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Department of Planning and Building San Luis Obispo County

Alex Hinds, Director
Bryce Tingle, Assistant Director
Barney McCay, Chief Building Official
Norma Salisbury, Administrative Services Officer

DATE: JUNE 25, 1992

TO: PLANNING COMMISSION

FROM: JOHN HAND, ADVANCE PLANNING *HH.*

VIA: *At* ALEX HINDS, DIRECTOR, PLANNING & BUILDING DEPARTMENT

SUBJECT: LOS OSOS VALLEY GROUNDWATER BASIN
RESOURCE CAPACITY STUDY

SUMMARY

The capacity of water systems in the Los Osos Valley groundwater basin is exceeded by demand, based upon analysis of current use patterns and the basin's estimated long-term sustainable yield.

In accordance with procedures specified by the Resource Management System, this information was communicated to the Board of Supervisors via the Annual Resource Summary Reports for 1990 and 1991. The 1990 report included a recommended level of severity II for the groundwater basin. The 1991 report recommended that the level II be changed to level III, based upon further evaluation of the data.

In approving the 1990 report on March 12, 1991, the Board directed staff to prepare a resource capacity study for the purpose of confirming the recommended level of severity. On January 14, 1992, the Board approved a proposed work program for the resource capacity study, a copy of which is attached. RMS procedures require that the Planning Commission hold a public hearing on the resource capacity study and transmit the study to the Board of Supervisors with appropriate recommendations. The resource capacity study is transmitted herewith for consideration by the Planning Commission.

RECOMMENDATION

The Planning Commission should recommend to the Board of Supervisors that:

1. The recommended level of severity III for the water system serving the Los Osos Valley groundwater basin should be certified;

2. The recommended level of severity II for the basin's water supply should be certified;
3. The three major water purveyors in the Los Osos area should cooperatively implement conservation measures, as specified in the resource capacity study;
4. The County, through CSA #9, and the other major water purveyors, should cooperatively perform additional investigations, as specified in the resource capacity study, to provide more definitive information upon which to base future recommendations;
5. The County should estimate the effect of relocating coastal wells on the current seawater intrusion problem and prepare a schedule for implementing the relocation;
6. The water supply for the Los Osos area should be increased by an amount which would assure the necessary ocean outflow to prevent seawater intrusion, less the annual reduction in extractions attributable to conservation measures implemented by the basin's water purveyors in response to recommendation 3., above. Within one year of the acceptance of this resource capacity study, a commitment should be made to some method, or combination of methods, for achieving this result;
7. A moratorium should be enacted which would apply to all land divisions within the South Bay Urban Reserve Line. While residential building permits could continue to be accepted for processing, it should be noted that most of the land area within the URL is already subject to the sewer moratorium.
8. The Planning and Engineering Departments should review additional water level data when it becomes available and advise the Board of Supervisors if changes to these recommendations would be appropriate, based upon the new information.

DISCUSSION

See attached resource capacity study.

OTHER AGENCY INVOLVEMENT

This study was prepared by the Planning Department, with significant collaboration with the Engineering Department. Implementation of the study's recommendations will be the responsibility of both departments.

FINANCIAL CONSIDERATIONS

The recommended conservation measures would result in some expense to the county, since County Service Area No. 9 is one of the water purveyors in the area. It is estimated that implementation of the recommended measures would involve an annual operating cost of approximately \$1200 to cover materials (readily available) and postage.

The cost of the recommended groundwater studies is as follows:

- * Sampling salinity, first year, on a quarterly basis; analysis of five wells and preparation of reports \$2500 to \$3200
- * Annual sampling, thereafter, five wells \$600 to \$750 / yr
- * Annual review of data / trends; summary report to RMS \$1500 / yr
- * Study to evaluate potential effectiveness and strategy for re-locating coastal wells; expanded simulation modelling from USGS report to evaluate potential for well relocation \$15000 to \$25000

Resource Capacity Study
Los Osos Valley Groundwater Basin

Summary of findings, conclusions and recommendations

New development in the Los Osos area is currently limited by two measures which have been enacted in response to water supply and water quality problems. Since 1988, a moratorium imposed by the Regional Water Quality Control Board (RWQCB) has prohibited the issuance of permits for construction involving new or expanded septic systems within a designated prohibition area. The Local Coastal Plan (LCP) Interim Service Capacity Allocation policy specifies that any remaining water supply capacity should be allocated first to agriculture, then to infill development on existing lots, additional land divisions in areas already substantially subdivided, additional divisions within the urban service line (USL) and lastly to land divisions outside the USL. Since remaining supplies are very low, at best, and since seawater intrusion is occurring, the system can be said to have no excess capacity. Thus, the allocation policy has the practical effect of prohibiting most new development in the Los Osos area.

The Resource Management System has recommended level of severity III for the Los Osos Valley groundwater basin, and that some measures to limit demand should be implemented until such time as the supply can be increased. This resource capacity study has been undertaken to certify the recommended level of severity and to recommend measures for correcting the resource deficiency.

It is the finding of this resource capacity study that:

- a. Level of severity III exists for the water system in the Los Osos Valley groundwater basin and level II exists for water supply;
- b. the Interim Service Capacity Allocation in the Estero Area LCP should be revised to acknowledge that there is no excess system capacity to be allocated;
- c. the water system should be modified to eliminate the factors causing seawater intrusion;
- d. the area's water purveyors should implement a package of permanent water conservation measures;
- e. the area's water purveyors should jointly undertake a regular monitoring program to determine the ongoing status of seawater intrusion;
- f. measures for increasing the water supply should be evaluated and pursued as appropriate;
- g. a moratorium on new subdivisions should be enacted, to include the area within the boundaries of the South Bay Urban Reserve Line;
- h. when new information about the basin's water supply becomes available, it should be promptly reviewed to determine whether the moratorium should be extended to include building permits in addition to subdivisions.

of the diminishing supplies. The LCP's Interim Service Capacity Allocation reserved 800 AFY (consumptive use) for agricultural use to protect existing and projected agricultural water needs. Any remainder would be allocated, first, to infill development on existing subdivided lots, then to certain other development and, lastly, to new subdivisions within the urban service line boundary. The allocations were intended to remain in effect until a resource capacity study was completed which would either confirm the conclusions upon which the allocations were based or would provide new information leading to their modification or elimination.

The LCP also emphasized the linkage between solutions to the water quality and water supply problems. It explained that "*one of the problems with sewerage is that the exportation of wastewater may lead to lowering of the safe yield of the Los Osos groundwater basin and increase the risk of seawater intrusion*".

RMS Levels of Severity. Since adoption of the LCP, the USGS and DWR reports have been completed. These reports contain the best information currently available regarding the water supply and water quality issues in the Los Osos Valley groundwater basin. A preliminary review of the reports was conducted in preparation for the resource management system's 1990 Annual Resource Summary Report. The 1990 report included a recommended level of severity II for the Los Osos Valley groundwater basin and a level of severity III for the water system.

The USGS and DWR reports have now been thoroughly reviewed as the principal data sources for this resource capacity study. The review of these documents has led to a conclusion that the level of severity for water supply in the basin should be level III rather than level II, and this recommendation is included in the 1991 Annual Resource Summary Report.

When the Board of Supervisors directed the Planning Department to complete this resource capacity study, they indicated that the study should:

- 1) Summarize the findings of the USGS and DWR reports and interpret them in the context of the resource management system;
- 2) Determine the cause and extent of seawater intrusion at various depths below the ground surface;
- 3) Assess the potential impacts of continued intrusion;
- 4) Critically examine the conclusion of previous studies that sewage collection, treatment and recharge will increase the basin's dependable yield;
- 5) Include well level data for the period since 1986;
- 6) Include chloride sampling data since 1986;
- 7) Include relevant information from the nitrate study, currently in progress.

The balance of this resource capacity study addresses these questions.

averaged slightly less than 16 inches, compared to the average of 19.2 inches for the 32-year period from 1955 to 1987 (Monthly Precipitation Table, DWR, Table 1, p. 8). During the period from 1970 to 1977 it is estimated that there was an average net outflow of 1030 AFY, slightly less than the outflow required to prevent seawater intrusion. In 1986, a year in which rainfall was about eight percent greater than normal, outflow to the ocean was only 590 AFY, or about half of what is required to prevent seawater intrusion (USGS, Table 6, p. 47). Thus, using water budget analysis, it appears that the basin was at or near an overdraft condition in 1986. However, such calculations are informed estimates of the variable factors. It is difficult to determine whether net outflow to the ocean equals the required 1100 AFY or is slightly less than that. Thus, whether to define the water supply as level of severity II or III is a matter of judgement.

Projected water budget, 2010. The USGS report, in its examination of simulated alternatives involving various water supply and wastewater disposal options, found that continued reliance on groundwater for supply and septic systems for disposal would result in an increased water budget deficit for 2010, and a small increase in seawater intrusion. Increases in municipal pumpage would be largely, but not totally, offset by increases in return flow from septic systems and urban landscape irrigation. In the simulated water budget for 1986, pumpage exceeded return flow by 550 AFY (USGS, Table 6, p. 47). In the 2010 water budget, the deficit is projected at 930 AFY, an increase of 380 AFY (USGS, Table 8, Alternative 1, normal rainfall]).

Water levels. The relationship between supply and demand in a groundwater basin may also be evaluated through observation of long-term trends in water levels. In confined aquifers, which characterize much of the Los Osos Valley groundwater basin, the water level in a well is referred to as its potentiometric head. The USGS report found that trends in potentiometric head for a sample of wells located in the groundwater basin for the period 1970-77 showed a slight long-term decline (USGS, p. 22, Figure 10, p. 23). The report also states:

"Potentiometric heads in deep wells near the south end of Morro Bay suggest that seawater has been intruding at least intermittently in recent years."

(USGS, p. 29).

Water quality. Water quality data can also be a useful indicator of excess demand in a coastal aquifer. Increases in salinity in wells near the coastline can signal the presence of seawater intrusion. Increases in chloride concentration were observed in observation wells located along the Morro Bay sandspit, for the period 1977-86:

"The water-quality and potentiometric-head data for wells near the south end of Morro Bay indicate that the direction and rate of underflow across the ocean boundary probably varies with depth in the basin fill. Deep aquifers (more than about 200 feet below land surface) are heavily stressed by pumpage at large

municipal wells. Deep aquifers have potentiometric heads generally slightly below sea level, and they are becoming more saline at the sandspit. Shallow aquifers, which are less heavily stressed, have potentiometric heads above sea level, and they are not becoming significantly more saline at the sandspit." (USGS, p. 30, and Table 4)

"The increases in chloride concentration indicate that there may have been a net inflow of seawater during 1977-86. However, there are not enough data to draw firm conclusions. The small changes in salinity could have resulted from slight shifts in the location of the interface, such as shifts resulting from normal seasonal and annual variations in recharge." (USGS, p. 29)

The DWR report points out that not only did the actual sampling indicate an increase in salinity, but also the computer simulations indicated the likelihood of seawater intrusion in 1986 (DWR, p. 35). Thus, the DWR report found that "*(t)he concentration of chloride ions in the water from wells on the sandspit along the coast showed an increase from 1977 to 1986, indicating that sea water has intruded.*" (DWR, p. 1) However, because of the inherent difficulty in determining the true cause of salinity in a coastal aquifer, additional sampling would have to be conducted before a firm conclusion could be reached (DWR, p. 63).

The DWR report suggests that seawater intrusion in the Los Osos Valley groundwater basin is probably occurring in those portions of the seawater/fresh water interface influenced by pumping depressions associated with wells located near the coast. However, the report does not include a simulation indicating whether seawater intrusion would occur if coastal wells were replaced by inland wells. Thus, the report does not rule out the possibility that the intrusion may be a more generalized condition attributable to basin-wide overdraft.

Water Level Data, 1986-91

The county Engineering Department has provided recent water level data for three wells located in the groundwater basin. Locations of these wells are indicated on the accompanying map, Figure 2. The wells are the same wells identified in Table 9 of the DWR Report (p. 36) and for which historic water level data are shown graphically in Figures 22 through 28 of the report (pp. 37 through 40). Two of these three wells demonstrate a slight long-term declining trend in water level. The water level in well K1, which represents the shallow layer of the aquifer, has dropped between three and four feet over the last 21 years. Well P2, which represents the mid-layer of the aquifer, shows a 11.6 foot decline over the past 18 years. Well L6, which represents the deepest layer, apparently had declining water levels until the mid-eighties, when levels began to increase. Levels in this well have risen approximately 13 feet in the past seven years. (This increase may be explained by the fact that a production well located in the vicinity of well L6 ceased operation in the mid-eighties, allowing water levels to rise.) The differing performance of

these wells makes it difficult to draw general conclusions which apply to all portions of the basin. However, the continuing downward trend of wells K1 and P2 supports the existence of an overdraft condition.

Water level data is also being analyzed independently by a group of Los Osos residents with the assistance of Cal Poly faculty. When this study is completed, the information it generates should be considered, together with existing data, and conclusions should be revised if warranted.

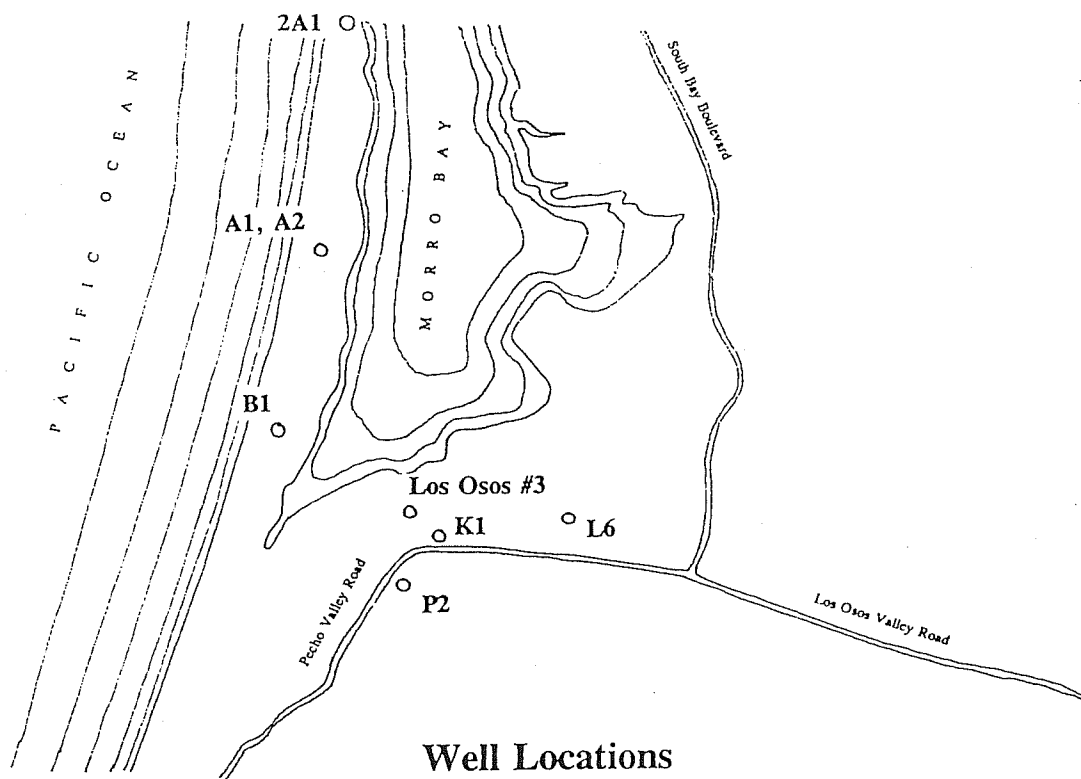


Figure 2

Water Quality Data, 1986-91

The DWR report includes water quality data for three wells located on the Morro Bay Sandspit. Table 7 (P. 17) shows sample results for wells 11A1, 11A2 and 14B1, including chloride content and total dissolved solids (TDS). Chloride content increased in all three wells between 1977 and the mid-1980s. The report stated that this increase in chlorides indicates some intrusion of seawater. However, in the period since 1986, the chloride content of two of these wells has declined slightly (wells A1 and B1) while the third has

continued to show an increase (well A2). (See map, Figure 2, for well locations.) A fourth well (well 2A1), which was not sampled in 1986, shows increased chlorides for 1992 when compared to 1977.

The Engineering Department has also provided data for several wells located in the Baywood/Los Osos area, but not on the sandspit. Some of these wells have been sampled only occasionally, making significant trends difficult to discern. For wells where sufficient sampling data exists, the chloride content appears to be relatively stable. However, one well, identified as Los Osos #3, does show an increase of chlorides. Seven samples taken between April 1974 and June 1979 averaged slightly less than 28 milligrams of chloride per liter, with a high reading of 35 mg/l in 1978. Five samples taken between December 1983 and January 1992 averaged 59.8 mg/l with a high reading of 68 mg/l in 1990.

It should be noted that the data regarding the chemical constituents of these water samples is raw data only, and has not been subjected to the detailed analysis normally required before firm conclusions can be reached. Nonetheless, it does suggest that seawater intrusion may be taking place and that ongoing monitoring and analysis should be conducted.

Interpretation of data in the context of the Resource Management System

The Resource Management System makes a distinction between water supply issues and water system issues. With regard to **water supply**, "A level III problem exists when water demand equals the available resource; the rate of use has reached the safe yield of the resource." "The capacity of a **water system** is the design capacity of its component parts..." "...a level III problem exists when water demand equals available capacity; in this case, when a water distribution system is functioning at design capacity." (Framework for Planning, Local Coastal Plan, pp. 47,48)

For the Los Osos Valley groundwater basin, available data from the USGS and DWR reports support a conclusion that a level III problem exists for the **water system**. Well location is considered to be a "system" issue. Production wells located near the coast in the western part of the basin are causing seawater intrusion and the system, of which these wells are a component, is operating in excess of its design capacity.

It is less clear that a level III exists for **water supply**, although the evidence seems to point in that direction. Relocation of the coastal wells could correct the **system** problem. However, even after the system problem is corrected, there may continue to be some portions of the seawater/fresh water interface where intrusion takes place. The USGS report's computer simulations do not address this issue specifically. However, the DWR report's discussion of overdraft suggests that it may be a basin-wide phenomenon. In addition, the identification of increased salinity in the sand spit wells, which are not affected by local pumping depressions, also indicates an overall supply problem, although additional studies would be required to provide confirmation.

Conclusions about supply, demand and long-term sustainable yield

The USGS and DWR reports examined several different aspects of the water supply issue. Long-term sustainable yield was estimated to be 2200 AFY. Extractions in 1986 were estimated to be 3400 acre-feet, indicating the existence of an overdraft of 1200 AF. A water budget was constructed for the basin which indicated the minimum amount of outflow to the ocean necessary to prevent seawater intrusion. Computer modelling indicates that the estimated actual outflow was less than required to prevent intrusion. Water samples from observation wells indicated the presence of increasing amounts of chlorides and total dissolved solids. These findings led the authors of the two studies to the conclusion that the basin may be in a long-term overdraft condition and that seawater intrusion may be taking place. The 1986-91 data, while still not definitive, support the conclusions reached by the USGS and DWR investigators.

Cause and extent of seawater intrusion at various depths below the ground surface

The cause of seawater intrusion, in general, is explained in Appendix C of the DWR report. The specific cause of the intrusion occurring currently in Los Osos is indicated in the DWR report on Tables 2 and 11. These tables show that the domestic water use has been at, or slightly higher than the long-term sustainable yield since 1984. This, in conjunction with the less-than-normal rainfall recharge over this period, makes seawater intrusion inevitable. ←

The precise current extent of seawater intrusion is not known. However, some data are available from which conclusions might be drawn. If a funding source is available, the Engineering Department could take a closer look at this data. Salinity in groundwater may be due to causes other than the intrusion of seawater. However, determining the true causes is sometimes difficult. In some instances, chemical analyses and the ratios of certain constituent ions may prove helpful in identifying sea water. At the present level of knowledge, however, chemical analyses can be used to distinguish sea water from certain oil-field brines or connate water (water trapped with the original sediments) only with the greatest difficulty. (DWR, p.63)

Potential impacts of continued seawater intrusion

Continued seawater intrusion has short-term and long-term consequences. In the short term, water from affected wells becomes increasingly saline. The water can be blended or desalted ← and continue to be used for general municipal purposes, or its use can be restricted to certain functions which do not require potable water - for example, some industrial or agricultural uses. In some cases, wells may be abandoned and new ones drilled at locations farther

inland. In the long term, sea water intrusion reduces the fresh water storage capacity of the groundwater basin. Seawater intrusion may be theoretically reversible, but once high concentrations of salt have saturated the pore spaces between soil particles, several times the volume of intruded ground water would be required to flush out the groundwater basin. Consequently, the effect of sea water intrusion tends to be cumulative. (DWR report, p.35)

Critically examine the conclusion of previous studies that sewage collection, treatment and recharge will increase the basin's dependable yield

The proposed sewer plan includes provisions for the collection of wastewater and disposal at two strategically located recharge sites. At the planned recharge sites, the return flow is concentrated in locations that are upgradient of the municipal wells. This provides a more efficient recharge method than nonconcentrated leach field recharge.

Groundwater in the Los Osos basin flows down and towards the ocean. Because of the presence of various clay strata, it is easier for the water to flow horizontally towards the ocean than vertically down. Currently, with septic system recharge, water enters the basin from the top. Most of this water flows to the ocean before it reaches the lower part of the basin where the municipal wells are supplied. Recharge efficiency is improved with treated water recharge by concentrating the recharge upstream from the municipal wells at a location where the water will miss the clay layers and will more directly recharge the lower depths of the basin from which most of the water is now pumped. Analysis of the water budgets for a collection and recharge system indicates that this system may result in a sustainable yield approximately 2000 AFY greater than the yield for a septic tank system.

Alternative actions to increase supply

To correct the current supply deficiency in the Los Osos Valley groundwater basin would require a supply increase of 1300 AFY. This could be accomplished by one or some combination of the measures discussed in this section.

Imported water. The DWR report concludes that the South Bay area should import 600 AFY of water for the purpose of serving the projected 2010 population of 24,300. (The 600 AFY figure is based on the assumption that the sewer project would be completed, resulting in an increase in the long-term sustainable yield from 2200 AFY to 4200 AFY.) Two potential sources of imported water are Lake Nacimiento and the State Water Project. A final determination to import water from one of these sources would make it unnecessary to use the other source.

As of November 19, 1991, California Cities Water Company had applied for 400-800 AFY from Lake Nacimiento for its Los Osos operation, while CSA #9 (Los Osos) had applied for

600 AFY for the entire basin, including the CSA #9, Cal Cities and S & T Mutual service areas. On May 27, 1992, the Board of Supervisors voted not to include CSA #9 as a recipient of State water.

Relocation of coastal wells. The DWR report states that a high capacity pumping well located near the coast would undoubtedly cause (localized) seawater intrusion, even if outflow to the ocean were greater than 3,000 AFY along the rest of the ocean boundary (DWR, p.34). In fact, all three of the major water purveyors in the basin have wells located within 1600 feet of the shoreline of Morro Bay. These wells are causing a reverse hydraulic gradient in that part of the basin which may be the primary source of the seawater intrusion found by the USGS and DWR studies. Reduction in pumping from these wells and optimizing the location of future wells could eliminate this cause of intrusion. Re-running the USGS computer model with revised well locations could provide useful information which could assist in developing a strategy for determining the locations for new wells and reducing pumping from existing wells.

Desalination. A 1991 draft report by the California Coastal Commission contains a summary of existing and proposed desalination plants in California and the estimated cost of the water supplied by these plants (Seawater Desalination in California, 1991). The report estimates that most seawater plants in the state would produce potable water for a cost in the range of \$1300 to \$2200 per acre-foot. The average cost is about \$1800 per acre-foot. In comparison, the reported cost of water from a variety of other sources averaged \$500 per acre-foot. This cost differential makes desalination a less economically attractive alternative when compared to some of the other possibilities for increasing supply.

Sewer project as proposed. The DWR report states that if wastewater is reclaimed and recharged at the recharge sites included in the proposed sewer project, the long-term sustainable yield of the basin would increase from the present 2200 AFY to 4200 AFY (DWR, Table 11, p.43). This annual yield would be sufficient to support a population of about 25,000 at a consumption rate of 150 gallons per capita per day (gpcd).

Alternative waste disposal options. Alternative waste disposal options were reviewed as part of the process which led to the recommendation of the sewer project. An advanced integrated ponding system (AIPS) was considered because of its potential to provide sewage treatment with a relatively low capital cost. Replacement of existing individual septic tanks with individual engineered septic systems was also considered.

The sewer project and the alternative waste disposal options were reviewed by two consulting firms, the Regional Water Quality Control Board, the State Water Resources Control Board and the U.S. Environmental Protection Agency.

Other water reclamation projects. The 1986 Master Water Plan Update discusses reclamation of waste water as a means of increasing local water supplies. The report suggests that reclamation should be given increased consideration for agricultural,

landscaping and certain types of industrial uses. The report did not identify any specific potential reclamation projects in the Los Osos area. However, the proposed sewer project may be considered a reclamation project, since almost 100 percent of the wastewater would be returned to the groundwater basin.

Alternative actions to stabilize or reduce demand

Conservation. It is clear from reviewing the recent performance of such communities as San Luis Obispo and Cambria that dramatic reductions in consumption rates are possible using various combinations of voluntary and mandatory conservation measures. In August of 1990, Cambria residents reduced consumption by about 28% under Stage 1 restrictions and San Luis Obispo has achieved a 40 percent to 50 percent reduction. However, long-term planning is not usually based upon reductions of this magnitude, since the population may not sustain such efforts except in critical drought situations. Nonetheless, there are several conservation measures which can be built into the land development and water supply processes which have the capability to reduce overall consumption at all times, while reserving a selection of additional measures for use in times of drought. These include mandatory regulations and voluntary guidelines for achieving efficiency of outdoor irrigation; public education programs; requiring ultra-low flow plumbing fixtures in all new construction, and pricing policies which provide economic penalties for excessive water use. In drought emergencies, the principal measure for achieving additional conservation would be to reduce the amount of water which could be used without paying a substantial surcharge.

An additional source of conservation measures is the draft Memorandum of Understanding Regarding Urban Water Conservation in California, prepared for use in discussion of the issues regarding San Francisco Bay and the Sacramento - San Joaquin Delta Estuary (the Bay/Delta Proceedings). The draft memorandum contains an inventory of best management practices, suggested implementation schedules and methods for estimating potential water savings through implementation of each conservation measure.

Moratorium. In light of documented water system and supply deficiencies, demand for water could be temporarily stabilized by enactment of a moratorium of some kind. A basin-wide moratorium would affect approximately 622 parcels that are not already covered by the RWQCB water quality moratorium. 520 of these parcels are located inside the South Bay urban reserve line and 102 are located outside the URL. At least 67 percent of these parcels are already developed. The balance are vacant or under cultivation. The following moratorium options could be considered:

Moratorium on new land divisions. A moratorium on new land divisions in the affected basin could be enacted. While this could allow some new construction to proceed on existing lots of record, the creation of new lots would be prohibited until the system and supply deficiencies were corrected. This approach is based on the

presumption that it would be unwise to increase the potential for new development in the face of the present evidence.

Partial or total moratorium on new residential building permits. A moratorium might apply to new construction only or it might also include remodeling involving increases in the number of bedrooms and/or bathrooms. It might apply only to single-family detached residences and might exempt denser forms of housing, based on the fact that housing with less land area uses less water for landscape irrigation. A moratorium on building permits may be considered premature at this time. However, it should be considered for prompt implementation if further studies of salinity and water levels confirm the need for additional action.

Moratorium on all new building permits requiring additional plumbing fixtures. This would include commercial and industrial as well as residential development. A measure such as this is not presently warranted.

Alternative boundaries for a moratorium area. A moratorium could include the entire groundwater basin or it could apply to some smaller area, such as the area within the South Bay Urban Reserve Line. In the present situation, the seawater intrusion related to the location of coastal wells in the western part of the basin can probably not be influenced by actions taken in the eastern part of the basin. Thus, any moratorium implemented at this time should be limited to the area within the URL, which excludes the eastern part of the groundwater basin.

Recommendations

Based on the best available information as presented in this resource capacity study, it is recommended that your Board take the following actions:

1. Certify a level of severity III for the water system, and level of severity II for water supply in the Los Osos Valley groundwater basin.
2. In response to the LOS III, the following actions should be taken:
 - a. The three major water purveyors in the area - CSA #9, Southern California Water Company, and S & T Mutual Water Company - should implement the following conservation measures on a permanent basis:
 1. Implement ascending block rate pricing structures;
 2. Adopt a water bill format that includes comparative use data;
 3. Provide educational materials for use in the public schools;
 4. Reduce system leakage to a maximum of 7% through establishment of

- an on-going leak detection and elimination program (such a program has been quite successful in Cayucos);
5. Provide leak detection assistance to customers;
 6. Provide landscape audits for customers to help them reduce the amount of water used for landscape irrigation;
 7. Award water bill discounts to customers who install or convert to xeriscape;

b. The Los Osos area water purveyors should consider signing the Bay/Delta Memorandum of Understanding regarding urban water conservation, or adopting the best management practices contained in the MOU, in addition to the seven conservation measures listed in item a., above.

c. The water purveyors in the Los Osos area - CSA #9, Cal Cities Water Co. and S & T Mutual Water Co. - should enter into a joint powers agreement for the purpose of monitoring selected well sites for the presence of salt water. The agreement should address identification of wells to be monitored, frequency of monitoring, monitoring methodology, reporting and funding. Monitoring results should be reported annually through the Resource Management System. The joint powers agreement should be prepared by the San Luis Obispo County Flood Control & Water Conservation District.

d. Estimate the potential effectiveness of relocating coastal wells as a means of reducing or eliminating seawater intrusion. Re-run the USGS computer simulation with modifications to the well location parameter to assist in developing a strategy for replacement of coastal wells.

3. The water supply for the Los Osos area should be increased by an amount which would assure the necessary ocean outflow to prevent seawater intrusion, less the annual reduction in extractions attributable to conservation measures implemented by the basin's water purveyors in response to recommendations 2.a. and 2.b., above. Within one year of acceptance of this resource capacity study, a commitment should be made to some method, or combination of methods, for achieving this result.
4. Enact a moratorium which would apply to all land divisions within the boundaries of the South Bay Urban Reserve Line. This area includes the western part of the basin most directly associated with the pumping which results in seawater intrusion. The large lot areas to the East, primarily in agricultural use, would not be included.

The moratorium would apply only to land divisions at this time. While residential building permits could continue to be accepted for processing, pending the results of ongoing monitoring and analysis of well levels and seawater intrusion, it is important to note that most of the land area within the URL is already subject to the sewer

moratorium. The moratorium would be terminated under the following circumstances:

- a. Importation of sufficient additional water supplies, in combination with conservation measures, to eliminate the discrepancy between long-term sustainable yield and annual extractions, or;
- b. Demonstration that relocation of coastal wells would eliminate seawater intrusion and subsequent relocation of the wells, or;
- c. Evidence that water levels that now appear to be declining have stabilized or are rising, or;
- d. Acceptance by the Board of Supervisors of any new information indicating that the long-term sustainable yield of the groundwater basin now exceeds annual extractions.

Resource Capacity Study
Los Osos Valley Groundwater Basin

Summary of findings, conclusions and recommendations

New development in the Los Osos area is currently limited by two measures which have been enacted in response to water supply and water quality problems. Since 1988, a moratorium imposed by the Regional Water Quality Control Board (RWQCB) has prohibited the issuance of permits for construction involving new or expanded septic systems within a designated prohibition area. The Local Coastal Plan (LCP) Interim Service Capacity Allocation policy specifies that any remaining water supply capacity should be allocated first to agriculture, then to infill development on existing lots, additional land divisions in areas already substantially subdivided, additional divisions within the urban service line (USL) and lastly to land divisions outside the USL. Since remaining supplies are very low, at best, and since seawater intrusion is occurring, the system can be said to have no excess capacity. Thus, the allocation policy has the practical effect of prohibiting most new development in the Los Osos area.

The Resource Management System has recommended level of severity III for the Los Osos Valley groundwater basin, and that some measures to limit demand should be implemented until such time as the supply can be increased. This resource capacity study has been undertaken to certify the recommended level of severity and to recommend measures for correcting the resource deficiency.

It is the finding of this resource capacity study that:

- a. Level of severity III exists for the water system in the Los Osos Valley groundwater basin and level II exists for water supply;
- b. the Interim Service Capacity Allocation in the Estero Area LCP should be revised or rescinded to acknowledge that there is no excess system capacity to be allocated at this time within the Urban Service Line;
- c. the water system should be modified to eliminate the factors causing seawater intrusion;
- d. the area's water purveyors should implement a package of permanent water conservation measures;
- e. the area's water purveyors should jointly undertake a regular monitoring program to determine the ongoing status of seawater intrusion;
- f. measures for increasing the water supply should be evaluated and pursued as appropriate;
- g. a moratorium on new subdivisions should be enacted, to include the area within the boundaries of the South Bay Urban Reserve Line;
- h. when new information about the basin's water supply becomes available, it should be promptly reviewed to determine whether the moratorium should be extended to include building permits resulting in increased water consumption in addition to subdivisions.

municipal wells. Deep aquifers have potentiometric heads generally slightly below sea level, and they are becoming more saline at the sandspit. Shallow aquifers, which are less heavily stressed, have potentiometric heads above sea level, and they are not becoming significantly more saline at the sandspit."

(USGS, p. 30, and Table 4)

"The increases in chloride concentration indicate that there may have been a net inflow of seawater during 1977-86. However, there are not enough data to draw firm conclusions. The small changes in salinity could have resulted from slight shifts in the location of the interface, such as shifts resulting from normal seasonal and annual variations in recharge." (USGS, p. 29)

The DWR report points out that not only did the actual sampling indicate an increase in salinity, but also the computer simulations indicated the likelihood of seawater intrusion in 1986 (DWR, p. 35). Thus, the DWR report found that "*(t)he concentration of chloride ions in the water from wells on the sandspit along the coast showed an increase from 1977 to 1986, indicating that sea water has intruded.*" (DWR, p. 1) However, because of the inherent difficulty in determining the true cause of salinity in a coastal aquifer, additional sampling would have to be conducted before a firm conclusion could be reached (DWR, p. 63).

The DWR report suggests that seawater intrusion in the Los Osos Valley groundwater basin is probably occurring in those portions of the seawater/fresh water interface influenced by pumping depressions associated with wells located near the coast. However, the report does not include a simulation indicating whether seawater intrusion would occur if coastal wells were replaced by inland wells. Thus, the report does not rule out the possibility that the intrusion may be a more generalized condition attributable to basin-wide overdraft.

Water Level Data, 1986-91

The county Engineering Department has provided recent water level data for three wells located in the groundwater basin. Locations of these wells are indicated on the accompanying map, Figure 2. The wells are the same wells identified in Table 9 of the DWR Report (p. 36) and for which historic water level data are shown graphically in Figures 22 through 28 of the report (pp. 37 through 40). Two of these three wells demonstrate a slight long-term declining trend in water level. The water level in well K1, which represents the shallow layer of the aquifer, has dropped between three and four feet over the last 21 years. Well P2, which represents the mid-layer of the aquifer, shows a 11.6 foot decline over the past 18 years. Well L6, which represents the deepest layer, apparently had declining water levels until the mid-eighties, when levels began to increase. Levels in this well have risen approximately 13 feet in the past seven years. (This increase may be explained by the fact that a production well located in the vicinity of well L6 ceased operation in the mid-eighties, allowing water levels to rise.) The differing performance of

Conclusions about supply, demand and long-term sustainable yield

The USGS and DWR reports examined several different aspects of the water supply issue. Long-term sustainable yield was estimated to be 2200 AFY. Extractions in 1986 were estimated to be 3400 acre-feet, indicating the existence of an overdraft of 1200 AF. A water budget was constructed for the basin which indicated the minimum amount of outflow to the ocean necessary to prevent seawater intrusion. Computer modelling indicates that the estimated actual outflow was less than required to prevent intrusion. Water samples from observation wells indicated the presence of increasing amounts of chlorides and total dissolved solids. These findings led the authors of the two studies to the conclusion that the basin, with the present pumping patterns, may be in a long-term overdraft condition and that seawater intrusion may be taking place. The 1986-91 data, while still not definitive, support the conclusions reached by the USGS and DWR investigators.

Cause and extent of seawater intrusion at various depths below the ground surface

The cause of seawater intrusion, in general, is explained in Appendix C of the DWR report. The specific cause of the intrusion occurring currently in Los Osos is indicated in the DWR report on Tables 2 and 11. These tables show that the domestic water use has been at, or slightly higher than the long-term sustainable yield since 1984. This, in conjunction with the less-than-normal rainfall recharge over this period, makes seawater intrusion inevitable.

The precise current extent of seawater intrusion is not known. However, some data are available from which conclusions might be drawn. If a funding source is available, the Engineering Department could take a closer look at this data. Salinity in groundwater may be due to causes other than the intrusion of seawater. However, determining the true causes is sometimes difficult. In some instances, chemical analyses and the ratios of certain constituent ions may prove helpful in identifying sea water. At the present level of knowledge, however, chemical analyses can be used to distinguish sea water from certain oil-field brines or connate water (water trapped with the original sediments) only with the greatest difficulty. (DWR, p.63)

Potential impacts of continued seawater intrusion

Continued seawater intrusion has short-term and long-term consequences. In the short term, water from affected wells becomes increasingly saline. The water can be blended or desalted and continue to be used for general municipal purposes, or its use can be restricted to certain functions which do not require potable water - ~~for example, some industrial or agricultural~~ uses. In some cases, wells may be abandoned and new ones drilled at locations farther

inland. In the long term, sea water intrusion reduces the fresh water ~~in~~ storage ~~in~~ capacity of the groundwater basin. Seawater intrusion may be theoretically reversible, but once high concentrations of salt have saturated the pore spaces between soil particles, several times the volume of intruded ground water would be required to flush out the groundwater basin. Consequently, the effect of sea water intrusion tends to be cumulative. (DWR report, p.35)

Critically examine the conclusion of previous studies that sewage collection, treatment and recharge will increase the basin's dependable yield

The proposed sewer plan includes provisions for the collection of wastewater and disposal at two strategically located recharge sites. At the planned recharge sites, the return flow is concentrated in locations that are upgradient of the municipal wells. This provides a more efficient recharge method than nonconcentrated leach field recharge.

Groundwater in the Los Osos basin flows down and towards the ocean. Because of the presence of various clay strata, it is ~~generally~~ easier for the water to flow horizontally towards the ocean than vertically down. Currently, with septic system recharge, water enters the basin from the top. Most of this water flows to the ocean before it reaches the lower part of the basin where the municipal wells are supplied. Recharge efficiency is improved with treated water recharge by concentrating the recharge upstream from the municipal wells at a location where the water will miss the clay layers and will more directly recharge the lower depths of the basin from which most of the water is now pumped. Analysis of the water budgets for a collection and recharge system indicates that this system may result in a sustainable yield approximately 2000 AFY greater than the yield for a septic tank system.

Alternative actions to increase supply

To correct the current supply deficiency in the Los Osos Valley groundwater basin would require a supply increase of 1300 AFY. This could be accomplished by one or some combination of the measures discussed in this section.

Imported water. The DWR report concludes that the South Bay area should import 600 AFY of water for the purpose of serving the projected 2010 population of 24,300. (The 600 AFY figure is based on the assumption that the sewer project would be completed, resulting in an increase in the long-term sustainable yield from 2200 AFY to 4200 AFY.) Two potential sources of imported water are Lake Nacimiento and the State Water Project. A final determination to import water from one of these sources would make it unnecessary to use the other source.

As of November 19, 1991, California Cities Water Company had applied for 400-800 AFY from Lake Nacimiento for its Los Osos operation, while CSA #9 (Los Osos) had applied for

presumption that it would be unwise to increase the potential for new development in the face of the present evidence.

Partial or total moratorium on new residential building permits. A moratorium might apply to new construction only or it might also include remodeling involving increases in the number of bedrooms and/or bathrooms. It might apply only to single-family detached residences and might exempt denser forms of housing, based on the fact that housing with less land area uses less water for landscape irrigation. A moratorium on building permits may be considered premature at this time. However, it should be considered for prompt implementation if further studies of salinity and water levels confirm the need for additional action.

Moratorium on all new building permits requiring additional plumbing fixtures. This would include commercial and industrial as well as residential development. A measure such as this is not presently warranted.

Alternative boundaries for a moratorium area. A moratorium could include the entire groundwater basin or it could apply to some smaller area, such as the area within the South Bay Urban Reserve Line. In the present situation, the seawater intrusion related to the location of coastal wells in the western part of the basin can probably not be influenced by actions taken in the eastern part of the basin. Thus, any moratorium implemented at this time should be limited to the area within the URL, which excludes the eastern part of the groundwater basin.

Recommendations

Based on the best available information as presented in this resource capacity study, it is recommended that your Board take the following actions:

1. Certify a level of severity III for the water system, and level of severity II for water supply in the Los Osos Valley groundwater basin.
2. In response to the LOS III, the following actions should be taken:
 - a. The three major water purveyors in the area - CSA #9, Southern California Water Company, and S & T Mutual Water Company - should jointly implement the following conservation measures on a permanent basis, subject to approval by appropriate regulatory agencies:
 1. Implement ascending block rate pricing structures;
 2. Adopt a water bill format that includes comparative use data;
 3. Provide educational materials for use in the public schools;

4. Reduce system leakage to a maximum of 7% through establishment of an on-going leak detection and elimination program. (Such a program has been conducted for CSA #9 and a similar program has been quite successful in Cayucos);
5. Provide leak detection assistance to customers;
6. Provide landscape audits for customers to help them reduce the amount of water used for landscape irrigation;
7. Award water bill discounts to customers who install or convert to xeriscape;

b. The Los Osos area water purveyors should consider signing the Bay/Delta Memorandum of Understanding regarding urban water conservation, or adopting the best management practices contained in the MOU, in addition to the seven conservation measures listed in item a., above.

c. The water purveyors in the Los Osos area - CSA #9, Cal Cities Water Co. and S & T Mutual Water Co. - should enter into a joint powers agreement for the purpose of monitoring selected well sites for the presence of salt water. The agreement should address identification of wells to be monitored, frequency of monitoring, monitoring methodology, reporting and funding. Monitoring results should be reported annually through the Resource Management System. The joint powers agreement should be prepared by the San Luis Obispo County Flood Control & Water Conservation District.

d. Estimate the potential effectiveness of relocating coastal wells as a means of reducing or eliminating seawater intrusion. ~~Re-run the USGS. If arrangements can be made with the USGS, the computer simulation should be re-run with modifications to the well location parameter to assist in developing a strategy for optimizing the management of extractions from the replacement of coastal wells.~~

3. The water supply for the Los Osos area should be increased by an amount which would assure the necessary ocean outflow to prevent seawater intrusion, less the annual reduction in extractions attributable to conservation measures implemented by the basin's water purveyors in response to recommendations 2.a. and 2.b., above. Within one year of acceptance of this resource capacity study, a commitment should be made to some method, or combination of methods, for achieving this result.
4. Enact a moratorium which would apply to all land divisions within the boundaries of the South Bay Urban Reserve Line. This area includes the western part of the basin most directly associated with the pumping which results in seawater intrusion. The large lot areas to the East, primarily in agricultural use, would not be included.

The moratorium would apply only to land divisions at this time. While residential building permits could continue to be accepted for processing, pending the results of

ongoing monitoring and analysis of well levels and seawater intrusion, it is important to note that most of the land area within the URL is already subject to the sewer

moratorium. The moratorium would be terminated under the following circumstances:

- a. Importation of sufficient additional water supplies, in combination with conservation measures noted in item 2, above, to eliminate the discrepancy between long-term sustainable yield and annual extractions, or;
 - b. Demonstration that relocation of coastal wells would eliminate seawater intrusion and subsequent relocation of the wells, or;
 - c. Evidence that water levels that now appear to be declining have stabilized or are rising, or;
 - d. Acceptance by the Board of Supervisors of any new information indicating that the long-term sustainable yield of the groundwater basin now exceeds annual extractions.
5. Staff should initiate a general plan amendment to delete South Bay Urban Area Standard 2., Interim Service Capacity Allocation, from the Local Coastal Plan for the estero area.
 6. Staff should be directed to transmit the final report of the Los Osos Water Basin Study Group as an advisory memo, along with recommended revisions to levels of severity, if warranted, as soon as the report can be reviewed and scheduled for discussion on the Board's regular agenda.

Resource Capacity Study
LOS OSOS VALLEY GROUNDWATER BASIN

Proposed Revisions

At the conclusion of the August 18, 1992 public hearing, the Board of Supervisors directed that the resource capacity study be referred back to the Planning Department and the Planning Commission to review the level of severity and to formulate an "Action Plan" with items 2, 3, 4, 6 and 9 of the Planning Commission's Exhibit A, and to include a retrofit program which would require retrofit of off-site plumbing fixtures as a condition of receiving a new residential water service. The elements of the Action Plan are summarized below:

Proposed Action Plan

2. The three major water purveyors in the area - CSA #9, Southern California Water Company, and S & T Mutual Water Company - should jointly implement the following conservation measures on a permanent basis:
 - a. implement ascending block rate pricing structures; **[Henric Skopinski of Cal Cities Water Company says that the Public Utilities Commission opposes ascending block rate pricing structures.]**
 - b. adopt a water bill format that includes comparative use data;
 - c. provide educational materials for use in the public schools;
 - d. reduce system leakage to a maximum of 7% through establishment of an on-going, periodic leak detection and elimination program (such a program has been conducted for CSA #9 and a similar program has been quite successful in Cayucos);
 - e. provide leak detection assistance to customers;
 - f. provide landscape audits for customers to help them reduce the amount of water used for landscape irrigation;
 - g. award water bill discounts to customers who install or convert to xeriscape; **[Address conflicts between tree-planting programs and xeriscape promotion.]**
 - h. insure that sources of water other than potable water are used to service area construction projects; and,

- i. initiate a retrofit program which would require replacement of high-water-use plumbing fixtures in off-site residences as a condition of receiving a new residential water service. **[Make sure that "retrofit" is clearly defined. Check appropriateness of a retrofit program in a community served by septic tanks.]**
3. The Los Osos area water purveyors should consider signing the Bay/Delta Memorandum of Understanding regarding urban water conservation, or adopting the best management practices contained in the MOU, in addition to the eight conservation measures listed in item 2., above.
4. The water purveyors in the Los Osos area - CSA #9, Cal Cities Water Co. and S & T Mutual Water Co. - should enter into a joint powers agreement for the purpose of monitoring selected well sites for the presence of salt water. The agreement should address identification of wells to be monitored, frequency of monitoring, monitoring methodology, reporting and funding. Monitoring results should be reported annually through the Resource Management System. The joint powers agreement should be prepared by the San Luis Obispo County Flood Control & Water Conservation District.
6. Implementation of any of the following shall trigger reconsideration of the Level of Severity:
 - a. Acceptance by the Board of Supervisors of any new information indicating that the long-term sustainable yield of the groundwater basin now exceeds annual extractions; or
 - b. Evidence that water levels that now appear to be declining have stabilized or are rising; or
 - c. Importation of sufficient additional water supplies, in combination with conservation measures, to eliminate the discrepancy between long-term sustainable yield and annual extractions.

[Consider deletion of item 6, or revising it to refer to changes to the level of severity in BOTH directions.]
9. Staff should be directed to transmit the final report of the Los Osos Water Basin Study Group as an advisory memo, along with recommended revisions to levels of severity, if warranted, as soon as the report can be reviewed and scheduled for discussion on the Board's regular agenda.

Additional "Best Management Practices"
from the Bay/Delta Memorandum of Understanding

- * Conduct interior water audits for residential, governmental and institutional customers;
- * Conduct large landscape water audits for customers with irrigated landscapes greater than three acres;
- * Public Information: provide speakers for community groups; use paid and public service advertising; promote conservation through the use of water bill inserts, etc;
- * Review proposed water use of new commercial and industrial projects before completion of the building permit process. Make recommendations for reducing water use;
- * Eliminate all non-conservation pricing; adopt conservation pricing; [**Possible conflict with Public Utility Commission policy.**]
- * Enact and enforce water waste prohibitions;
- * Designate a water conservation coordinator.