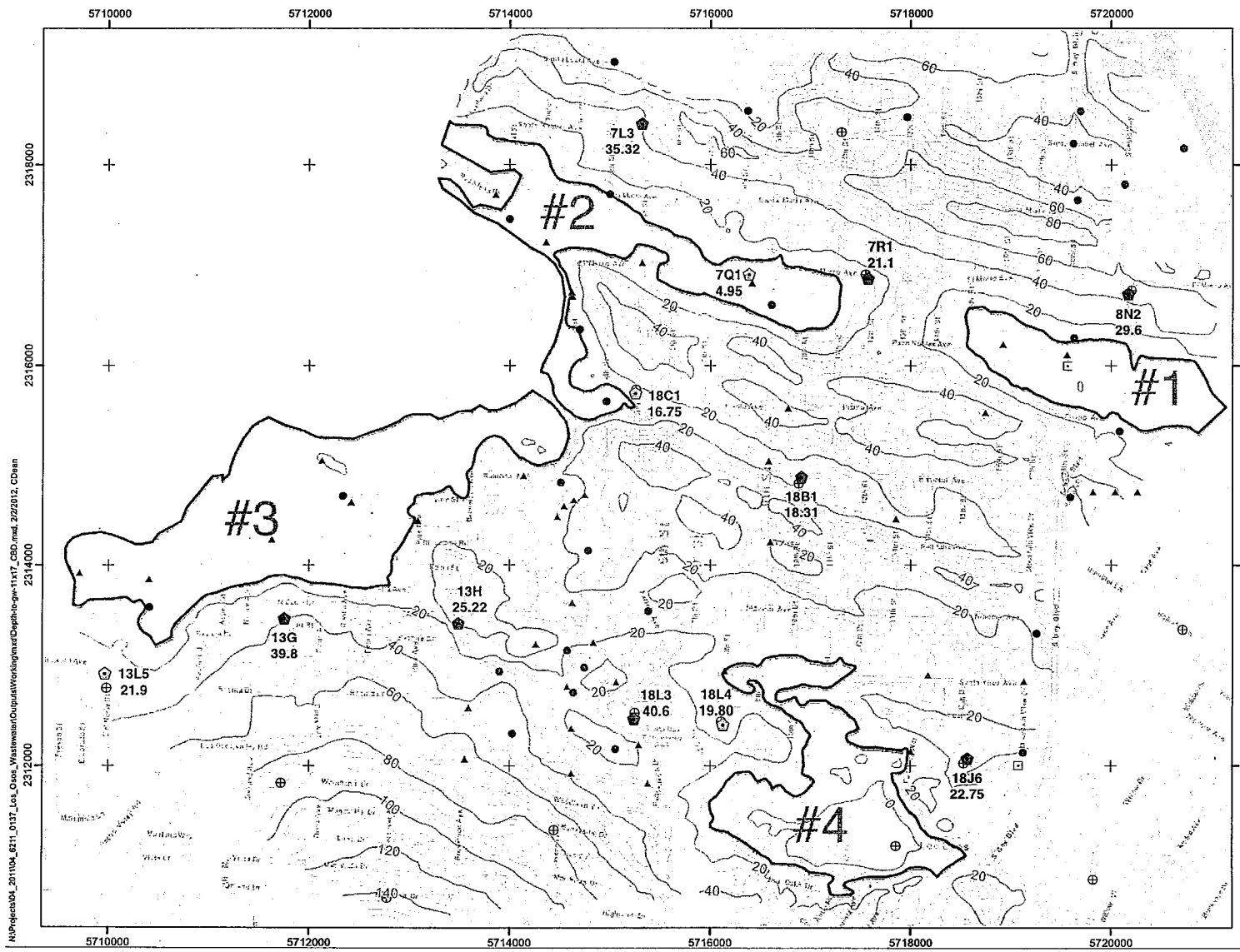
ALL TABLE QUANTITIES ARE IN ACRE-FEET PER YEAR

* Triple adverse impact on upper aquifer recharge

Increased by Major shift in pumping to the upper aquifer

A comparison of the septic return flow volumes in Tables 8 and 9 shows the reduction in this component in the hydrologic budget that is effectuated by the LOWWP. Roughly half of the recharge from septic system percolation is located over the perching clay layer while the remainder is located over the upper aquifer in areas not confined by the clay layer. As indicated by the reduction in this recharge component (see Table 9) the LOWWP effectively captures over 90 percent of the septage return flows within the Los Osos Basin.

CDM
Project No. 04.62110137



LEGEND

- Hollow Stem Auger Boring Site (Fugro, 2003)
- CPT Site (Fugro, 2003)
- Hollow Stem Auger Boring Site (Fugro, 1997)
- CPT Site (Fugro, 1997)
- Hollow Stem Auger Boring Site (Cleath, 2003)
- Boring Site (CFS, 1999)
- CPT Site (CFS, 1999)
- County Engineering Monitoring Well
- Hand Auger Site

18B1
18.31 — LOCSD Monitoring Well with Depth to Water Measurement (December 2011)

13L5
21.9 — LOCSD Monitoring Well with Depth to Water Measurement (December 2011) and Water Quality (January 2012)

Area Less Than 10 Feet Depth to Water

Depth to Groundwater Contour
CI = 20 feet
CI = 5 feet

Note:
1) Depth to groundwater is approximate and varies seasonally. Depth calculated as difference between surface topography obtained from Montgomery Watson Harza and groundwater levels and contours estimated from explorations.
2) Plate modified from Plate 8c, Fugro 2004.

Grid: NAD83 State Plane California V, Feet

N

1:12,000

0 500 1,000 2,000 Feet

WATER LEVEL AND WATER QUALITY SAMPLE LOCATIONS AND AREAS OF DEPTH TO WATER LESS THAN 10 FEET
Los Osos Wastewater Project
San Luis Obispo County, California

PLATE 1

Aquacraft
WATER ENGINEERING & MANAGEMENT

Memo

To: Los Osos Sustainability Group

From: Peter Mayer, P.E.

Date: October 10, 2011

Re: **Review of 2011 Water Demand Analysis and Water Conservation Evaluation prepared by Maddaus Water Management**

The Los Osos Sustainability Group (LOSG) contacted Peter Mayer of Aquacraft and requested his review of the *2011 Water Demand Analysis and Water Conservation Evaluation* prepared by Maddaus Water Management for the Los Osos ISJ Working Group. The LOSG wanted to know if the Maddaus plan maximized cost-effective conservation for the Los Osos area, and, what can be done to increase water use efficiency in Los Osos. We very much appreciate the opportunity to review this analysis and evaluation document and offer the following thoughts and comments for the LOSG.

In 2011, Aquacraft, Inc. completed a state-wide analysis of single-family home water use in California (DeOreo, 2011). This study provided detailed data on the patterns of indoor and outdoor water use homes across the State. The statistics on water use and models that were prepared for this study provide a clear picture of current, typical single family water use in California, and we have relied on these results in our analysis.

General Comments

Los Osos, California is a small community that has real concerns about the long term viability of its groundwater supply because of documented evidence of seawater intrusion into the aquifer that is relied upon for potable water. Based on documents provided to Aquacraft by the LOSG, the danger of seawater intrusion is significant and experts have recommended that Los Osos reduce groundwater pumping quickly to try and reduce further damage to the aquifer.

The evidence of seawater intrusion in the Los Osos basin is well documented. The *Los Osos Groundwater Basin Update* states, "Based on the increasing rate of seawater intrusion described, it is clear that quick and decisive action must be taken to address the intrusion" (ISJ Working Group, 2010). Dr. Douglas Smith of CSUMB notes in a June 9, 2010 letter to the California Coastal Commission, "The available chloride data from the basin (although not up to date) indicates that saltwater intrusion is quickly progressing." Eugene Yates, author of two studies on the Los Osos

Basin states, "The seawater intrusion problem is extremely urgent. Seawater intrusion moved over a half mile in four years and has reached the center of municipal pumping from the lower aquifer" (Yates 2010).

Groundwater is the sole water source for the area at this time. A concerted water conservation effort in Los Osos has been identified as the quickest and least expensive way to reduce groundwater pumping and stabilize the endangered aquifer. A strong and aggressive water conservation program appears to be of critical importance for the sustainability of the Los Osos basin.

The Los Osos Wastewater Project, Coastal Development Permit (CDP-A-3-SLO-09-055/069) issued 9/7/2010 states that "prior to construction" a water conservation program must be implemented which, "limits indoor water use to no more than 50 gallons per person per day on average within the basin," and which should, "reduce potable water use as much as possible." The CDP document also states that the Los Osos conservation program, "shall include provisions for the use of the $5 million committed by the Permittee to initiate water conservation measures pursuant to the basin plan as soon as possible following CDP approval."

With this context in mind, I have prepared the following observations and comments about the Maddaus 2011 Water Demand Analysis and Water Conservation Evaluation.

Lack of Urgency

The first thing that struck me in reviewing the Maddaus report is that there is barely any mention of the seawater intrusion issue in the entire document. There is no indication from the Maddaus plan that the water supply of Los Osos is in peril and without substantial water conservation could be severely impaired. A single sentence on page nine notes that, "The implementation of the selected conservation program is intended to be a key element in the correction of the existing groundwater basin overdraft condition that has led to seawater intrusion." There is barely a mention of seawater intrusion in the rest of the document.

The Maddaus plan is not couched in the context of the potentially devastating impacts of seawater intrusion facing Los Osos. There is a distinct lack of urgency in the tone of the Maddaus report. The plan reads like a standard consultant water conservation study for a community that wishes to reduce water use for the purpose of obtaining a desired permit and meeting long-term and development goals.

The Maddaus plan does not appear to address all of the special conditions put forward in the CDP including the provision to "reduce potable water use as much as possible" and the "provisions for the use of the $5 million committed by the Permittee to initiate water conservation measures pursuant to the basin plan as soon as possible following CDP approval."

The LOSG is very concerned about the seawater intrusion issue and had hoped the Maddaus study would maximize conservation per the Coastal Development Permit. However, the Maddaus study appears not to go beyond a 50 gpcd goal, which is less aggressive than it could be. Based on my

review, it does not appear that the Maddaus plan was prepared with the goal of reducing seawater intrusion as the over-arching theme.

Outdoor Use Under-Estimated and Not Strongly Addressed

The Maddaus conservation strategy is heavily weighted towards indoor residential use. However, it is likely that substantial additional cost-effective demand reductions could be achieved in Los Osos through expanded outdoor efficiency efforts for both residential and non-residential customers. If the Maddaus analysis had used a higher estimate of outdoor use and focused more on halting seawater intrusion, different conclusions about outdoor conservation programs might have been reached.

The minimum-month method used to estimate indoor and outdoor use in Los Osos[1] is a well-accepted standard approach, but it does tend to overestimate indoor use in warmer climates where some outdoor use occurs in every month of the year. The Maddaus study estimates residential demand to be 75% indoors and 25% outdoors. This is likely an overestimate of the indoor demand in Los Osos. It's not possible to say how large an overestimate it is with the available information, but the previous Wallace/Maddaus Urban Water Management Plan for Los Osos from 2000 estimated water use to be 54% indoor and 46% outdoor (Wallace et. al 2000). This is a substantial difference.

In the California Single Family study the data showed that on average as many households tended to under-irrigate as to over irrigate. With this in mind, the goal of an outdoor conservation program should not be to bring everyone into perfect alignment with the local evapotranspiration rate, but to reduce excess irrigation while encouraging the deficit irrigators to continue their low water use practices. By establishing water budgets for outdoor use based efficient levels of irrigation, Los Osos water providers could have strongest and quickest effect on outdoor use.

The Maddaus plan considers the following outdoor conservation measures:

- Design standards for new landscapes
- Educational workshops for residents.
- Rebates for rain sensors.
- Requirement for smart controllers and rain sensors in multi-family (a relatively small segment of customers in Los Osos)
- Turf removal (aka cash for grass)

Of these measures only rebates for rain sensors and turf removal had a benefit/cost ratio greater than 1 indicating it would be cost-effective to implement given the various assumptions. The Maddaus plan does not consider the most effective measure for reducing outdoor water use which is the creation of landscape water budgets that help both utilities and customers identify wasteful irrigation practices.

[1] In the Maddaus study, "Indoor use is based on an average of 2 lowest consecutive months in the winter if meters are read bi-monthly, or single lowest month if meters are read monthly.

The Maddaus conservation report uses an avoided cost for new water based on the Naciemento project. The report gives an annual cost for new water from the Naciemento project as follows: $400/Acre-Foot (AF) for operations, $3,000/AF for annualized capital costs for a total annual cost of $3,400/AF. At the relatively high cost of $3,400/AF for an alternative water supply, the benefit/cost ratio of a wide range of indoor and outdoor water conservation measures will be very attractive. However, this estimate must be solidified to answer key questions such as: Are all costs included? What are the environmental impacts and costs? How firm are the basic capital costs? Are there connection costs that must be borne by Los Osos? How reliable is the Naciemento project water?

Metering and Rates : Powerful Demand Management Tools

Perhaps the most startling omission from the Maddaus study is any substantive discussion of metering and rates. Charging users for the measured volume of water they use each month using a tiered, conservation-oriented water rate structure has been shown through numerous studies to be one the most effective and cost-effective ways to reduce water use.

Some properties in Los Osos are currently not metered, including properties using private wells. Full metering of ***all*** water users (including private wells) and monthly billing for all customers of water suppliers should be an immediate goal for Los Osos. The Maddaus study assumes full metering of the S&T service area (currently not metered), which is a condition for the LOWWP coastal development permit (Condition 108). However, the Maddaus plan does not recommend full metering of private wells within the URL. Full metering of private wells is essential to quantifying the total amount of water pumped within the basin, an important step in combating seawater intrusion.

The Maddaus study states that two of Los Osos' three water providers have water rate structures that "encourage conservation", but the study does not describe these rate structures or provide any analysis of the effectiveness of these specific rate designs for reducing water use and encouraging efficiency. Furthermore, the study overlooks the fact that S & T water company will apparently continue to be without any sort of a conservation-oriented rate structure after metering is implemented.

The Maddaus study does include a "Conservation Pricing Modification" measure option, but there is little discussion of this measure in the text and it is unclear how its inclusion impacts demand (if at all) in the forecasts. It appears that reducing water use through pricing mechanisms was not a major consideration in this study.

If I were designing a water conservation program for Los Osos I would place a strong emphasis on metering and rates and I would recommend that Los Osos move quickly to adopt a water-budget based increasing block rate structure which has been shown to be one the most effective ways to reduce water use quickly. This type of rate structure is different from a simple tiered rate structure. Traditional tiered rates go up with increasing water use regardless of household and property size. A water-budget rate structure establishes billing rates based key factors such as landscaped area and average occupancy. Water budget-based rates encourage efficient water use among all users. Good examples of water budget-based rate structures can be found in Irvine, CA, San Juan Capistrano, CA,

Boulder, CO, and Castle Rock, CO. Full metering of all water uses in the Los Osos Basin and implementation of aggressive water budget-based rate structures may require governmental action, possibly ordinances, and financial incentives to implement, but offer Los Osos maximum opportunity to reduce water demands and combat seawater intrusion.

A key element of metering is finding ways to provide water customers with real time information on their consumption via a simple and convenient display. Several low-cost devices are available on the market that allow the end users of water to track their use and be included as active participants in the water management efforts, rather than passive recipients of top-down commands.

The combination of conservative water budgets linked to a proper rate structure, which compels over users to pay the full avoided costs for excess use as well as penalties for wasteful use, can provide maximum incentive for customers to alter their use patterns with minimum costs to the public. In this system subsidies and rebates would be replaced with a pricing system that accurately reflects the true cost of water and then allows the customer to make rational economic decisions. To the extent that rebates and public expenditures are included, they could be funded from the $5 million budget discussed in the CDP and/or from revenues generated from high water users under a water budget rate structure.

Why focus on new building provisions?

In the Maddaus study, efficiency measures impacting new development comprise a third of the program offerings considered in three of four scenarios. This is further indication that the Maddaus study was not developed for the primary purpose of reducing seawater intrusion. Even when designed for optimum efficiency, new development increases overall water use. Since seawater intrusion threatens the basin water supply, wouldn't it make sense to temporarily halt new development until the intrusion problem is solved? The Maddaus plan assumes new construction will begin in 2015, one year after LOWWP implementation and before the impacts of the water conservation program and seawater intrusion mitigation efforts can be fully assessed.

Greater conservation is achievable

The LOSG asked Aquacraft to consider what level of water efficiency could be achieved with water conservation program measures and a $5 million budget. The Maddaus study aims to reduce indoor per capita use to 50 gpcd by 2018 at the earliest.

Fifty gpcd is not particularly aggressive. Aquacraft's research has shown that 40 gpcd can be achieved today through the installation of water efficient toilets, high-efficiency washers, and low flow faucet aerators. Indoor usage levels below 40 gpcd can be achieved with more efficient fixtures and a good leak detection and repair program.

The results from the California Single family study showed that indoor use of 120 gphd, which is equivalent to about 42 gpcd, is an achievable efficiency target for existing homes (DeOreo, 2011). This is equivalent to approximately 3,600 gallons per household per month, or 4.8 billing units. An effective way to set water budgets would be to base them on 42 gpcd. This combined with an appropriate outdoor budget, would provide water users an efficient monthly target to hit. It is

expected that residents in Los Osos will respond, especially if they are presented with effective social marketing messages as part of a concurrent education program and appropriate technical and financial assistance as necessary.

In order to achieve a target of 42 gpcd, the California Single Family study found that the following conditions are necessary (DeOreo, et. al. 2011):

1. Limit the average toilet flush volume to 1.28 gpf (That means old toilets must be replaced with high efficiency – HET – models)
2. Limit leakage to no more than 25 gphd in any home. (The data showed that high leakage rates in a few homes caused the bulk of the total leakage volume).
3. Limit clothes washers to an average of 20 gallons per load.
4. Reduce miscellaneous faucet use by 10%.

If these things are done, and all other use patterns remain the same then the indoor use can be reduced to about 42 gpcd.

For outdoor use, the California study indicated that that key goals for reducing outdoor use were (DeOreo, et. al. 2011):

1. Eliminate excess irrigation where it is occurring, without encouraging deficit irrigators to increase their use.
2. Change landscapes by replacing high water use plants and grass with varieties that require substantially less water.
3. Reduce irrigated areas.
4. Set water budget allocations that discourage wasteful swimming pool use.

Water use reductions beyond 42 gpcd are possible, but will require more efficient fixtures and appliances and additional reductions in faucet use and leaks. Given a budget of $5 million, it is certainly possible that with a properly designed and implemented conservation program Los Osos could achieve a level of savings below 42 gpcd.

Summary

This review was prepared at the request of the Los Osos Sustainability Group (LOSG) and members of the group provided background documents and feedback into the development of this memo.

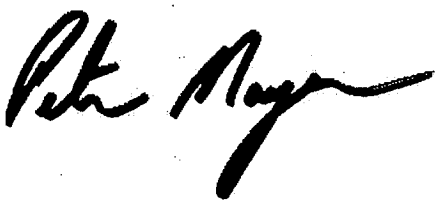
Based on these documents, the danger of seawater intrusion is significant and experts have recommended that Los Osos reduce groundwater pumping quickly to try and reduce further damage to the aquifer. In my opinion this will require significant and aggressive water conservation

measures which go beyond those identified in the *2011 Water Demand Analysis and Water Conservation Evaluation* prepared by Maddaus Water Management for the Los Osos ISJ Working Group. The Maddaus conservation strategy does not "reduce potable water use as much as possible" as the CDP indicates. Outdoor usage is underestimated and not well addressed in the Maddaus plan and metering and water rates are not substantively discussed.

If the Los Osos community intends to rely on groundwater as the primary water source for years to come, a significant, aggressive, and well-funded water conservation strategy is recommended.

It is also recommended that Los Osos complete a thorough baseline water use analysis, similar to the program used for the California Single Family Home study. By performing detailed analyses of water use patterns from sample of homes from the service area it will be possible to determine the current indoor and outdoor use much more accurately, which can then be used to design the most rational and cost effective conservation program possible.

Sincerely,



Peter W. Mayer, P.E.

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Smith, D. (2010) Letter to the Coastal Commission. Prepared by Dr. Douglas Smith, Co-Director of the CSU Monterey Bay Watershed Institute, June 9, 2010.

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Project area	area, sq ft	Volume w/ 5' of water*	Volume w/ 10' of water*
Area A - gravity pipes	3,500,000 sq. ft.	121 AF	241 AF
Area B - gravity pipes	4,800,000 sq. ft.	165 AF	331 AF
Area C - gravity pipes	1,800,000 sq. ft.	62 AF	124 AF
Area D - gravity pipes	1,300,000 sq. ft.	45 AF	90 AF
Gravity Pipies Total	11,400,000 sq. ft.	393 AF	785 AF
Recycled Water Main	1,240,000 sq. ft.	43 AF	85 AF
Conveyance Force Main	1,003,000 sq. ft.	35 AF	69 AF
Pressure Main Subtotal	2,243,000 sq. ft.	77 AF	154 AF
		547 AF	**1094 AF**

*assumes 30% voids in soil (which is conservative, could be 35-40%)

total area at a given time	306,796 sq. ft.
2 block by 3 block area	1,250,000 sq. ft.

Approximate areas and volume of water of high groundwater areas		Volume w/ 5' of water*	Volume w/ 10' of water*
lake area #1; Paso Robles & 16th area	3,000,000 sq. ft.	103 AF	207 AF
lake area #2; Pasadena St. area	5,000,000 sq. ft.	172 AF	344 AF
lake area #3; Questa by the Sea area	12,000,000 sq. ft.	413 AF	826 AF
lake area #4; LOVR downtown area	6,000,000 sq. ft.	207 AF	413 AF
		895 AF	**1791 AF**

I Acre-foot (AF)	325,851 gallons

Receiving areas of pumped waters from Dewatering Plan, pp. 15-16	Capacity	Capacity	
construction, compaction, dust control	5,000 gpd	0.02 AFD	
mid-town retention basin (safety factor 2)	16,000,000 gpd	49.1 AFD	12.3 ft/day
mid-town retention basin (safety factor 4)	8,000,000 gpd	24.6 AFD	6.1 ft/day
Broderson	810,000 gpd	2.5 AFD	

Estimated pumping rates from Dewatering Plan, p. 17	Gallons Per Day, gpd	Acre Feet per Day	Days to pump 1000 AF	GPM
min. estimated disposal requirement for single area	893,000 gpd	2.7 AFD	**365 days**	620
max estimated disposal requirement for single area	1,900,000 gpd	5.8 AFD	**172 days**	1319
max estimated disposal requirement for four areas	7,000,000 gpd	21.5 AFD	**47 days**	4861

hydraulic conductivity, p.7	10-50 feet per day
inflow of seawater, p.7	pumping will have to increase, where is the water to go, induced seawater intrusion

perc rates, minutes per inch	ft/day
1	120
2	60
3	40
4	30
5	24
10	12
12	10
perc rates were typically between 1-4 min/inch	30-120 feet per day based on measured perc rates