OCCIDENTAL COUNTY SANITATION DISTRICT SUMMARY REPORT ON REQUEST FOR INFORMATION (RFI)

Summary of the Problem

The North Coast Regional Water Quality Control Board (Regional Board) has issued Cease and Desist Orders (CDOs) against the District for violation of the discharge requirements in its permit. In addition to the CDOs, the Regional Board has taken other enforcement measures against the District to ensure compliance with applicable laws and regulations. Simply stated, the violations are a result of the District's sanitation infrastructure being inadequate to meet the stringent requirements spelled out in its discharge permit.

The most recent National Pollutant Discharge Elimination System (NPDES) permit requires the District to comply with the basin plan for the Russian River watershed, which states that no wastewater treatment facility is allowed to discharge waste to the Russian River or its tributaries (like Graham's pond) during the period of May 15 through September 30. Thus, the District is no longer able to release any treated wastewater into Dutch Bill Creek, including Graham's Pond, from May 15 through September 30. The Regional Board has required the District to complete a capital improvement project that would bring the District into compliance by January 2018.

Proposed Solution

The Sonoma County Water Agency, which operates the treatment plant for the District, has looked at several solutions to the problem over the last decade. All were rejected because they were either too expensive, had technological problems or were unpopular with the community.

The Water Agency is now exploring options that include treatment changes, supplying recycled water to agricultural lands, and trucking to other treatment facilities. Treatment changes could improve the quality of recycled water from secondary to tertiary. **Regardless of the technology used, the District will have to find or develop storage and irrigation systems for the recycled water in the summer** – since no recycled water (regardless of treatment level) can be discharged into Dutch Bill Creek between May 15 and September 30.

A Request for Information (RFI) was sent to representatives of 32 firms that manufacture products for wastewater treatment plants and processes. The goal of the RFI was to determine if there are low-cost options to rebuild or upgrade the existing plant to comply with regulations while stabilizing operation and maintenance costs.

While the responses to the RFI could improve the quality of the recycled water from secondary to tertiary, the "solution" would not be complete without identifying storage and irrigation options. As another alternative, the Water Agency also studied the option of trucking sewage to other treatment plants, which would eliminate the need for additional treatment, storage and irrigation options.

Summary of Responses

The responses that the Water Agency received to the RFI included information on more than a dozen treatment and/or tertiary filtration systems. The attached table summarizes the responses based on the type of technology used and if the level of treatment provided would be sufficient to meet permit requirements for rainy season discharge to Dutch Bill Creek. Below are descriptions of the technologies, treatment and discharge options.

Treatment Processes

Though there are a variety of technologies available to treat wastewater, the basic treatment process is similar for all. First, large pieces of non-biodegradable waste (e.g. household garbage) are screened out, and then (with some systems) the smaller dense particles of grit (sand) are settled out. The wastewater is then mixed with bacteria that consume the solid organic (carbon based) matter and oxygen, transforming the organic matter into carbon dioxide and water. When the available organic matter is nearly gone, remaining solids are concentrated and removed from the treated water.

Concentration of solids can be accomplished through a variety of methods and sometimes in multiple steps. Solid concentration can include clarifiers (which use gravity for settling) or filters (granular media, cloth, or membranes). The treated wastewater that has passed through the clarifiers and filters is then disinfected by chlorine, ultraviolet radiation, or (rarely) heat pasteurization.

Sometimes an additional step called biological nutrient removal (BNR) is required after the organic matter is gone, but before clarification/filtration. The purpose of BNR is to remove inorganic nutrients (mostly nitrogen-based ammonia). BNR relies on a sequence of steps and a variety of different types of bacteria.

Description of Technologies

Technologies that accomplish these steps and which are appropriate for small systems like Occidental include:

- Membrane Bio-Reactor (MBR): MBR technology cleans the water by aerating it (add/mix oxygen) in a reactor basin where bacteria process the waste, and then filtering it through a membrane filter. The membrane typically returns particles larger than about 0.0001 mm (1/1000th the diameter of a human hair) to the reactor basin for further processing. The bacteria that process the waste are highly concentrated, which means that the footprint of the treatment plant can be very small due to the high level of biological activity. These systems all treat to a tertiary level.
- Sequencing Batch Reactor (SBR): As the name suggests, SBR technology processes the wastewater in batches, through a sequence of steps. After the bacteria in the aeration basin(s) have processed the waste, the batch is settled and decanted. A portion of the settled solids are returned to supply bacteria for the next batch. To meet tertiary standards, the effluent must then be filtered.
- Diffused air extended aeration activated sludge system: This system requires existing ponds to be graded to a narrower and deeper shape and lined with a synthetic liner. Fine air diffusers would be added to the ponds to create varying levels of oxygen in the water. These regions of varying oxygenation allow for different types of bacteria to grow and help remove both organic compounds and nitrogen-based nutrients. To meet tertiary standards, the effluent would need to be filtered.
- Membrane filter systems: Used in combination with a biological treatment process, these systems produce tertiary quality effluent by using pressure to force treated wastewater through tiny holes in the membrane of either flat sheets or bundles of tiny tubes. Constant flows across the surface of the membrane keep the solids from building up.
- Cloth filter: Used in combination with a biological treatment process, these filters are often rotating discs, with the water flowing from outside the discs to the inside to produce tertiary quality effluent. Occasional backwash cycles return the collected solids to be treated again.
- Fixed film media: These are surfaces upon which a "film" of bacteria that removes the inorganic nutrients can grow. In Occidental, fixed film media might take the form of textile webbing suspended in the existing treatment ponds.

Project Alternatives

To meet the District's permit requirements, four general categories of project alternatives are currently being considered. **Storage and irrigation costs must be added to all of the treatment upgrades options listed below. Costs for storage and irrigation vary considerable depending mostly on the distances to these locations, starting as low as $1.3 million and ranging up to $5.9 million.**

Multiple technology options for treatment, described above, may apply to a given project alternative:

1. Secondary treatment, no water would be discharged: This alternative would not include any new treatment to the existing process, and instead proposes to develop new

storage and irrigation locations. Costs for this option range from $2.7 million to $5.9 million.

2. Tertiary treatment, no water would be discharged: Treatment systems would improve the water to a quality that meets "Title 22" tertiary standards, significantly expanding the potential uses of the recycled water. Even with this higher level of treatment, the water would not be guaranteed to meet permitted discharge requirements to Dutch Bill Creek. This alternative may include the addition of membrane filtration to existing treatment (three responses), or a fixed film media placed into the existing ponds followed by cloth filters (one response). Estimated costs for treatment only are $0.9 to $2.0 million. Total project costs are estimated to be $3.6 million to $7.8 million, including construction, irrigation and storage.

3. Tertiary treatment with winter discharge to Dutch Bill Creek and summer irrigation reuse: Treatment systems would improve water quality to "Title 22" tertiary standards and be suitable for discharge into Dutch Bill Creek. This alternative may include MBR (five responses) , SBR plus cloth filters (five responses), or extended aeration activated sludge within the existing (modified) aeration basin plus cloth filters (one response). At this level of analysis, total systemic costs for all of these are comparable, so selection would be based on other criteria or through more refined proposals from the suppliers. Estimated costs for treatment alone are $2.2 to $4.7 million. Total project costs are estimated to be $3.5 million to $7.4 million, varying primarily on the distance to summer irrigation locations.

4. Trucking: This would involve the development of truck-fill stations, discharge stations and a wastewater equalization pond. Discharge could be either at the Russian River County Sanitation District (Guerneville) treatment plant or at the Airport/Larkfield/Wikiup Sanitation Zone treatment plant. The existing treatment pond could be modified to become an equalization pond, covered to divert rainfall and aerated to reduce the odors associated with anaerobic biological activity. It is likely that an outside contractor could provide the most cost-effective approach to trucking the wastewater. Total improvements would cost about $1.5 million to $3.2 million. Additionally, a "connection" fee may be needed to transfer the wastewater from OCSD to another District/Zone. Annual operating costs would be slightly higher than currently, with the savings from the shutdown of the current treatment plant offsetting most of the costs for transportation.

Operation and Maintenance Costs of Alternatives

Alternatives that require discharges to Dutch Bill Creek will have the highest total operations and maintenance costs. While the costs of the actual plant operations might be similar to what is incurred today, the new NPDES permit requires more testing than is currently required. There would also be some additional costs of pumping and maintenance of the recycled water system. In addition, discharges to Dutch Bill Creek may be subject to more stringent treatment requirements in the future.

An Upgrade to tertiary treatment while maintaining zero discharge would likely have costs similar or slightly higher than the current system. While there may be some cost savings in monitoring and testing, these will be offset by the maintenance of the tertiary treatment system and maintenance of a more extensive recycled water system.

Continuing to treat to a secondary level while maintaining zero discharge would have the lowest operations and maintenance costs. The costs to maintain the tertiary filtration system would be eliminated, but there may be additional pumping costs if the users are located at greater distances from the treatment plant.

Analysis of Categories/Alternatives, Including Trucking

Based on very preliminary analysis, any of these four options may prove to be technically feasible. While the District does not have the funds currently available, grants and low-interest loans would be sought to fully or partially cover capital costs. Given the District's high rates, finding a solution with low and predictable costs for operations and maintenance are a high priority. Further analysis of the options is needed to determine operating and maintenance costs. With the exception of the trucking option, **a major challenge for any option will be to find agricultural enterprises near the treatment plant who are interested in using the recycled water for irrigation. Property owners that have the ability to store treated water are also being sought.**

Next Steps

The District has sent letters to potential agricultural users of recycled water that are within two to three miles of the treatment plant. Responses may help the District determine if a zero-discharge alternative is feasible and if the expense of tertiary treatment would be necessary for a zero-discharge alternative. This information will help the District determine which options merit in-depth study.

Attachments

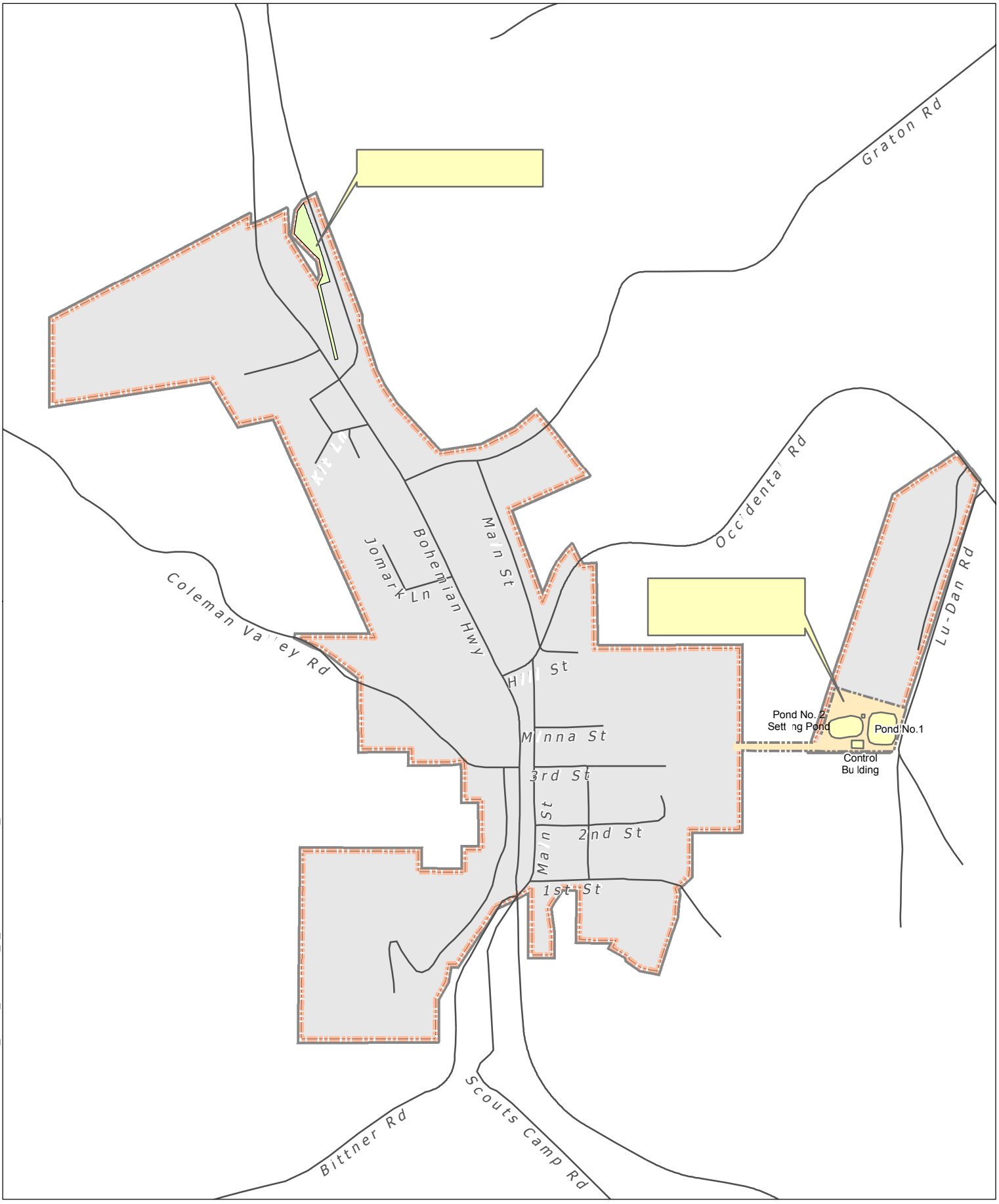
1) Map of the existing treatment system.

2) Map of agricultural parcels in the area, the owners of which have been asked about their interest in using recycled water.

3) Letter sent to potential users of recycled water.

4) Chart with each manufacturer (and trucking) laying out the alternatives and the associated costs.

5) Chart of Concept Level Estimate of Total Project Costs



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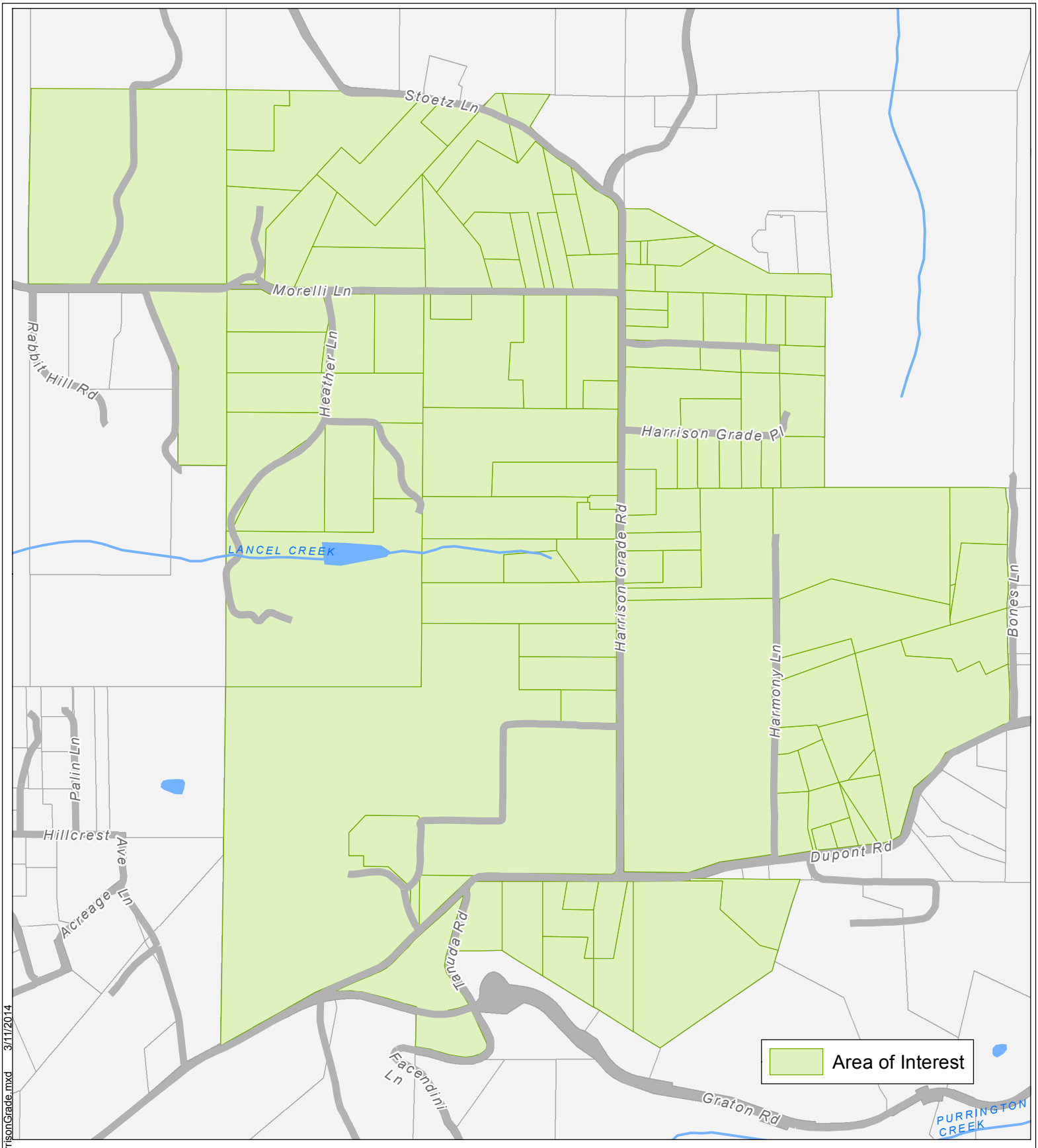

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Occidental Storage and Reclamation:
Area of Interest for Possible Irrigation Project

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W E
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0 500 1,000 Feet

SONOMA COUNTY WATER AGENCY

March 7, 2014

<<Owner_Name_First_Name_First>>
<<Mail_Address>>
<<Mail_City>>, <<Mail_State>> <<Mail_ZIPZIP4>>

RE: OCCIDENTAL COUNTY SANITATION DISTRICT RECYCLED WATER

Dear Property Owner:

The community of Occidental needs your help. The Occidental County Sanitation District (District) is looking for irrigation areas for its treated recycled water. If we are unable to find areas to irrigate this water, the District is faced with the expensive choices of piping the water to another area, trucking it to another treatment facility or incurring the high costs and uncertainty of testing recycled water that is released into Dutch Bill Creek. Occidental residents and businesses already pay the highest sewer rates in the County and cannot afford these options.

The District is studying the possibility of providing this drought-proof recycled water in the vicinity of your property.– Recycled water can be used to irrigate a wide variety of plants and crops. The attached chart gives examples of the many ways this water can be used. Currently the District treats the water to a secondary level. However, the District is studying the possibility of upgrading the treatment process to a higher level, called “tertiary”.

If you are interested in having access to this reliable source of irrigation water we would like to talk to you. Gauging interest will help the District determine what areas will be served by pipelines. (Recycled water would be delivered under pressure to the property line of interested landowners.) If you would consider having access to this water for irrigation purposes on your property, please contact me at (707) 547-1953 or cordel@scwa.ca.gov

Sincerely,

Cordel Stillman
Deputy Chief Engineer

Attachment

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Recycled Water Uses Allowed[1] in California

Use of Recycled Water	Treatment Level	
	Disinfected Tertiary Recycled Water	Disinfected Secondary – 2.2 Recycled Water
Irrigation of:		
Food crops where recycled water contacts the edible portion of the crop, including all root crops	**Allowed**	Not Allowed
Parks and playgrounds	**Allowed**	Not Allowed
School yards	**Allowed**	Not Allowed
Residential landscaping	**Allowed**	Not Allowed
Unrestricted-access golf courses	**Allowed**	Not Allowed
Any other irrigation uses not prohibited by other provisions of the California Code of Regulations	**Allowed**	Not Allowed
Food crops, surface-irrigated, above-ground edible portion, and not contacted by recycled water	**Allowed**	**Allowed**
Cemeteries	**Allowed**	**Allowed**
Freeway landscaping	**Allowed**	**Allowed**
Restricted-access golf courses	**Allowed**	**Allowed**
Ornamental nursery stock and sod farms with unrestricted public access	**Allowed**	**Allowed**
Pasture for milk animals for human consumption	**Allowed**	**Allowed**
Non-edible vegetation with access control to prevent use as a park, playground or school yard	**Allowed**	**Allowed**
Orchards with no contact between edible portion and recycled water	**Allowed**	**Allowed**
Vineyards with no contact between edible portion and recycled water	**Allowed**	**Allowed**
Non food-bearing trees, including Christmas trees not irrigated less than 14 days before harvest	**Allowed**	**Allowed**
Fodder and fiber crops and pasture for animals not producing milk for human consumption	**Allowed**	**Allowed**
Seed crops not eaten by humans	**Allowed**	**Allowed**
Food crops undergoing commercial pathogen-destroying processing before consumption by humans	**Allowed**	**Allowed**
Ornamental nursery stock, sod farms not irrigated less than 14 day before harvest	**Allowed**	**Allowed**
Supply for impoundment:		
Non-restricted recreational impoundments, with supplemental monitoring for pathogenic organisms	**Allowed**[3]	Not Allowed
Restricted recreational impoundments and publicly-accessible fish hatcheries	**Allowed**	**Allowed**
Landscape impoundments without decorative fountains	**Allowed**	**Allowed**
Supply for cooling or air conditioning:		
Industrial or commercial cooling or air conditioning involving cooling tower, evaporative condenser, or spraying that creates a mist	**Allowed**[4]	Not Allowed
Industrial or commercial cooling or air conditioning not involving cooling tower, evaporative condenser, or spraying that creates a mist	**Allowed**	**Allowed**

Recycled Water Uses Allowed[1] in California
(continued)

Use of Recycled Water	Treatment Level: Disinfected Tertiary Recycled Water	Treatment Level: Disinfected Secondary – 2.2 Recycled Water
Other uses:		
Groundwater recharge	**Allowed** under special case-by-case permits by RWQCBs[5]	
Flushing toilets and urinals	**Allowed**	Not Allowed
Priming drain traps	**Allowed**	Not Allowed
Industrial process water that may contact workers	**Allowed**	Not Allowed
Structural fire fighting	**Allowed**	Not Allowed
Decorative fountains	**Allowed**	Not Allowed
Commercial laundries	**Allowed**	Not Allowed
Consolidation of backfill material around potable water pipelines	**Allowed**	Not Allowed
Artificial snow making for commercial outdoor uses	**Allowed**	Not Allowed
Commercial car washes, not heating the water, excluding the general public from washing process	**Allowed**	Not Allowed
Industrial process water that will not come into contact with workers	**Allowed**	**Allowed**
Industrial boiler feedwater	**Allowed**	**Allowed**
Non-structural fire fighting	**Allowed**	**Allowed**
Backfill consolidation around non-potable piping	**Allowed**	**Allowed**
Soil compaction	**Allowed**	**Allowed**
Mixing concrete	**Allowed**	**Allowed**
Dust control on roads and streets	**Allowed**	**Allowed**
Cleaning roads, sidewalks, and outdoor work areas	**Allowed**	**Allowed**
Flushing sanitary sewers	**Allowed**	**Allowed**

This summary is prepared from the December 2, 2000-adopted Title 22 Water Recycling Criteria and supersedes all earlier versions. Prepared by Bahman Sheikh and edited by EBMUD Office of Water Recycling, who acknowledge this is a summary and not the formal version of the regulations referenced above.

[1] Refer to the full text of the December 2, 2000 version of Title 22: California Code of Regulations, Chapter 3 Water Recycling Criteria. This chart is only an informal summary of the uses allowed in this version, with the exception of orchards and vineyards noted as "Not Allowed[2]" on page 1 and explained below.

[2] Per California Department of Public Health letter of January 8, 2003 to California Regional Water Quality Control Boards.

[3] Allowed with "conventional tertiary treatment." Additional monitoring for two years or more is necessary with direct filtration.

[4] Drift eliminators and/or biocides are required if public or employees can be exposed to mist.

[5] Refer to Groundwater Recharge Guidelines, available from the California Department of Public Health.

2013

Attachment 4: OCSD Concept Level Estimate for Treatment Options in thousands of dollars. These are the basis for the "Treatment Cost" column in Attachment 5												
	Company	System	Needs Building	Concrete reactor tank(s)	Equipment supply	EQ Tank	Concrete Reactor tanks	Building	Equipment pads, electrical, screening, other	Filters, installed	Subtotal for Treatment Construction	Subtotal for Treatment including Design, Inspection, Management
Membrane BioReactor	**BioProcessH2O**	**bioPULSE MBR**	Y	Y	$625	$250	$300	$200	$500	$0	$1,875	$2,813
					$800	$0	$300	$200	$500	$0	$1,800	$2,700
	Koch	**Puron MBR**	Y?	N	$600		$0	$200	$500	$0	$1,300	$1,950
	Kubota USA	**KUBOTA Submerged Membrane Unit**	N	Y?	$554	$250	$300	$0	$500	$0	$1,604	$2,406
	OVIVO	**microBLOX single stage MBR**	N	N	$665	$250	$0	$0	$500	$0	$1,415	$2,123
	Smith & Loveless Inc	**Titan MBR**	N	N			$0	$0	$500	$0		
Sequencing Batch Reactor	**Aeration Industries**	**Argos SBR plus Nova Disk filter**	N	Y	$366	$250	$300	$0	$500	$250	$1,666	$2,499
	Aero-Mod, Inc.	**Sequencing Bioreactor**	N	Y	$370	$0	$300	$0	$500	$250	$1,420	$2,130
	Aqua-Aerobic Systems, Inc	**AquaSBR (incl aerobic digester)**	N	Y	$500	$250	$300	$0	$500	$80	$1,630	$2,445
	AWT (bioworks)	**Advanced Sequensing Bioreactor**	N	Y	$175	$0	$300	$0	$500	$250	$1,225	$1,838
	Parkson	**EcoCycle SBR**	N?	Y	$300	$0	$300	$0	$500	$250	$1,350	$2,025
Extended Aeration Activated Sludge	**Bioworks**	**Extended Aeration Activated Sludge, fine air diffusion**	N	N	$295	$0	$150	$0	$700	$250	$1,395	$2,093
	EDI	**Atlas Decanted BioBalanced Reactor**	N	N		$0						
Fixed Film and Cloth Filter	**Entex Technologies Inc.**	**Webitat fixed film units submerged in ponds. FlowTex disk filter.**	N	N		$0	$0	$0	$0	$250		
Membrane Filtration	**Aqua-Aerobic Systems, Inc**	**UltraFiltration hollow fiber membrane.**	Y	N	$232	$0	$0	$150	$300	N/A	$682	$1,023
	BioProcessH2O	**bioTRIPURE**	Y	N	$400	$0	$0	$150	$300	N/A	$850	$1,275
				N	$550	$0	$0	$150	$300	N/A	$1,000	$1,500
	Pall Corporation	**Aria AP3 hollow fiber membrane**	Y	N		$0	$0					

SONOMA COUNTY WATER AGENCY

Attachment 5: OCSD Concept Level Estimate of Project Costs in millions of dollars								
Project Alternative	New Treatment System	Treatment Cost	Storage Cost	4" Irrigation main	Pump Station	30% contingency	**TOTAL**	Estimate Range
1. Secondary Treatment, no water would be discharged	None		$0.7	$2.0	$0.3	$0.9	**$3.9**	**$2.7 – $5.9**
2. Tertiary Treatment, no water would be discharged	Membrane filtration or fixed film plus cloth filtration	$1.0	$0.7	$2.0	$0.3	$1.2	**$5.2**	**$3.6 – $7.8**
3. Tertiary treatment with winter discharge to Dutch Bill Creek	MBR, SBR, or Extended Aeration A/S	$2.4		$1.3	$0.1	$1.1	**$4.9**	**$3.5 – $7.4**

SONOMA COUNTY WATER AGENCY