Los Osos CSD

# Los Osos Community Services District
# Alternatives Report for Wastewater Treatment

## Introduction

This report describes the process used to evaluate wastewater treatment alternatives for the Project Report. The Project Report is one of four elements required in the Facilities Plan that must be submitted to be eligible for State Revolving Loan Fund financing. Four different treatment plant options at six different sites were considered. Thirteen different combinations of treatment methods and treatment sites were evaluated.

Two workshops were held with a sub-committee of the Wastewater Committee, which advises the Los Osos CSD Board of Directors. The purpose of these workshops was to first frame the criteria that would used to assess the treatment alternatives and then assess/rank the alternatives using the criteria. To assist in this process a software package (Decision Criterium Plus) was used. Montgomery Watson has used this package on numerous projects where a complex array of criteria must be used to select a recommended alternative. It documents a framework for decision making and allows rapid assessment of the impact each criterion has in ranking the proposed alternatives.

## Background

The CSD began its alternatives evaluation by assessing the relative merits of the following treatment methods:

- AIWPS pond system,
- sequencing batch reactor (SBR)
- extended aeration.

These were evaluated at the following sites:

- Turri,
- Pismo,
- Eto/Nipomo,
- Resource Park,
- Holland,
- Powell.

Not all treatment alternatives were viable at all treatment sites. For example, AIWPS would fit only at the Resource Park site. Table 1 presents the viable combinations that were evaluated.

**Table 1. Potential Sites for Wastewater Treatment Alternatives**

| Sites | Treatment Alternatives | | | |
|---|---|---|---|---|
| | AIWPS | Ext. Aer. | Hybrid | SBR |
| Eto/Nipomo | | ✔ | | ✔ |
| Holland | | ✔ | | ✔ |
| Pismo | | ✔ | | ✔ |
| Powell | | ✔ | | ✔ |
| Resource Park | ✔ | ✔ | ✔ | ✔ |
| Turri | | ✔ | | ✔ |

## Evaluation Criteria

The criteria that were used to evaluate each alternative are shown in Figure 1. Many of these criteria were taken from "Vision Statement for Los Osos" developed by the Los Osos Community Advisory, or were developed in consultation with the Wastewater Committee and Subcommittee. A complete description each criterion is contained in the attachment to this report.

## Criteria Weightings

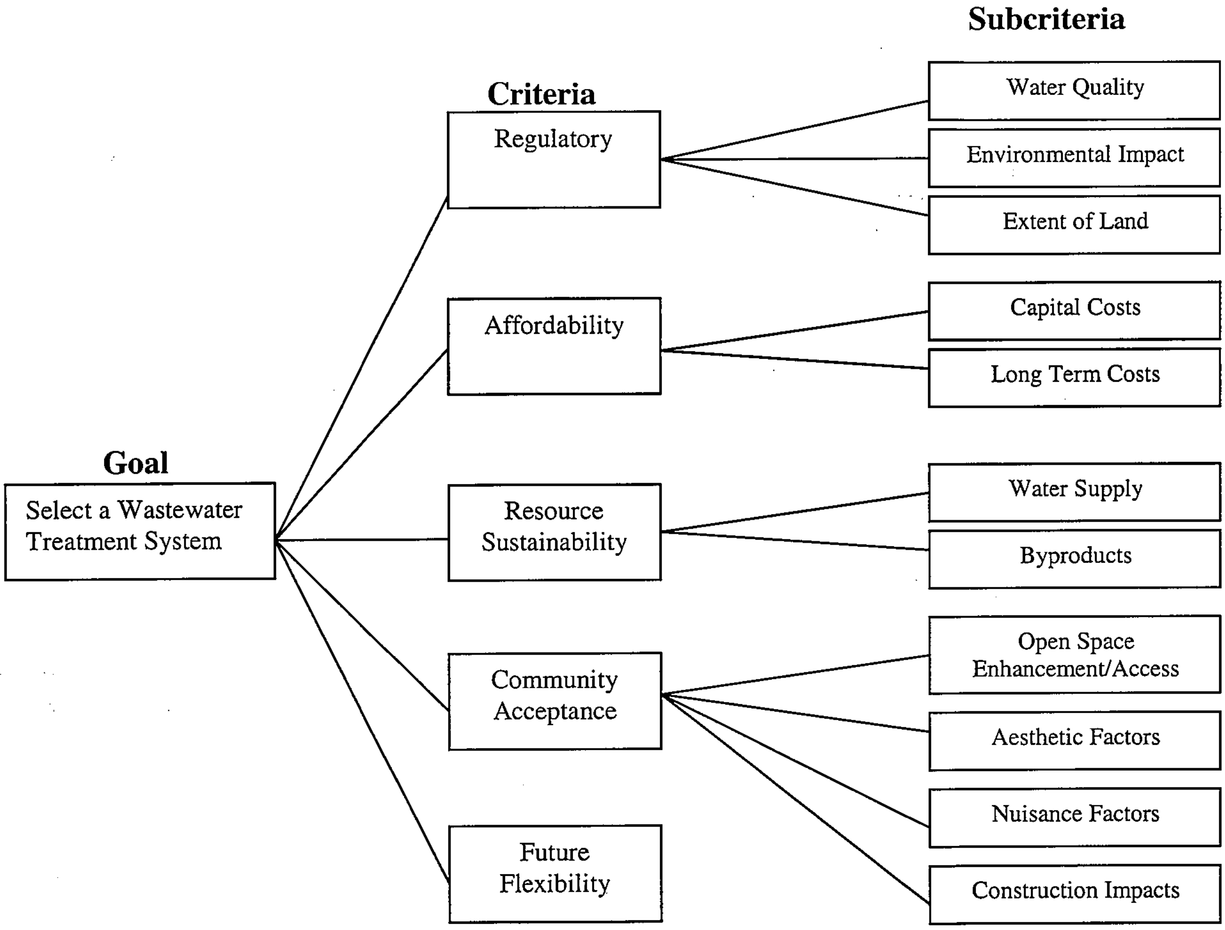
The weightings given to each of the criteria are summarized in Table 2. As can be seen in this table, affordability was given the heaviest weighting factor (56). This weight reflects the paramount importance of having an affordable alternative. The ability to satisfy regulatory requirements and sustain resources were given lower, but still significant weights (31 and 25 respectively).

**Table 2. Criteria Weightings**

| Criteria | Relative Weight |
|---|---|
| Regulatory | 31 |
| Affordability | 56 |
| Resource Sustainability | 33 |
| Community Acceptance | 25 |
| Future Flexibility | 1 |

Community acceptance represents the amount of accessible open space and the aesthetic benefits that can be provided to Los Osos. Resource sustainability represents Los Osos' goals to limit its growth to sustainable levels and to take care of its waste without imposing on other communities. Therefore, resource sustainability and community acceptance together represent many of the values stated in the Vision Statement for Los Osos. The combined weighting of these two criteria (58) is essentially equal to the weighting given to affordability, showing the importance of delivering Los Osos community values.

**Figure 1. Wastewater Treatment Criteria and Subcriteria**




## Results of First Workshop

On June 20, 2000 the first workshop was held with the Wastewater Subcommittee to refine and apply the criteria and subcriteria to the wastewater alternatives. The clearest result of the first workshop was that Resource Park was found to be the best site in meeting the range of criteria discussed above. In summary, the other treatment plant sites were found to be unable to deliver an aesthetic benefit to the community. The sites on the outskirts of town could not deliver a community use area that was readily accessible to the majority of residents in the manner that a central location such as Resource Park could. The other sites that were close to the center of Los Osos were too small to site a treatment plant and afford sufficient buffer to nearby residential neighbors.

Furthermore, the Powell, Eto, and Pismo sites had the added disadvantages of impacting endangered species or removing prime agricultural land from production. These impacts contributed to the low ranking of these sites. The Turri site would have less of these impacts. However, it cannot deliver readily useable public area because of its distance from the center of town. It also does not offer a large compensating cost advantage because of the cost conveying raw sewage to the site and treated effluent to the proposed disposal areas.

As a result of these findings, the number of alternatives was short-listed to the following four treatment alternatives at Resource Park:

- AIWPS
- Sequencing batch reactors
- Extended aeration
- Hybrid using extended aeration, but fully covered, odor scrubbed, and aesthetically treated

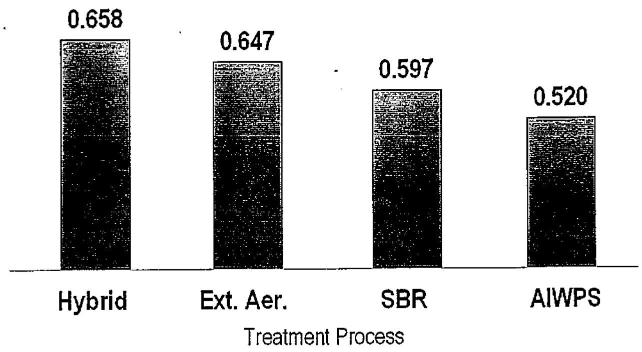
**Results of the Second Workshop**

A second workshop was held on July 7, 2000 to evaluate the alternative treatment systems at Resource Park. Using the criteria described above, it became evident that small foot print treatment alternatives (SBRs, extended aeration, and hybrid alternatives) can deliver a wide range of benefits. They minimize the amount of land needed, which lowers the cost of these alternatives. Therefore, even though they have higher construction costs than AIWPS, their overall capital costs are lower than AIWPS. Small foot print alternatives also allow more accessible land to be used as a park because they don't occupy the entire site with treatment ponds. Thus, they are able to deliver an important benefit (accessible parkland) without a cost penalty.

The small footprint alternatives also employ treatment processes that have been widely used in numerous locations for nitrogen removal. Thus, they are proven processes that would gain ready approval by the Regional Water Quality Control Board and the State Water Resources Control Board. The AIWPS facility, as proposed for Los Osos, does not have an established track record removing effluent nitrogen to the levels required for this project.

The ranking and scores of the alternatives are shown in Figure 2, using the criteria and weightings developed thus far. As shown, the hybrid alternative is ranked the highest. Its ranking is due to its ability to deliver a large amount of accessible parkland at a cost that is slightly lower than AIWPS. Because it uses a widely proven treatment process, it would readily gain regulatory approval.

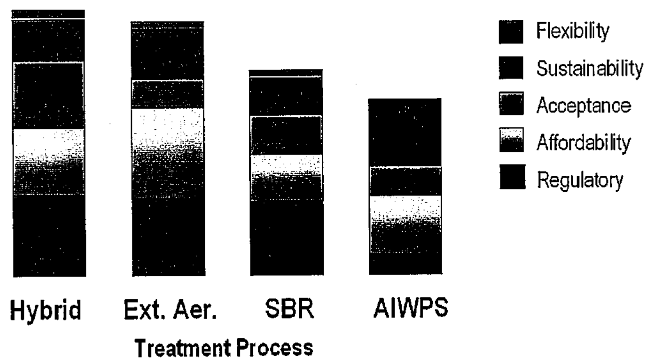
**Figure 2. Decision Scores of Alternatives**




## Alternative Descriptions

A more complete description of each of the treatment alternatives at Resource Park and how their attributes contributed to their ranking is presented in the following paragraphs and is shown in Figure 3.

**Figure 3. Contributions of Criteria to Decision Scores**




**AIWPS.** The AIWPS is a patented technology developed by Oswald Engineering Associates Inc. A complete description of the AIWPS is contained in the "The Resource Park Wastewater Facilities Project, Draft Report, January 31, 2000". The AIWPS is an innovative treatment system that relies on a series of ponds to treat wastewater. It is an aerobic wastewater treatment system that uses solar energy via algae growth, supplemented by mechanical aeration, to provide the needed oxygen for treatment. It generates biosolids in the form of algal material.

The treatment system and emergency storage require approximately 64 acres, leaving approximately 20 acres at Resource Park for potential community park and open space. As shown in Table 3, the land costs for this alternative (including mitigation land at a 1:1 ratio) are $8.4 million, the highest of all alternatives. It is this high land cost that causes this alternative to have the highest capital cost of all alternatives. If salvage value of land were not considered in the present worth analysis, the present worth cost of this alternative would be higher than the other alternatives by a greater margin. The annualized capital costs plus annual operations/maintenance costs result in a total annual cost of $2.3 million for this alternative.

Based on the criteria and subcriteria used to evaluate the alternatives, potential concerns associated with this alternative include:

- its ability to reliably meet the Regional Water Quality Control Board's water quality effluent limit of 7mg/L Total Nitrogen,
- its relatively high cost which is primarily associated with the amount of land needed for the ponds,
- its relatively high environmental impact associated with the amount of land needed for the ponds and the amount of mitigation land that would have to be purchased and managed,
- the limited amount of accessible park space associated with the facility,
- the need to treat the algal sludge to Class A standards to allow reuse by the community,
- the inability to treat odors originating from open ponds.

**SBR.** A sequenced batch reactor is a biologically based system that relies on a series tanks that sequentially fill, aerate, settle, and decant the wastewater to achieve the discharge standards. It is a compact process that has gained wide acceptance for its treatment capabilities. An SBR generates biosolids in the form of sludge rather than algal mass.

The treatment system, emergency storage, and aesthetic buffer space would require approximately 20 acres, and provides approximately 34 acres of community park or open space. Thus, this alternative could deliver more accessible parkland than the AIWPS alternative.

As shown in Table 3, the land costs for this alternative (including mitigation land at a 1:1 ratio) are $5.9 million. The construction cost for this alternative is the highest of all alternatives, but when the cost of land is considered, the total capital cost is less than for the AIWPS alternative. The annualized capital costs plus annual operations/maintenance costs result in a total annual cost of $2.4 million for this alternative, which is higher than the AIWPS alternative by four percent.

Based on the criteria and subcriteria used to evaluate the alternatives, potential concerns associated with this alternative include:

- it is a mechanized treatment process,
- the need to treat the biosolids to Class A standards to allow reuse by the community,
- the need to cover and fully odor scrub the process to allow its siting at Resource Park,
- its higher energy consumption (as compared with AIWPS).
- it has the highest cost, by a slight margin, when compared with the other alternatives at Resource Park

**Extended Aeration.** The extended aeration alternative is a biologically based system that relies on aerobic treatment of wastewater. It uses mechanical aeration and generates biosolids in the form of sludge. Developments made in the early 1980's have allowed this process to remove nitrogen to very low levels and it has gained wide acceptance as a reliable and simple treatment process.

The treatment system, emergency storage, and aesthetic buffer would require approximately 20 acres, and provides approximately 34 acres of accessible park or open space. This alternative can deliver more accessible parkland than the AIWPS alternative.

As shown in Table 3, the land costs for this alternative (including mitigation land at a 1:1 ratio) are $5.9 million. The construction cost for this alternative ($12.3 million) is the lowest of all alternatives, because many of the features of the other alternatives are not delivered. This alternative does not cover the processes, does not provide full odor scrubbing, and does not recycle biosolids within the Los Osos community.

The annualized capital costs plus annual operations/maintenance costs result in a total annual cost of $2.0 million for this alternative, which is the lowest of all the alternatives.

Based on the criteria and subcriteria used to evaluate the alternatives, potential concerns associated with this alternative include:

- it is a mechanized treatment process,
- the need to treat the biosolids to Class A standards to allow reuse by the community,
- it would be negatively impact the visual amenity of the community and could have a significant odor impacts on the nearby residential neighbors
- its higher energy consumption (as compared with AIWPS).

**Hybrid.** The hybrid alternative addresses the need to fully cover and odor scrub the extended aeration alternative in order to minimize the impact that a traditional above ground, mechanized treatment plant would have on community amenity. Breckenridge, Colorado and San Francisco have successfully used this approach to site this type of treatment facility. As with the traditional extended aeration system, this alternative will generate biosolids in the form of sludge.

The treatment system, emergency storage, and aesthetic buffer space would require approximately 20 acres, and provides approximately 34 acres of community park or open space. As with the SBR and extended aeration alternatives, this alternative delivers more accessible parkland than the AIWPS alternative.

As shown in Table 3, the land costs for this alternative (including mitigation land at a 1:1 ratio) are $5.9 million. The construction cost for this alternative ($15.7 million) is higher than the extended aeration alternative, because it is fully covered, odor scrubbed, and will allow biosolids recycling within the Los Osos community. This alternative allows a greater range of choices as to the use of Resource Park. That is, the land not used for treatment could be developed into a park or sold as surplus land if total project budgets become critical. Fifteen to twenty acres of land could be sold as surplus, which would lower the capital costs by $1.4 to 1.8 million. A further flexibility with this alternative would be that the surplus acreage could be used as mitigation land, which would lower the capital costs of this alternative by as much as $1.3 million. (This statement assumes that a mitigation ratio of 1:1.)

The annualized capital costs plus annual operations/maintenance costs result in a total annual cost of $2.3 million for this alternative, which is equal to the annualized cost of AIWPS. If surplus land were sold, the annualized costs could be reduced to $2.1 million, which would be nine percent lower than the AIWPS alternative.

Based on the criteria and subcriteria used to evaluate the alternatives, potential concerns associated with this alternative include:

- it is a mechanized treatment process,
- the need to treat the biosolids to Class A standards to allow reuse by the community
- its higher energy consumption (as compared with AIWPS)
- community doubts regarding the reliability of odor scrubbing

## Table 3. Cost Comparison of Alternatives

| | Alternatives | | | |
|---|---|---|---|---|
| **Capital Costs** | **AIWPS** | **SBR** | **Hybrid** | **Extended Aeration** |
| Treatment Plant Site-Land | $6,720,000 | $4,620,000 | $4,620,000 | $4,620,000 |
| Mitigation Land | $1,650,000 | $1,320,000 | $1,320,000 | $1,320,000 |
| **Subtotal - Land Costs** | **$8,370,000** | **$5,940,000** | **$5,940,000** | **$5,940,000** |
| Base Capital | $13,000,000 | $14,600,000 | $12,000,000 | $12,000,000 |
| Additional Collection system | $100,000 | $100,000 | $100,000 | $100,000 |
| Additional Odor Control | $0 | $500,000 | $1,500,000 | $0 |
| Additional Water Feature Cost | $0 | $250,000 | $250,000 | $0 |
| Additional Drainage Creek Improvements | $300,000 | $250,000 | $250,000 | $250,000 |
| Additional Biosolids Recycling Facilities | $1,595,000 | $1,595,000 | $1,595,000 | $0 |
| **Subtotal -Capital Costs: Construction** | **$14,995,000** | **$17,295,000** | **$15,695,000** | **$12,350,000** |
| Salvage Value - Land | -$2,343,600 | -$1,663,200 | -$1,663,200 | -$1,400,000 |
| **TOTAL PRESENT WORTH, CAPITAL COST** | **$21,021,400** | **$21,571,800** | **$19,971,800** | **$16,890,000** |
| **Annual Costs** | | | | |
| Annualized Capital Cost (6.625%, 20 yr.) | $1,891,926 | $1,941,462 | $1,797,462 | $1,520,100 |
| Annual O&M Cost | $425,000 | $500,000 | $475,000 | $475,000 |
| **TOTAL ANNUAL COST** | **$2,316,926** | **$2,441,462** | **$2,272,462** | **$1,995,100** |

### Notes

*Treatment Plant Site-* estimated cost of each site, including allowance for legal and admin. buildings.

*Mitigation-* assumes 1:1 mitigation & purchase cost of $30,000 per acre; assumes 64 acres for AIWPS & 44 acres for others

*Base Capital-* from process cost estimate, includes construction, contingency, engineering, legal and admin.

*Additional Collection System-* assumes length of pipe from centroid of service area at 9th and Los Osos Valley Rd to site

*Additional Odor Control-* allowance for additional odor control costs above that estimated for the process. Includes allowance for covering aeration basins.

*Additional Water Feature Cost-* allowance for additional costs associated with providing effluent storage as a water feature.

*Additional Drainage Creek Improvements* -allowance for modifying the existing creek in Resource Park

*Additional Biosolids Recycling Facilities* -assumes $75,000 for 2 acres + $1,500,000 for recycling facility, to make Class A biosolids at Turri site, O&M = hauling costs

*Salvage Value of Land* -salvage value of land purchased, assuming land retains full value, brought back from 20 years

*Total Present Worth, Capital Cost* -capital cost subtotal less salvage value

*Annual Capital Cost (6.625%, 20 yr.)* -assumes 20 years at 6.625%

## Attachment 1. Full Description of Criteria and Subcriteria

| Criteria | Subcriteria | Description |
|---|---|---|
| **Regulatory:** | | Includes water quality, environmental impact, and extent of land. This criteria captures the ability to obtain regulatory approval of the project so as to remove Cease and Desist orders and obtain low cost financing. |
| | | |
| | *Water Quality:* | • Ability to meet regulatory water quality requirements.<br>• Reliability and proven track record for the process to meet 7 mg/L N.<br>• Emergency spill potential and retention capability.<br>• Treatment level capability at peak capacities.<br>• Positive aquifer maintenance and management for buildout.<br>• Flood control, drainage enhancement.<br>• Measure of risk to schools, properties occupied by children/families.<br>• Public/Private community partnerships.<br>• Water supply, potable, improved for buildout of community. |
| | | |
| | *Environmental Impact:* | • Site-specific impacts to endangered species, cultural and natural resources.<br>• Environmental requirements of agencies such as the US Fish & Wildlife Service, National Marine Fisheries Service, California Dept. of Fish & Game, US Environmental Protection Agency, and US Army Corps of Engineers.<br>• Coastal zone impacts and ability to gain regulatory approval from California Coastal Commission (Land use only), especially on prime agricultural land.<br>• Additional studies required (EIR, geotechnical, percolation).<br>• Long-term air quality impacts.<br>• Disposal requirements for biosolids.<br>• Potential negative environmental impacts in emergencies.<br>• Seismic risks. |
| | | |
| | *Extent of Land:* | • Amount of land in acres required for the treatment system.<br>• Land potentially needed for mitigation is not included. |

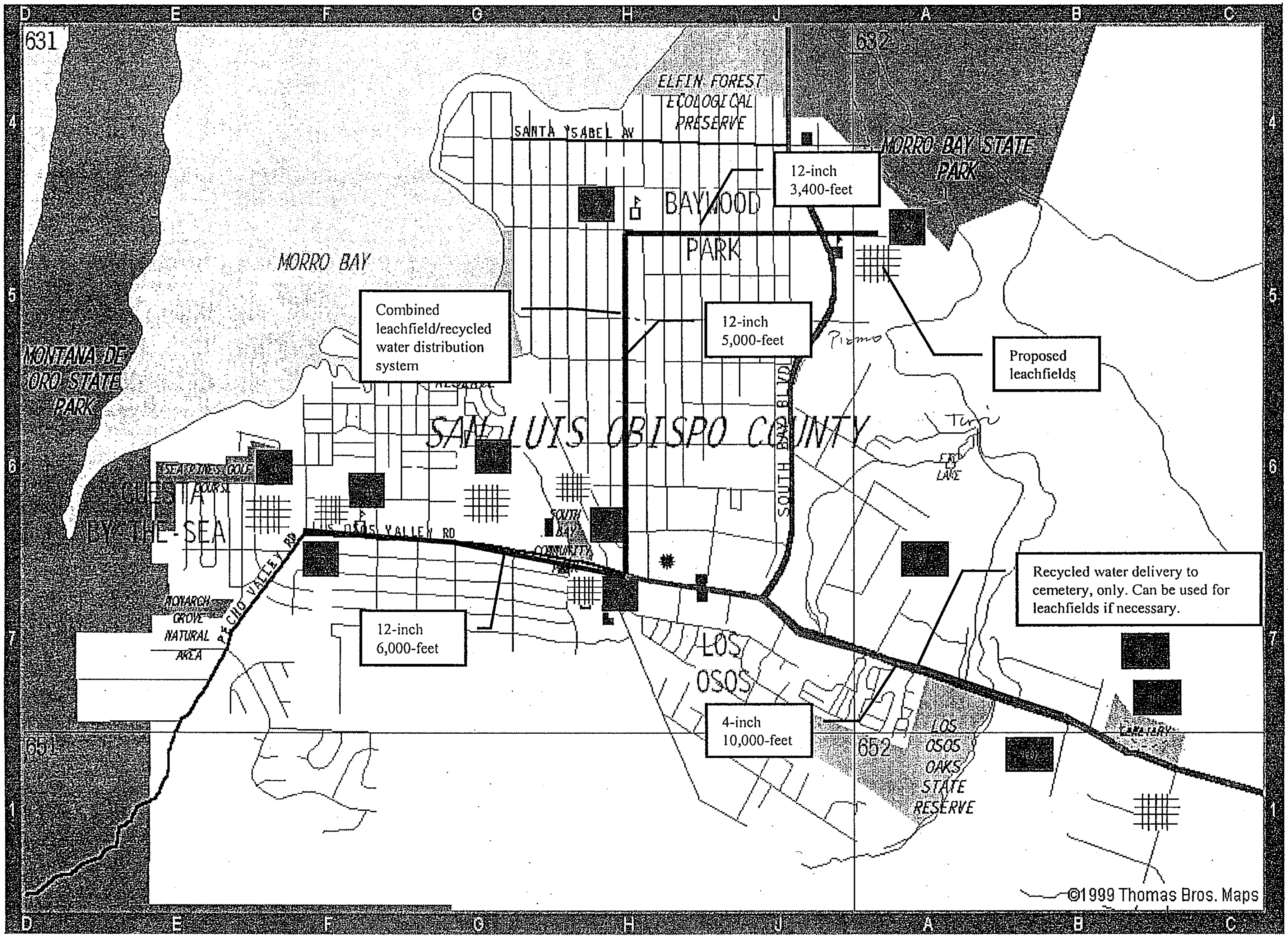
| Criteria | Subcriteria | Description |
|---|---|---|
| **Affordability:** | | • Affordability to ratepayers.<br>• Includes construction, capital and operating costs including the following: land acquisition, power, pipelines, facility construction, and biosolids disposal.<br>• Includes operator staff levels and training level requirements.<br>• Includes costs associated with redundancy.<br>• Provides cost preference for innovative, alternative technology projects.<br>• Costs with energy and inflation considered. Cost of land, inflation considered. Market value of publicly owned land not used for WW treatment. O&M costs, current annual dollars (fixed). Cost of system component replacement. Present worth at 20 and 50 years. Cost, reserve capacity consideration. |
| | | |
| | *Capital:* | Upfront costs for construction (facilities, equipment, etc.), and land acquisition. If converted to an annual basis, will also include finance costs. |
| | | |
| | *Long-Term:* | • Recurring costs associated with capital facilities.<br>• Includes normal operation and maintenance costs plus periodic replacement of equipment during the life of the project as defined by the SWRCB (20 years). |
| | | |
| **Resource Sustainability :** | | • Ability of treatment system to sustain and reduce nitrate in groundwater basin without importing water from somewhere else, and flexibility to augment water supply (sustainable resource).<br>• Ability of system to limit growth to critical sustainable resources (water, land use).<br>• Compatibility with water conservation goals.<br>• Difficulty and frequency of biosolids handling and ability to reduce biosolids generation and use biosolids locally.<br>• Emphasis on low energy/solar energy systems.<br>• Includes consideration of green house gas emissions and hazardous chemicals required for operation.<br>• Construction complexity of treatment system. |

| Criteria | Subcriteria | Description |
|---|---|---|
| **Resource Sustainability:** | | |
| | *Water Supply:* | • Ability to sustain and reduce nitrate in groundwater basin without importing water from elsewhere.<br>• Flexibility of system to augment water supply in the future.<br>• Limit growth to critical sustainable resources (water, land use).<br>• Compatibility with water conservation goals. |
| | | |
| | *Byproducts:* | • Impact or value of byproducts.<br>• Byproducts include biosolids and greenhouse gases. |
| | | |
| **Community Acceptance:** | | • Refers to the aesthetics of the system and its ability to be a community resource.<br>• System should be an example to other communities of an innovative approach to achieve wastewater treatment and meet environmental requirements.<br>• Should be visually pleasing, have no odor, and be a hub of the community based on location and final construction.<br>• Noise was not considered a differentiating factor amongst alternatives as buildings and other engineering measures would reduce noise of permanent facility.<br>• Positive community economic/political/social impacts.<br>• Community "ownership" of innovative facility/project. |
| | *Open Space Enhancement and Accessibility:* | • Amount of open space or parkland located at readily accessible locations.<br>• Community enhancement - environment. Potential of enhanced bike, pedestrian, and park amenities. |
| | | |
| | *Aesthetic Factors:* | • Does it add or subtract to the aesthetic amenity of the community? (i.e, can it be "drop dead gorgeous?") Visual enhancement to the community.<br>• Community enhancement-positive affect on property values. |
| | | |
| | *Nuisance Factors:* | • Tendency to generate odors as determined by distance from source to receptor, intensity, character, and frequency.<br>• Noise generated by facility operations and truck/vehicle traffic. |

| Criteria | Subcriteria | Description |
|---|---|---|
| **Community Acceptance:** | *Construction Impacts:* | • Length of construction period (i.e., most efficient construction sequence, shortest construction period); disruption to the public, traffic, emergency services; environmental impacts during construction (noise, dust, runoff, BMP). Other environmental impacts captured in Regulatory-Environmental Impact. |
| | | |
| **Future Flexibility:** | | • Flexibility to meet future conditions, and environmental regulations.<br>• Includes level of treatment for water reuse, drinking water, or more stringent requirements.<br>• Mechanical complexity and dependency. |

# Matrix Summary of Wastewater Disposal Alternatives

| Disposal Alternative | Disposal Capacity (gpd) | Cost (million $) | Winter/ Summer Option | Public Health Concerns | Environmental | Technical Challenges | Institutional Challenges |
|---|---|---|---|---|---|---|---|
| New Leachfields<br>includes urban recycling and some to Broderson | 2,300,000[1] | $8 -10 M<br><br>Nominal O&M Cost | Winter and Summer | Nominal | None | Depth to groundwater greater than 30 feet.<br>Sufficient area to deliver entire flow.<br>Integrate with the recycled water system.<br>Pilot testing necessary | Develop customer agreements<br>Driving range |
| Broderson Site[3] | Variable | $6 - 8M<br><br>Significant O&M Costs | Winter and Summer | Groundwater Recharge | Endangered Morro shoulderband snail | Travel time<br>Blend<br>Modeling<br>Advanced Treatment<br>Brine Management | ~~DHS~~ written approval<br>Public Perception |
| Urban Recycled Water Market | 250,000[5] | Included with Leachfields | Summer only | Public Contact | None | Title 22 treatment | Use ordinance.<br>Letters of Intent<br>Cal-Cities |
| Agricultural Recycled Water Market | Variable | | Summer only | Potential Recharge of Lower Aquifer | Groundwater Impacts | Salt tolerant crops only<br>Retrofit existing irrigation system<br>Additional Treatment? | Grower perception<br>Water transfer<br>loss of water from basin |
| Surface Water Discharge to Los Osos Creek | Unknown | Comparable to Broderson | Summer and Winter | TMDL Priority Pollutant List | TMDL Priority Pollutant List | Advanced Treatment<br>Brine Management | Public Perception<br>Bay Impacts |


631
682
651
652
MONTANA DE ORO STATE PARK
MORRO BAY
ELFIN FOREST ECOLOGICAL PRESERVE
SANTA YSABEL AV
MORRO BAY STATE PARK
BAYWOOD PARK
12-inch
3,400-feet
Combined leachfield/recycled water distribution system
12-inch
5,000-feet
Proposed leachfields
SAN LUIS OBISPO COUNTY
SOUTH BAY BLVD
CUESTA BY-THE-SEA
SEA PINES GOLF COURSE
LOS OSOS VALLEY RD
PECHO VALLEY RD
MONARCH GROVE NATURAL AREA
12-inch
6,000-feet
Recycled water delivery to cemetery, only. Can be used for leachfields if necessary.
LOS OSOS
4-inch
10,000-feet
LOS OSOS OAKS STATE RESERVE
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