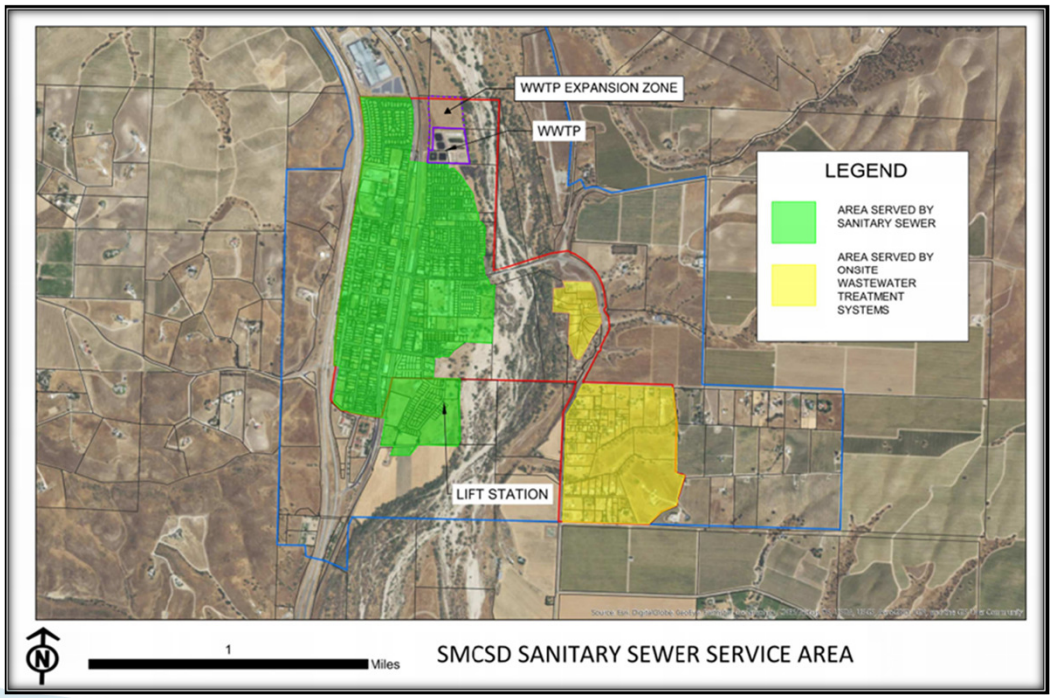
# WWTP RENOVATION AND EXPANSION

Engineering Study – Preliminary Results

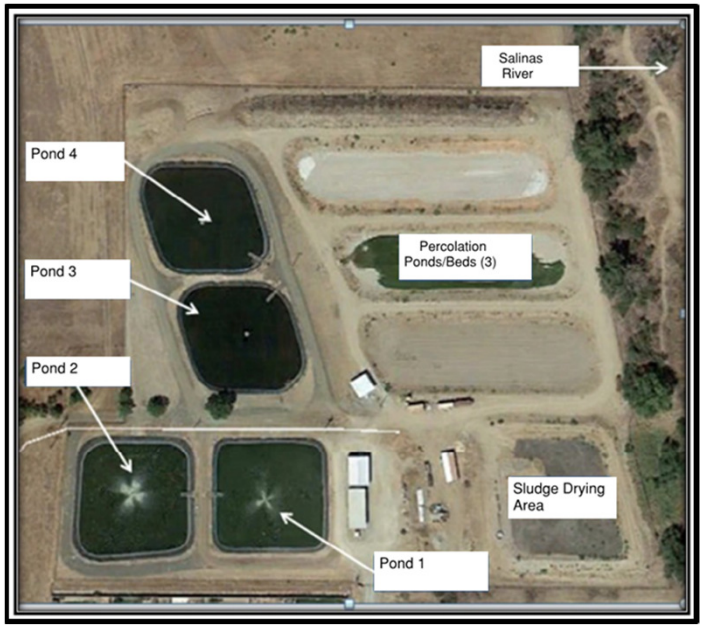
November 15, 2018

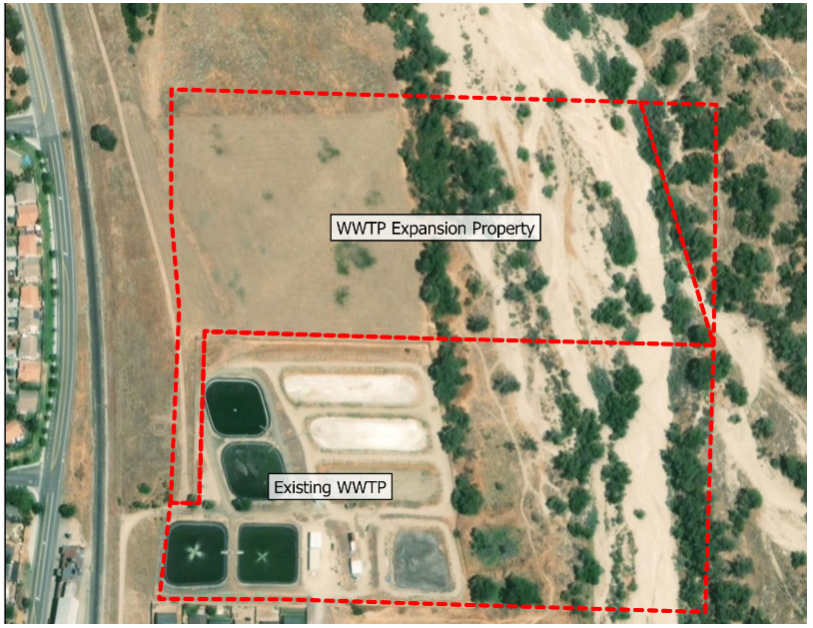
# SAN MIGUEL CSD WASTEWATER SYSTEM

- 737 Connections
- Population Served: 2700



# EXISTING WWTP CONFIGURATION



# EXISTING PERMIT REQUIREMENTS

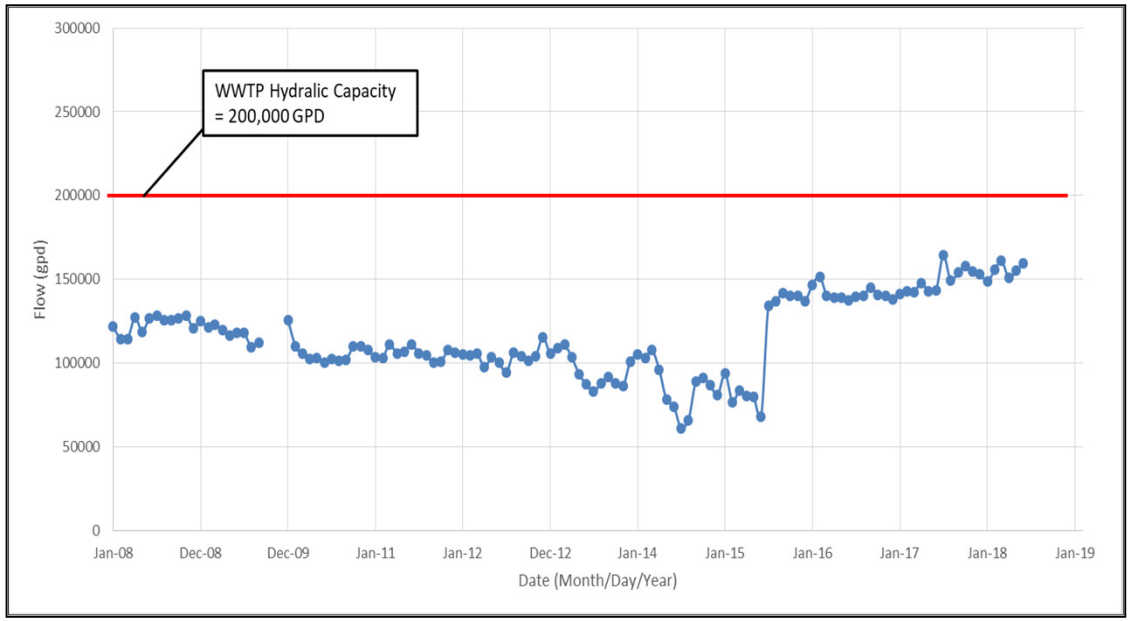
- Permitted Treatment Capacity, MGD — 0.2 (max. month)
- Effluent Limitations:

| | Avg. last 6 samples | Maximum |
|---|---|---|
| TDS, mg/L | 825 | 900 |
| Chloride, mg/L | 180 | 200 |
| Sulfate, mg/L | 175 | 200 |
| Sodium, mg/L | 150 | 170 |

- The treatment ponds must maintain a minimum 2.0 feet freeboard at all times and must maintain dissolved oxygen of 1.0 mg/L minimum at all times.
- Effluent pH shall range between 6.5 and 8.4 at all times.
- Discharge shall not cause nitrate concentrations in downgradient GW to exceed 5 mg/L (as N)
- Discharge shall not cause "significant" increase in TDS.
- Under the current WDRs, the SMCSD is not required to sample influent or effluent organic waste strength parameters (total suspended solids (TSS) or biochemical oxygen demand ($BOD_5$)). However, the District must submit quarterly monitoring reports, and submit an annual report summarizing the past year's effluent and disposal area monitoring.

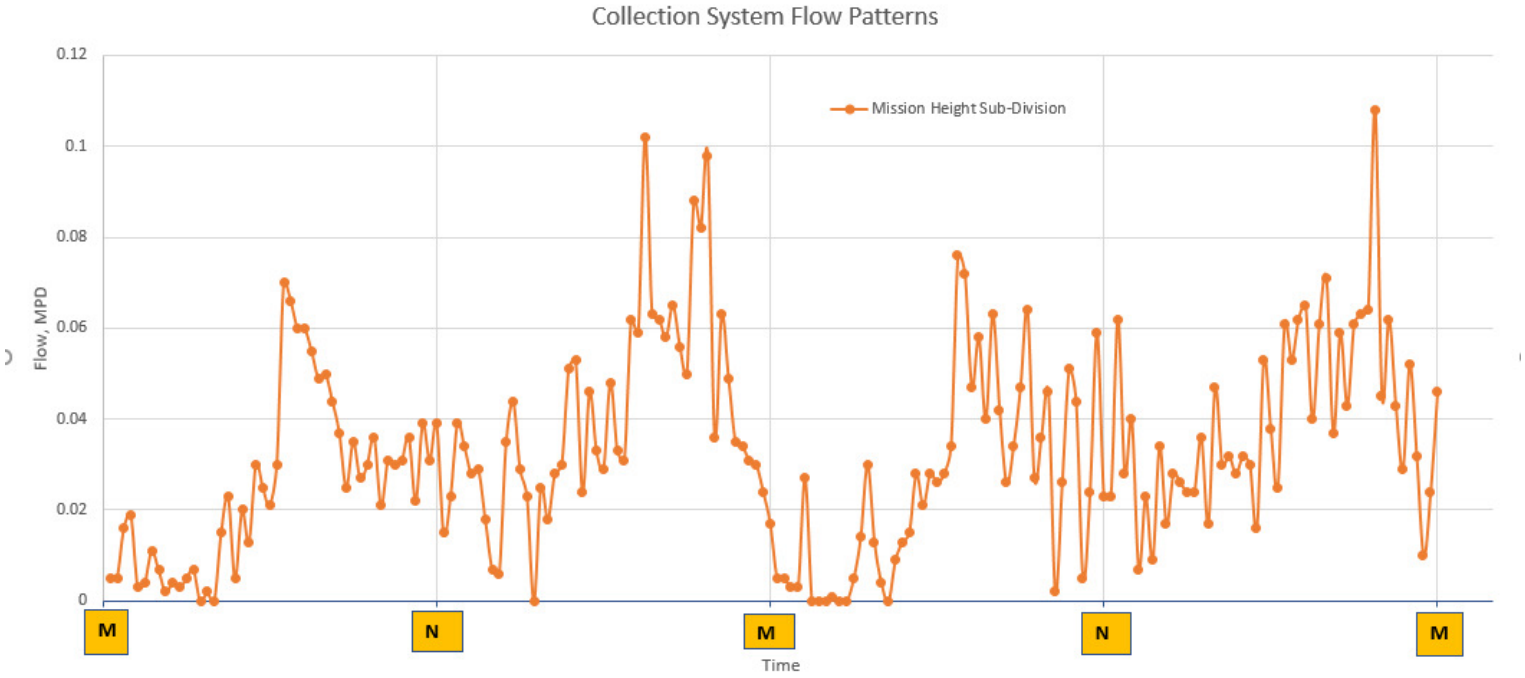
# WWTP HISTORIC FLOW SUMMARY

- AVG. Daily Flows



# DAILY FLOW PATTERN

- Flow Monitoring Data



# FUTURE EFFLUENT QUALITY NON-TITLE 22

- "30/30/10"
- Reduce Salt Loading to GW Basin

| Constituent | Units | Current Limit | | Potential Future Limit |
|---|---|---|---|---|
| | | Average of the last 6 samples | Maximum | |
| **TDS** | mg/L | 825 | 900 | Same as Current |
| **Chloride** | mg/L | 180 | 200 | Same as Current |
| **Sulfate** | mg/L | 175 | 200 | Same as Current |
| **Sodium** | mg/L | 150 | 170 | Same as Current |
| **Dissolved Oxygen** | mg/L | No less than 1.0 mg/L in all lagoons at any time | | Same as Current |
| **pH** | pH units | 6.5-8.4 | | Same as Current |
| **5-Day Biological Oxygen Demand ($BOD_5$)** | mg/L | None | | 30 |
| **Total Suspended Solids (TSS)** | mg/L | None | | 30 |
| **Total Nitrogen, as N (TN)** | mg/L | None | | 10 |

# FUTURE EFFLUENT QUALITY
# TITLE 22

| Parameters | BOD5 | TSS | TDS | Total Nitrogen (as N) | Dissolved Oxygen | pH | Sulfate | Sodium | Filtration Required | Disinfection Required |
|---|---|---|---|---|---|---|---|---|---|---|
| **units** | mg/L | mg/L | mg/L | mg/L | mg/L | | mg/L | mg/L | Y/N | Y/N |
| **Expected Future Effluent Limits** | 30 | 30 | 825 | 10 | 1.0 Minimum | 6.5-8.4 | 175-200 | 150-170 | N | N |
| **Agricultural supply for Vineyard** | No limit | No limit | 450-750 | 5-10 | No limit | 6.5-8.4 | <150 | < 125 | N | Y |
| **Title 22: Disinfected Tertiary Recycled Water** | Per Permit Requirement | Per Permit Requirement | Per Permit Requirement | Per Permit Requirement | Per Permit Requirement | Per Permit Requirement | Per Permit Requirement | Per Permit Requirement | Y | Y |

# FUTURE PROJECTED FLOWS

| Flow Condition | Peaking Factor | Existing Flow (mgd) | Projected Flow (mgd) | | | |
|---|---|---|---|---|---|---|
| | | | 2023 | 2028 | 2035 | 2050 |
| Average Daily Flow (ADF) | -- | 0.170 | 0.195 | 0.210 | 0.255 | 0.470 |
| Maximum Day Dry Weather Flow (MDDWF) | 1.25 | 0.213 | 0.244 | 0.263 | 0.319 | 0.588 |
| Maximum Day Wet Weather Flow (MDWWF) | 1.5 | 0.255 | 0.293 | 0.315 | 0.383 | 0.705 |
| Peak Hour Wet Weather Flow (PHWWF) | 3.5 | 0.595 | 0.683 | 0.735 | 0.893 | 1.645 |
| Estimated Population Served | | 2700 | 3000 | 3350 | 3700 | 6300 |
| Estimated Number of sewer connection | | 765 | 850 | 900 | 1050 | 1800 |
| Annual Discharge (AC-FT) | | 190 | 220 | 240 | 290 | 530 |
| Annual Discharge (AC-FT) w/ Gallo Wastewater | | 230 | 260 | 280 | 330 | 570 |

[1] Projected ADF, population increase, and sewer connections are based on SMCSD Water & Wastewater Masterplan Update, land Use in San Miguel (Monsoon Consultants, November 2017)

[2] It should be noted that the peaking factor for computing the MDWWF for future conditions was reduced from 4.0 to 3.5.

[3] They system flow, up to 2035, is based upon a a sngle person 65 gpcd. From 2050, the average per person is increased to 75 because it's estimated that new developed area will use more water compared to the current socio economic community that is present today.

[4] The projected treatment system life expectancy is roughly 25-30 years.

# BASIC WWTP OPERATIONS/PROCESSES

- **Wastewater treatment** is a process used to convert **wastewater** into an effluent that can be returned to the water cycle with minimum impact on the environment, or directly reused. The basic processes include the following:
  - Headworks
  - Influent Lift Station
  - Primary Treatment
  - Secondary Treatment
  - Bio-Solids Handling
  - Tertiary Treatment
  - Disinfection
  - Recycled Water Supply / Transmission

# SMCSD WWTP EXPANSION/UPGRADE ALTERNATIVES EVALUATION CRITERIA

- Evaluate Processes Based On:
  - Utilization of Existing Facilities & Available Land
  - Identification of Scalable Processes To Permit Future Growth
  - Cost (Capital, O & M) vs Benefit
  - Compatibility with Existing Operations Staff Expertise
  - Mitigation of Odor Compounds
  - System Reliability
  - Quality of Effluent

# WWTP EXPANSION / UPGRADE ALTERNATIVES

- COMMON IMPROVEMENTS
- TREATMENT ALTERNATIVES
  - Primary Processes
  - Secondary Treatment Processes
  - Tertiary Treatment Processes
  - Secondary-Tertiary Treatment Processes
  - Disinfection Treatment Processes
  - Bio-Solids Treatment and Disposal Processes
  - Title 22 Recycled Water Supply System

# COMMON IMPROVEMENTS

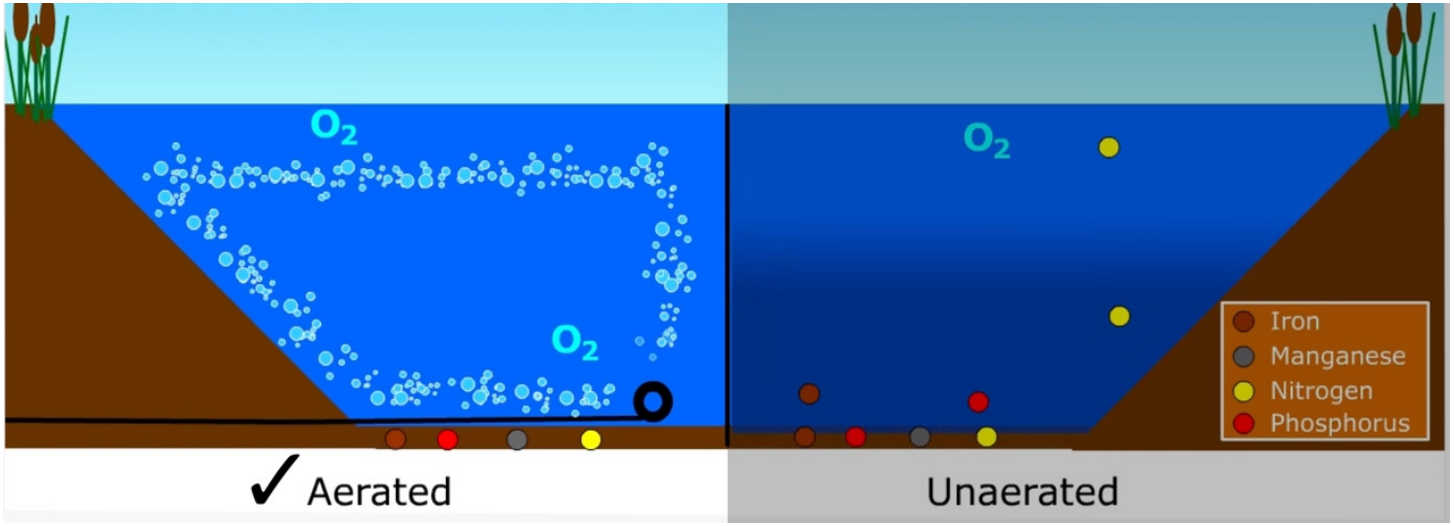
# COMMON IMPROVEMENTS

- Septage Receiving Station
- Headworks
  - Screening
  - Grit Removal
- Influent Pumping Station
- Office and Laboratory Facilities
- Additional Maintenance & Equipment Storage/Shop Facilities
- Environmentally Controlled Electrical & Controls Facilities
- Upgrade & Modernization of the Electrical, Controls & SCADA Systems
- Upgrade Power Generation Facilities

# PRIMARY TREATMENT PROCESSES

# PRIMARY PROCESSES

- Flow Equalization
  - Aerated
  - Non-Aerated



# SECONDARY TREATMENT PROCESSES

# SECONDARY TREATMENT ALTERNATIVES

- Activated Sludge
- Activated Sludge w/ Membrane Bio-Reactor
- Trickling Filter
- Trickling Filter w/ Membrane Bio-Reactor
- Membrane Bio-Reactor
- Rotating Biological Contactors
- Rotating Biological Contactors w/ Membrane Bio-Reactor
- Moving Bed Bio-Reactor w/ Membrane Bio-Reactor
- Integrated Fixed Film Activated Sludge
- Modified Aerated Ponds w/ Sequence Batch Reactor
- Modified Aerated Ponds w/ Anoxic/Oxic Tanks
- Renovated Aerated Ponds w/ Anoxic/Oxic Tanks
- Modified Aerated Pond w/ Membrane Bio-Reactor
- Modified Aerated Pond w/ Moving Bed Bio-Reactor
- Sequence Batch Reactor
- Modified Aerated Pond w/ Oxidation Ditch
- Oxidation Ditch
- Activated Sludge w/ Packed Bed Reactor and Membrane Bio-Reactor
- Renovated / Retrofitted Ponds

# SECONDARY PROCESSES EVALUATION MATRIX

| Secondary Treatment - Suspended Growth Biological Treatment Systems | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Criteria | Weight(%) | Activated Sludge (AS) | | Sequencing Batch Reactor (SBR) | | Oxidation Ditch | | Retro-Fitted Aerated Ponds | | Membrane BioReactor (MBR) | |
| | | Raw | Weighted | Raw | Weighted | Raw | Weighted | Raw | Weighted | Raw | Weighted |
| Capital Cost | 20 | 2.5 | 0.5 | 4 | 0.8 | 3 | 0.6 | 5 | 1 | 3 | 0.6 |
| Operating Cost | 20 | 4 | 0.8 | 4 | 0.8 | 3 | 0.6 | 3 | 0.6 | 3 | 0.6 |
| Odor Mitigation | 5 | 4 | 0.2 | 4 | 0.2 | 4 | 0.2 | 3 | 0.15 | 4 | 0.2 |
| Staff Requirement | 5 | 3 | 0.15 | 3 | 0.15 | 4 | 0.2 | 3 | 0.15 | 3 | 0.15 |
| Reliability | 10 | 4 | 0.4 | 4 | 0.4 | 4 | 0.4 | 4 | 0.4 | 5 | 0.5 |
| Construction Feasability | 10 | 3 | 0.3 | 4 | 0.4 | 4 | 0.4 | 5 | 0.5 | 4 | 0.4 |
| Ease of O&M | 5 | 3 | 0.15 | 3 | 0.15 | 4 | 0.2 | 3 | 0.15 | 3 | 0.15 |
| Adaptability/ Scalabiltiy | 5 | 2 | 0.1 | 5 | 0.25 | 2 | 0.1 | 4 | 0.2 | 4 | 0.2 |
| Effluent Quality | 10 | 4 | 0.4 | 4 | 0.4 | 4 | 0.4 | 4 | 0.4 | 5 | 0.5 |
| Footprint | 10 | 3 | 0.3 | 5 | 0.5 | 2 | 0.2 | 5 | 0.5 | 4 | 0.4 |
| **Total** | **100** | | **3.3** | | **4.05** | | **3.3** | | **4.05** | | **3.7** |
| ***Membrane BioReactor is a combined secondary/tertiary treatment system** | | | | | | | | | | | |

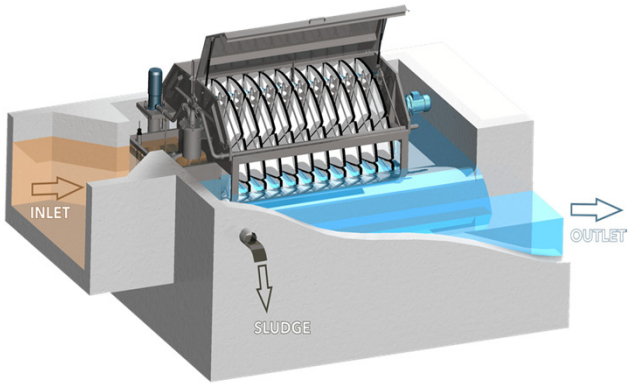
# SECONDARY ALTERNATIVE EVALUATION MATRIX CONT.

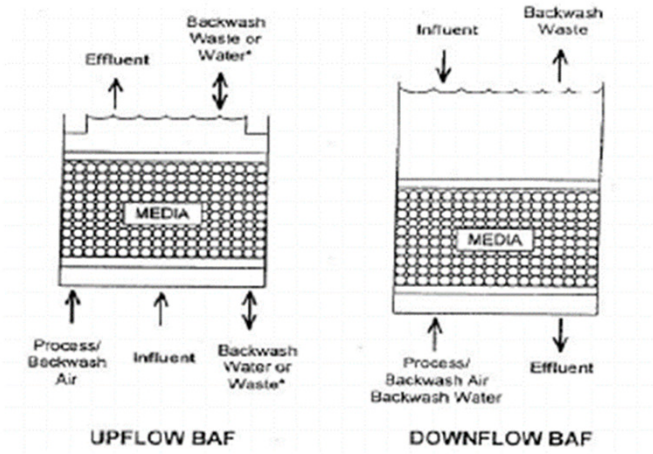
| Secondary Treatment - Fixed Film Biological Treatment System | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Criteria | Weighted(%) | Trickling Filters (TF) | | Rotating Biological Contactors (RBC) | | Moving Bed Biofilm Reactors (MBBR) | | Integrated Fixed-Film Activated Sludge (IFAS) | |
| | | Raw | Weighted | Raw | Weighted | Raw | Weighted | Raw | Weighted |
| Capital Cost | 20 | 2.5 | 0.5 | 2.5 | 0.5 | 2 | 0.4 | 2 | 0.4 |
| Operating Cost | 20 | 3 | 0.6 | 3 | 0.6 | 2 | 0.4 | 2 | 0.4 |
| Odor Mitigation | 5 | 2.5 | 0.125 | 4 | 0.2 | 4 | 0.2 | 4 | 0.2 |
| Staff Requirement | 5 | 4 | 0.2 | 3 | 0.15 | 2.5 | 0.125 | 2.5 | 0.125 |
| Reliability | 10 | 3 | 0.3 | 3 | 0.3 | 4 | 0.4 | 4 | 0.4 |
| Construction Feasability | 10 | 4 | 0.4 | 3 | 0.3 | 4 | 0.4 | 3 | 0.3 |
| Ease of O&M | 5 | 2.5 | 0.125 | 3 | 0.15 | 3 | 0.15 | 2.5 | 0.125 |
| Adaptability/ Scalabiltiy | 5 | 3 | 0.15 | 2 | 0.1 | 4 | 0.2 | 3 | 0.15 |
| Effluent Quality | 10 | 3 | 0.3 | 3 | 0.3 | 4.5 | 0.45 | 5 | 0.5 |
| Footprint | 10 | 4 | 0.4 | 3 | 0.3 | 4 | 0.4 | 3 | 0.3 |
| **Total** | **100** | | **3.1** | | **2.9** | | **3.125** | | **2.9** |

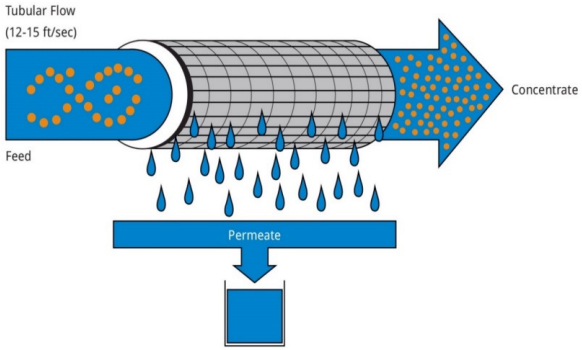
# TERTIARY TREATMENT PROCESSES

# TERTIARY TREATMENT – FILTRATION PROCESSES

- Disk Filters
- Granular Media Filters
- Membrane Filters (microfiltration and ultrafiltration)



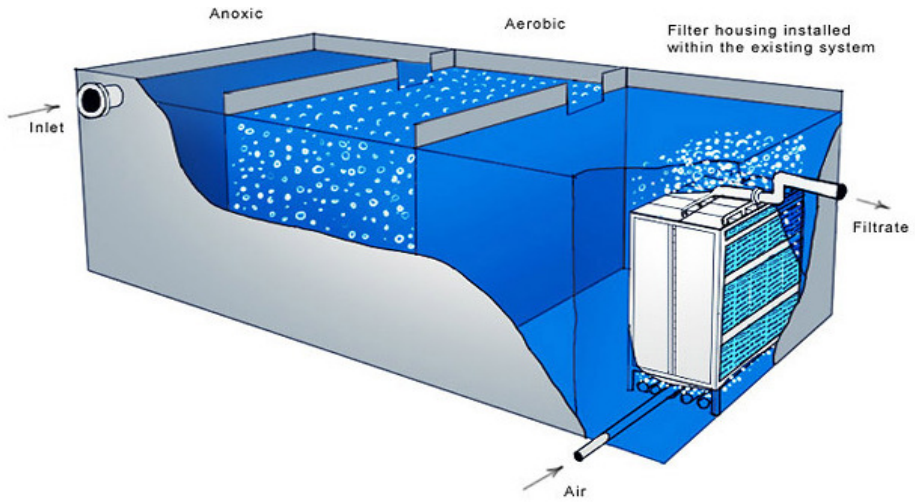
# TERTIARY TREATMENT – FILTRATION EVALUATION MATRIX

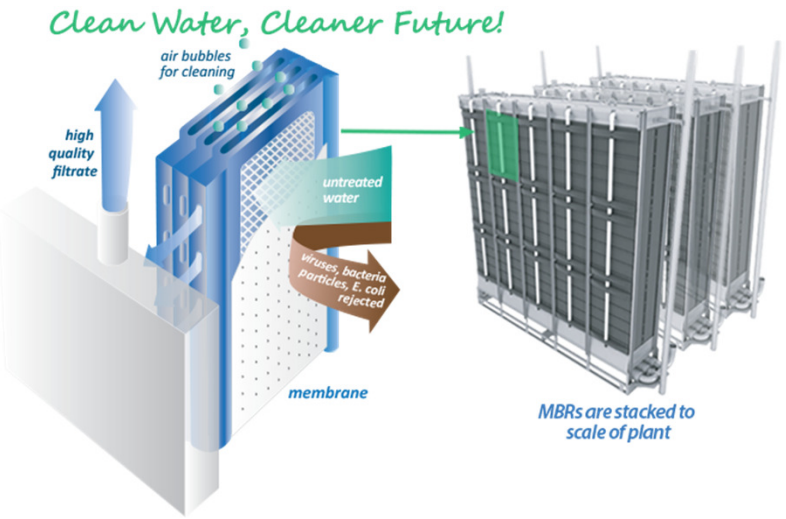
| Tertiary Treatment - Filtration Treatment Systems | | | | | | | |
|---|---|---|---|---|---|---|---|
| Criteria | Weighted(%) | Disc Filters | | Media Filters | | Membrane Filters | |
| | | Raw | Weighted | Raw | Weighted | Raw | Weighted |
| Capital Cost | 20 | 4 | 0.8 | 3 | 0.6 | 2 | 0.4 |
| Operating Cost | 20 | 3 | 0.6 | 3 | 0.6 | 2 | 0.4 |
| Odor Mitigation | 5 | 5 | 0.25 | 5 | 0.25 | 5 | 0.25 |
| Staff Requirement | 5 | 4 | 0.2 | 4 | 0.2 | 3 | 0.15 |
| Reliability | 10 | 3 | 0.3 | 3 | 0.3 | 4 | 0.4 |
| Construction Feasability | 10 | 4 | 0.4 | 3 | 0.3 | 4 | 0.4 |
| Ease of O&M | 5 | 4 | 0.2 | 4 | 0.2 | 3 | 0.15 |
| Adaptability/ Scalabiltiy | 5 | 4 | 0.2 | 3 | 0.15 | 3 | 0.15 |
| Effluent Quality | 10 | 4 | 0.4 | 4 | 0.4 | 5 | 0.5 |
| Footprint | 10 | 4 | 0.4 | 3 | 0.3 | 2.5 | 0.25 |
| **Total** | **100** | | **3.75** | | **3.3** | | **3.05** |

# HYBRID SECONDARY – TERTIARY TREATMENT PROCESSES

# COMBINED SECONDARY/TERTIARY TREATMENT

- Membrane Bio-Reactor

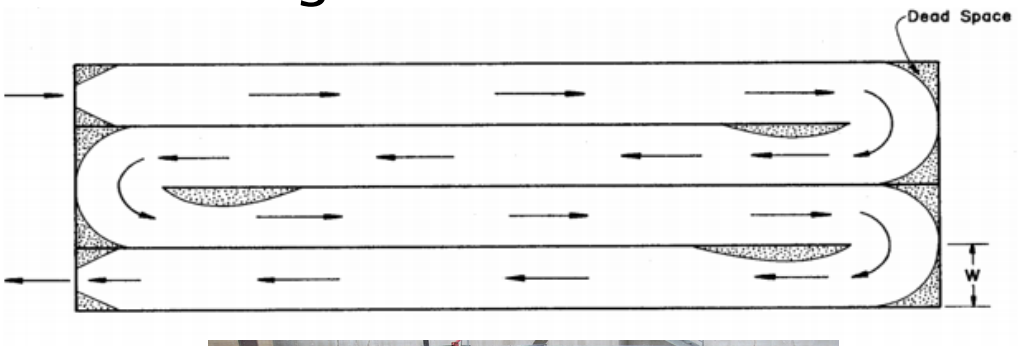


# DISINFECTION PROCESSES

# DISINFECTION PROCESS

- Chlorination/Dechlorination Basin
- UV Light





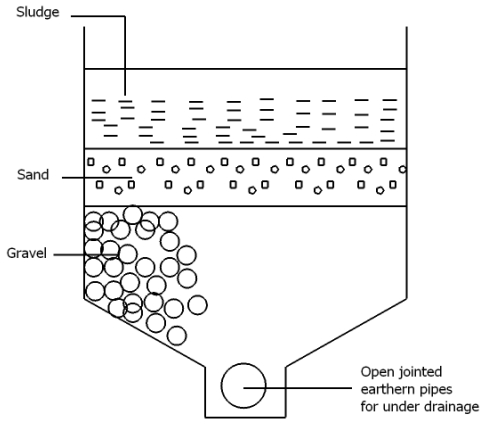
# DISINFECTION PROCESSES EVALUATION MATRIX

| Tertiary Treatment - Disinfection Treatment Systems | | | | | |
|---|---|---|---|---|---|
| Criteria | Weighted(%) | UV Disinfection | | Chlorine Disinfection | |
| | | Raw | Weighted | Raw | Weighted |
| Capital Cost | 20 | 3 | 0.6 | 3 | 0.6 |
| Operating Cost | 20 | 2 | 0.4 | 3 | 0.6 |
| Odor Mitigation | 5 | 5 | 0.25 | 4 | 0.2 |
| Staff Requirement | 5 | 3 | 0.15 | 3 | 0.15 |
| Reliability | 10 | 3 | 0.3 | 4 | 0.4 |
| Construction Feasability | 10 | 4 | 0.4 | 3 | 0.3 |
| Ease of O&M | 5 | 4 | 0.2 | 3 | 0.15 |
| Adaptability/ Scalabiltiy | 5 | 4 | 0.2 | 3 | 0.15 |
| Effluent Quality | 10 | 4 | 0.4 | 3 | 0.3 |
| Footprint | 10 | 4 | 0.4 | 3 | 0.3 |
| **Total** | **100** | | **3.3** | | **3.15** |

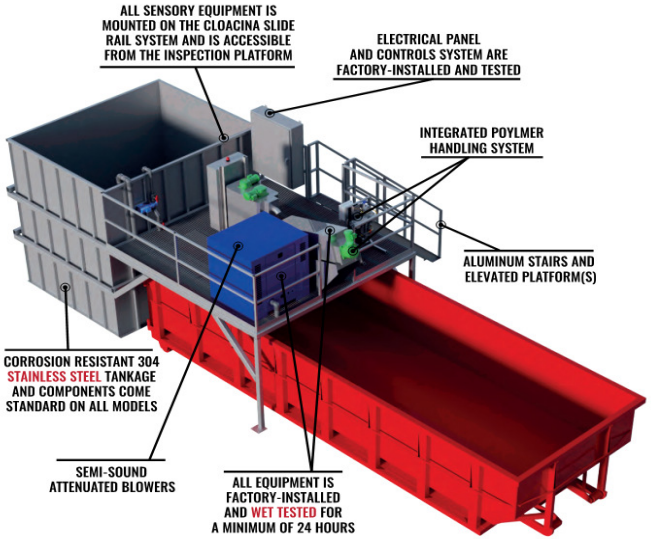
# SLUDGE MANAGEMENT PROCESSES

# BIOSOLIDS MANAGEMENT PROCESSES

- Sludge Drying Bed
- Dewatering Container Filters (Sludge Box)
- Screw Press







# BIOSOLIDS MANAGEMENT PROCESSES EVALUATION MATRIX

| Tertiary Treatment - Bio-Solids Handling Systems | | | | | | | |
|---|---|---|---|---|---|---|---|
| Criteria | Weighted(%) | Sludge Drying Bed | | Dewatering Container Filters (Sludge Box) | | Screw Press | |
| | | Raw | Weighted | Raw | Weighted | Raw | Weighted |
| Capital Cost | 20 | 5 | 1 | 4 | 0.8 | 3 | 0.6 |
| Operating Cost | 20 | 3 | 0.6 | 4 | 0.8 | 4 | 0.8 |
| Odor Mitigation | 5 | 2 | 0.1 | 4 | 0.2 | 3 | 0.15 |
| Staff Requirement | 5 | 2 | 0.1 | 4 | 0.2 | 4 | 0.2 |
| Reliability | 10 | 3 | 0.3 | 4 | 0.4 | 4 | 0.4 |
| Construction Feasability | 10 | 5 | 0.5 | 5 | 0.5 | 5 | 0.5 |
| Ease of O&M | 5 | 3 | 0.15 | 4 | 0.2 | 4 | 0.2 |
| Adaptability/ Scalabiltiy | 5 | 2 | 0.1 | 4 | 0.2 | 4 | 0.2 |
| Effluent Quality | 10 | 4 | 0.4 | 4 | 0.4 | 4 | 0.4 |
| Footprint | 10 | 3 | 0.3 | 4 | 0.4 | 5 | 0.5 |
| **Total** | **100** | | **3.55** | | **4.1** | | **3.95** |

# CASE STUDIES

# NIPOMO WASTEWATER TREATMENT FACILITY

- Permitted Capacity of 0.9 MGD, Operating at 0.6 MGD
- The current plant included 4 aerated ponds, 2 sludge drying beds, and 8 percolation basins.
- Projected Effluent and Flow limits Would Be Reached Soon
- Four Treatment Processes Were Evaluated for the WWTF Upgrade:
  A. ADDITIONAL AERATED PONDS
  B. BIOLAC WAVE OXIDATION SYSTEM
  C. OXIDATION DITCH
  D. CONVENTIONAL ACTIVATED SLUDGE
- Selected Treatment Option was **RETROFITTED POND SYSTEM**

# KING CITY WASTEWATER TREATMENT FACILITY

- Permitted Capacity of 1.2 MGD, Operating at 0.85 MGD
- The current plant included head works, seven aerated ponds, an effluent disposal pump station and force man, and six spray irrigation fields for disposal of treated effluent. Projected effluent and flow limits would be reached soon
- Initially, multiple options were considered:

1.) Activated Sludge
2.) Trickling Filter (1-stage)
3.) Nitrifying Trickling Filter
4.) Denitrification Filters
5.) Additional Ponds
6.) Conventional Activated Sludge (CAS) W/ Modified Ludzach-Etinger (MLE) Process
7.) Oxidation Ditch
8.) MBR

- Based on BOD removal, Ammonia removal, Total Nitrogen removal, reliability and recommendations made by Carollo, the 3 investigated further included:

A. **Conventional Activated Sludge (CAS) W/ Modified Ludzach-Etinger (MLE) process**
B. **Oxidation Ditch**
C. **MBR**

- These three systems were evaluated based on a matrix that included performance, footprint, constructability, operation and maintenance requirements, economic factors, and safety. The highest score received was by **Oxidation Ditch**, which was selected as the alternative.

# MORRO BAY WASTEWATER TREATMENT FACILITY

- Design ADF Of 1.5 MGD, Operating At 1.25 MGD
- The current plant included bar screens, aerated Grit Basin, 2 primary clarifiers, 2 trickling filters, solids contact chamber, secondary clarifier, chlroine contact basin, and effluent discharged to the ocean. The systems sludge was sent to a digester.
- Multiple treatment Processes were looked at but two were evaluated for the WWTF upgrade:
  A. **SBR**
  B. **MBR**
  C. **OXIDATION DITCH**

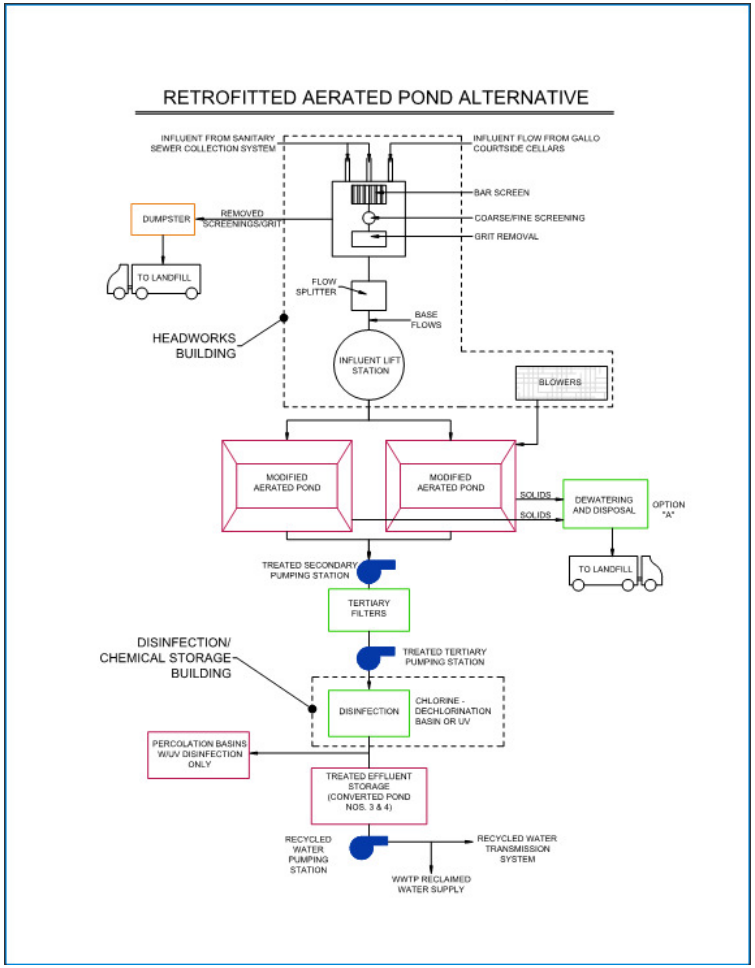
  Selected treatment option was **MBR System**

# WWTP EXPANSION / UPGRADE PREFERRED ALTERNATIVE CONFIGURATIONS

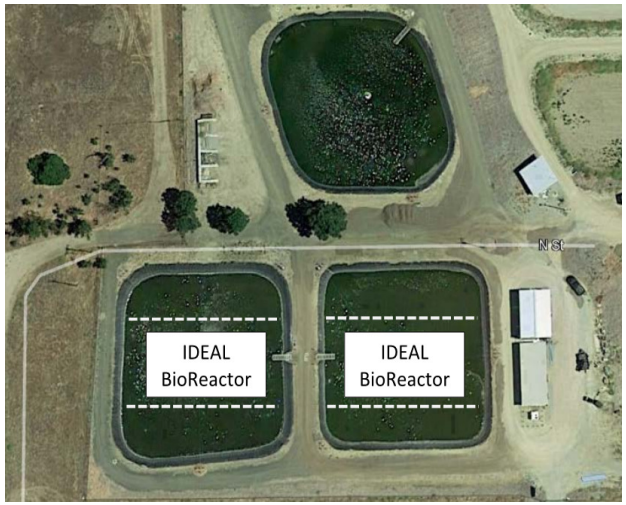
# Retrofitted Existing Pond System Sequencing Batch Reactor (SBR) Membrane Bio-Reactor (MBR)

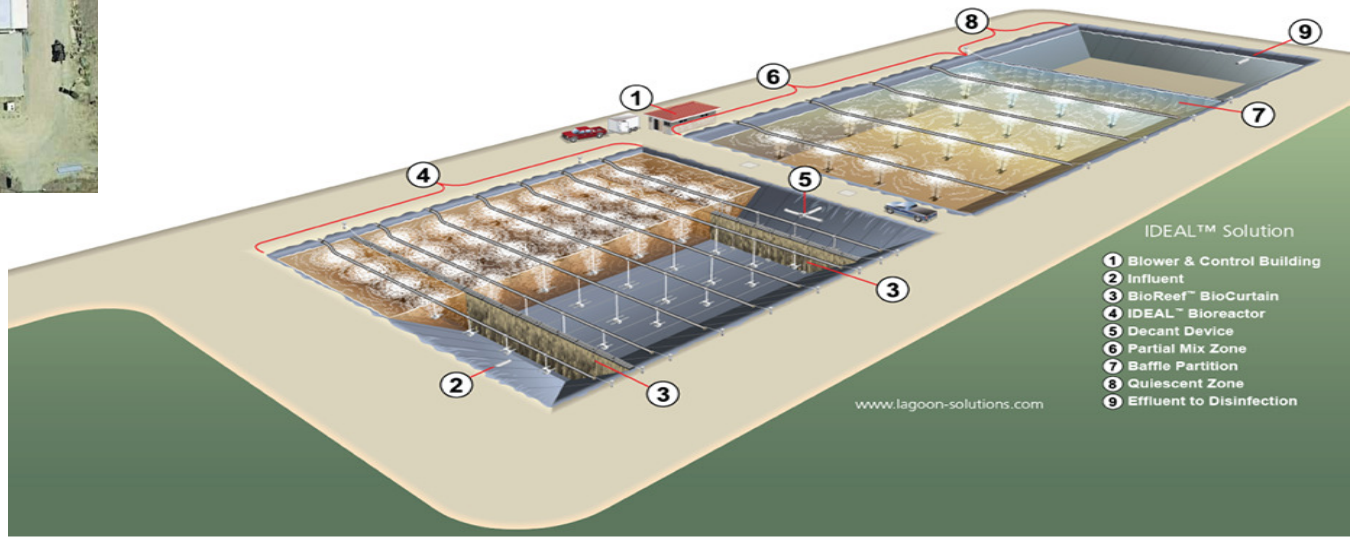
# RETROFITTED EXISTING POND SYSTEM (HYBRID SBR)

- Summary of Configuration
  - Headworks
  - Influent Lift Station
  - Aerated Flow Equalization
  - Hybrid SBR Pond System
  - Tertiary Filtration
  - UV Disinfection
  - Biosolids Handling
  - Recycled Water System



# RETROFITTED POND SYSTEM (HYBRID SBR)



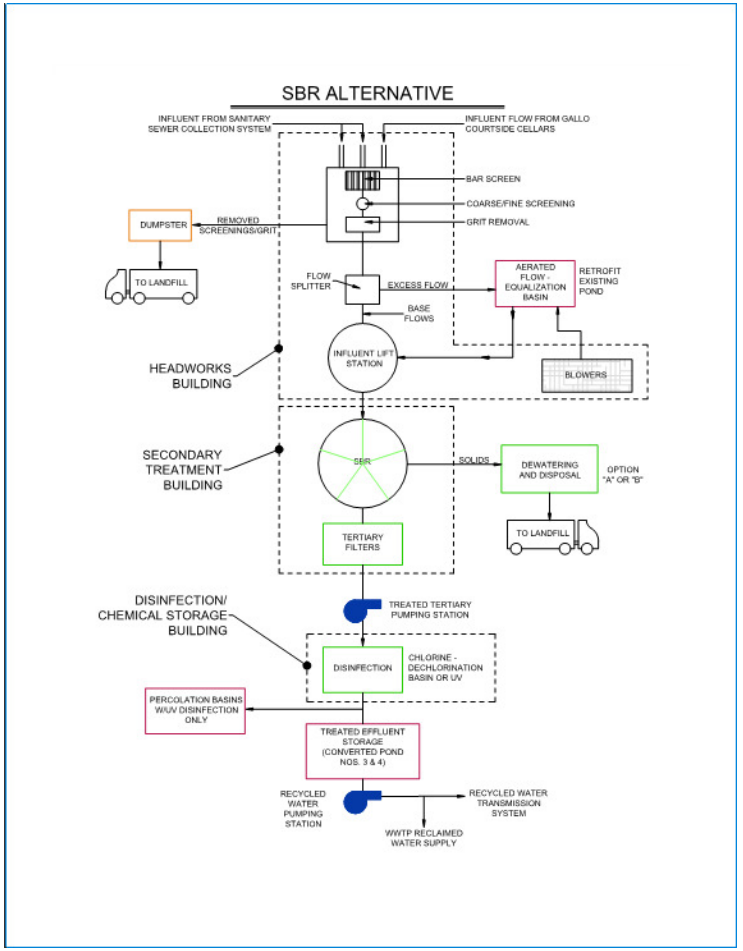



# EXISTING HYBRID SBR POND SYSTEMS

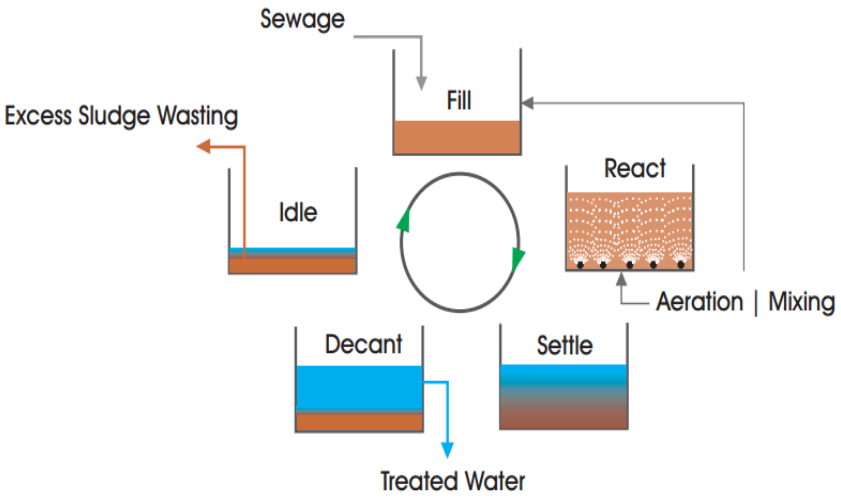
| NAME OF FACILITY | LOCATION (CITY, STATE) | ADF |
|---|---|---|
| Lexington WWTP | Lexington, Tennessee | 1.1 MGD |
| City of Rupert Wastewater Treatment Plant | Rupert, Idaho | 2.6-3.0 MGD |
| Mountain Green Sewage District Plant | Mt. Green, Utah | 0.2-0.6 MGD |
| Grantsville WWTP | Grantsville, Utah | 1.5 MGD |
| Brakebush Brothers Inc., Poultry | Westfield, Wisconsin | 0.1 MGD |
| F&A Dairy Products, Inc. | Dresser, Wisconsin | 0.1 MGD |
| Miner WWTP | Miner, Missouri | 0.3 MGD |

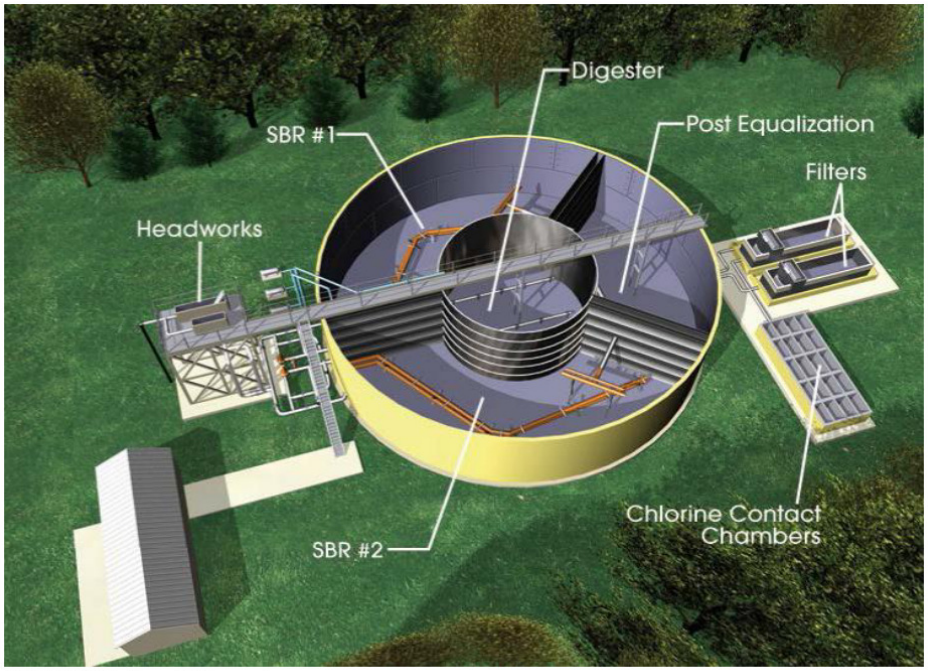
# SEQUENCING BATCH REACTOR

- Summary of Configuration
  - Headworks
  - Influent Lift Stations
  - Aerated Flow Equalization
  - SBR Unit
  - Tertiary Filtration
  - UV Disinfection
  - Biosolids Handling
  - Recycled Water System



# SEQUENCING BATCH REACTOR SYSTEM



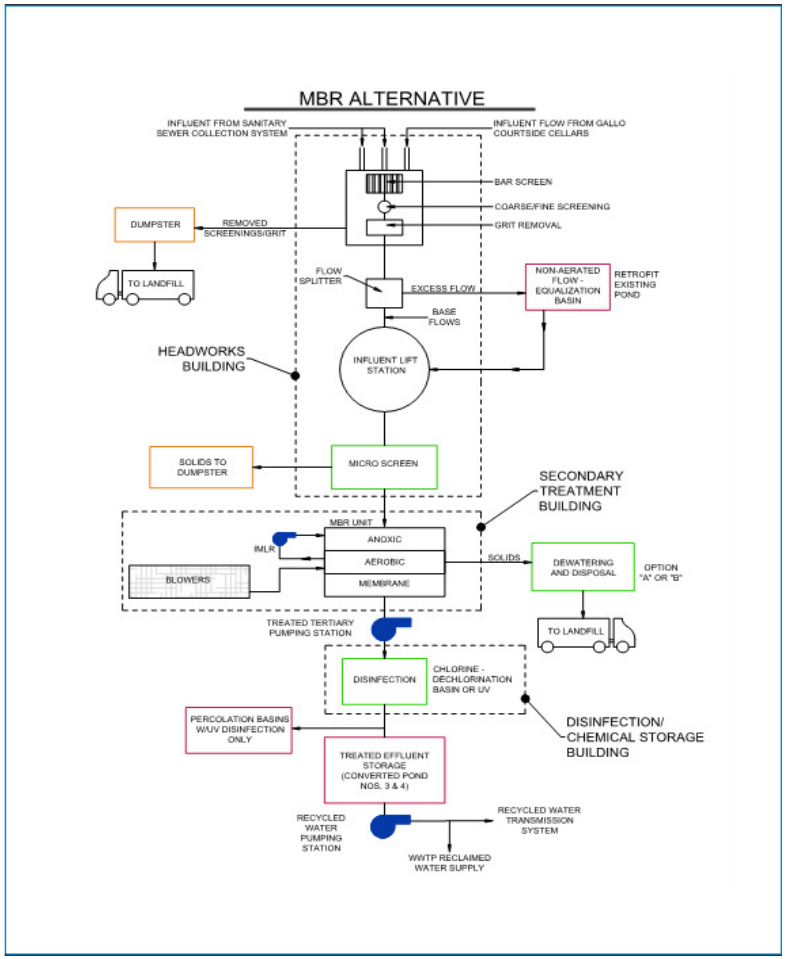

OMNIPAC® Field - Erected SBR system layout

# EXISTING SEQUENCING BATCH REACTOR SYSTEMS

| NAME OF FACILITY | LOCATION (CITY, STATE) | ADF |
|---|---|---|
| Siletz WWTP | Siletz, Oregon | 90-200,000 |
| Mingus WWTP | Cottonwood, Arizona | 1,000,000 |
| Sometron WWTP | Somerton, Arizona | 800,000 |
| Cave Creek WWTP | Cave Creek, Arizona | 300,000 |
| Pala Casino Spa & Resport WWTP | Pala , California | 600,000 |
| Coquille Sewage TP | Coquille, Oregon | 6.12 MGD |
| Creswell WTF | Creswell, Oregon | 800,000 |
| Sun Lakes WWTP | Sun Lakes, Arizona | 2.4 MGD |
| Sundance Water Reclamation Facility | Buckeye, Arizona | 1.2 MGD |
| Mountain House Water Reclamation Facility | (near Tracy), California | 3 MGD |
| Cypress Ridge WWTP | Arroyo Grande, California | 0.14 MGD |
| Calera Creek WRP | Pacifica, California | 3.30 MGD |
| Santa Rosa Rancheria | Lemoore, California | 0.55 MGD |
| Table Mountain Rancheria | Friant, California | 0.5 MGD |

# MEMBRANE BIO-REACTOR

- Summary of Configuration
  - Headworks
  - Influent Lift Station
  - Non-Aerated Flow Equalization
  - Micro Screening
  - MBR Unit
  - UV Disinfection
  - Biosolids Handling
  - Recycled Water System



# EXISTING MEMBRANE BIO-REACTOR SYSTEMS

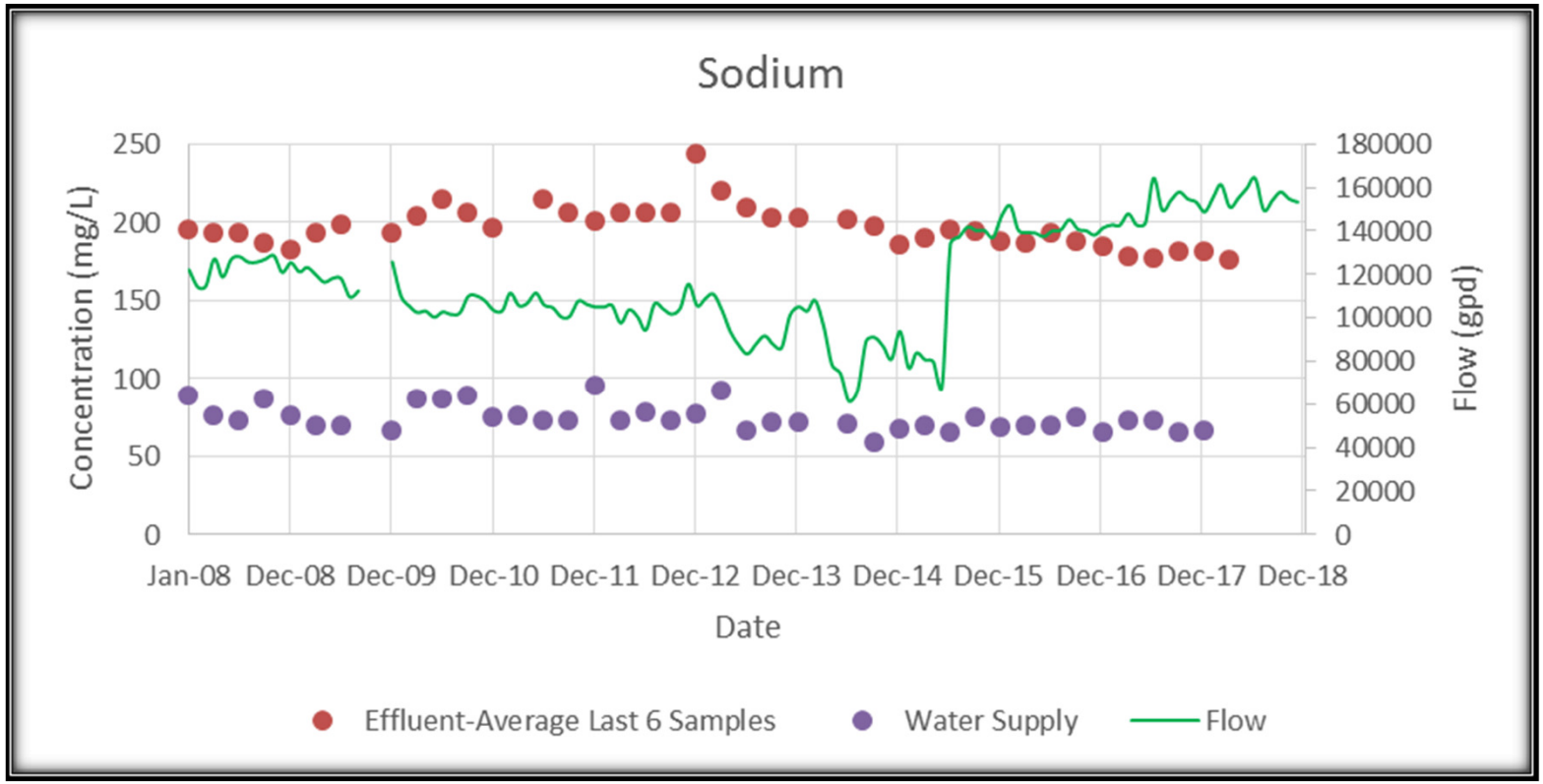
| NAME OF FACILITY | LOCATION (CITY,STATE) | ADF |
|---|---|---|
| Quechan Paradise Casino | Winterhaven, Ca | 600,000 GPD |
| Double Tree Paper Mill Facility | Gila Bend, Az | 300,000 GPD |
| Corona WWTP | Carona, Ca | 3.8-8.5 MGD |
| Tri-City water Pollution Control Plant (WPCP) | Oregon City, Clackamas County, Oregon | 4 MGD |
| San Luis Obispo WRRF MBR upgrade | San Luis Obispo, CA | 3 MGD |
| Ironhouse Sanitary District WWTP | Countra Costa County, CA | 8.6 MGD |
| Redlands WWTP | San Bernardino County, CA | 6.6 MGD |
| Santa Paula WWTP | Ventura County, CA | 4.2 MGD |
| American Canyon WWTP | Napa County, CA | 3.75 MGD |
| Red Hawk Casino WWTP | CA | 0.3 MGD |
| *Morro Bay WWTP(in progress, deciding on MBR Manufacturer) | Morro Bay, CA | 1.1 MGD |

# SHORT-LIST EVALUATION MATRIX

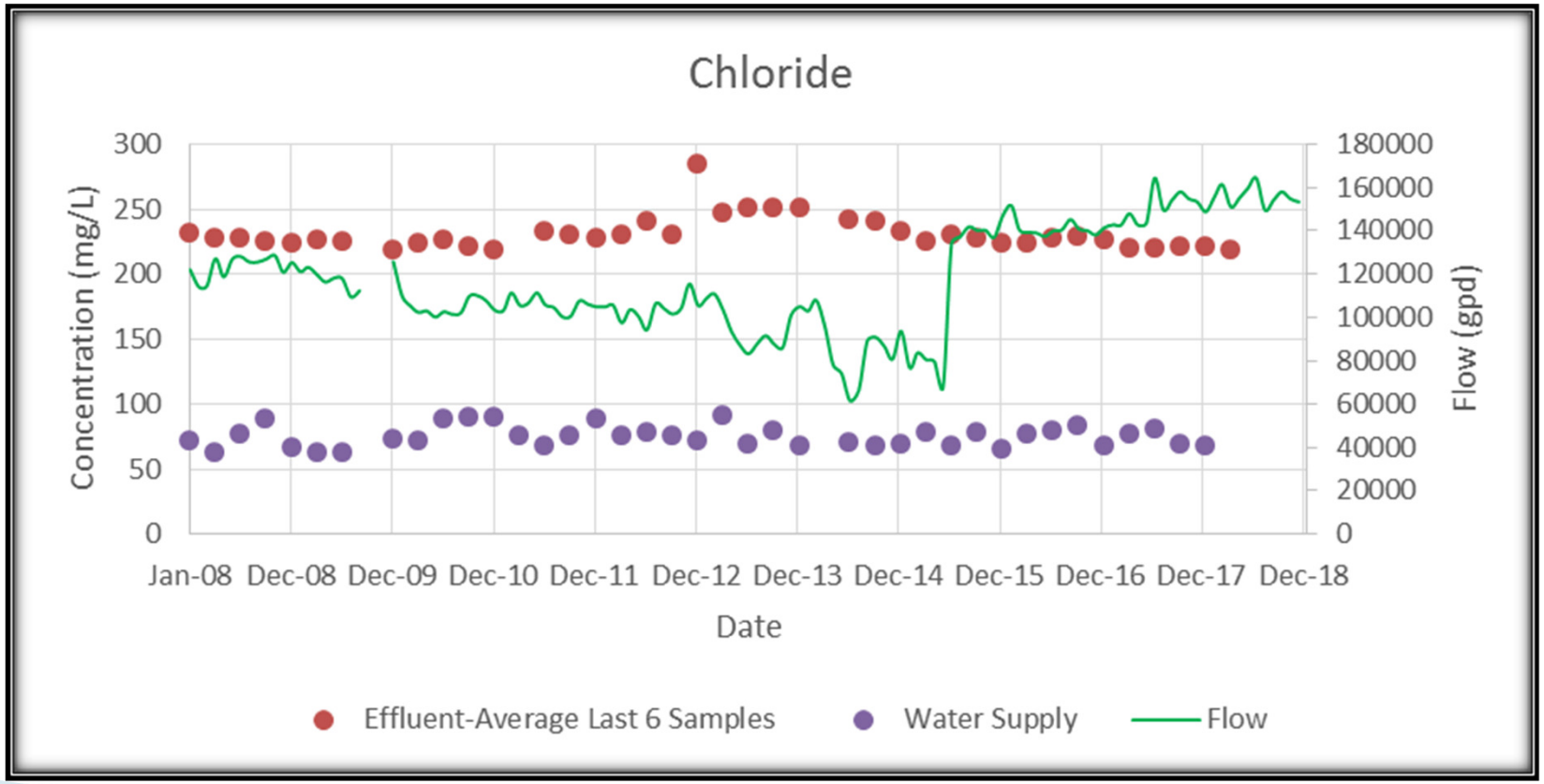
| Criteria | Weight(%) | Recommended Treatment Systems | | | | | |
|---|---|---|---|---|---|---|---|
| | | Retro-Fitted Aerated Ponds | | Sequencing Batch Reactor (SBR) | | Membrane BioReactor | |
| | | Raw | Weighted | Raw | Weighted | Raw | Weighted |
| Capital Cost | 20 | 5 | 1 | 4 | 0.8 | 3 | 0.6 |
| Operating Cost | 20 | 3 | 0.6 | 4 | 0.8 | 3 | 0.6 |
| Odor Mitigation | 5 | 3 | 0.15 | 4 | 0.2 | 4 | 0.2 |
| Staff Requirement | 5 | 3 | 0.15 | 3 | 0.15 | 3 | 0.15 |
| Reliability | 10 | 4 | 0.4 | 4 | 0.4 | 5 | 0.5 |
| Construction Feasability | 10 | 5 | 0.5 | 4 | 0.4 | 4 | 0.4 |
| Ease of O&M | 5 | 3 | 0.15 | 3 | 0.15 | 3 | 0.15 |
| Adaptability/ Scalabiltiy | 5 | 4 | 0.2 | 5 | 0.25 | 4 | 0.2 |
| Effluent Quality | 10 | 4 | 0.4 | 4 | 0.4 | 5 | 0.5 |
| Footprint | 10 | 5 | 0.5 | 5 | 0.5 | 4 | 0.4 |
| **Total** | **100** | | **4.05** | | **4.05** | | **3.7** |

# SALT MANAGEMENT STRATEGY

# SODIUM TRENDS IN EFFLUENT



# CHLORIDE TRENDS IN EFFLUENT

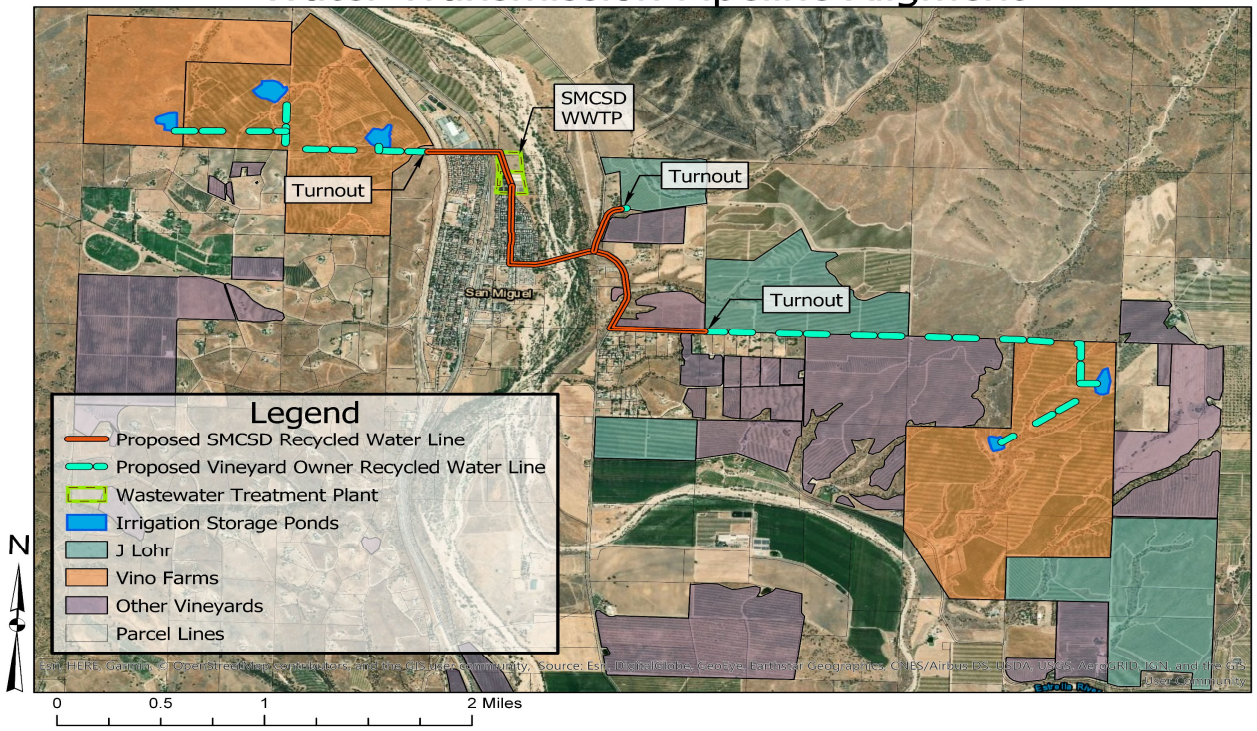


# SALT REDUCTION THROUGH BLENDING

- RECYCLED WATER THAT MEETS TITLE 22 DISINFECTED SECONDARY STANDARDS CAN BE USED FOR VINEYARD DRIP IRRIGATION SYSTEMS
- MIXING RECYCLED WATER WITH WELL WATER PRODUCED BY VINEYARDS WILL PRODUCE A IRRIGATION SUPPLY THAT IS SUITABLE FOR VINE HEALTH
- ELIMINATE THE PERCOLATION OF EFFLUENT WITH HIGH SALT CONCENTRATIONS INTO THE GROUNDWATER AQUIFER
- DISTRIBUTE THE PRODUCED MASS OF SALT OVER A SIGNIFICANT AREA (MINIMAL ADVERSE IMPACT TO THE GROUNDWATER BASIN)
- REDUCED PUMPING FROM NEARBY VINEYARD IRRIGATION WELLS
- POTENTIAL SIGNIFICANT LONG-TERM INCOME SOURCE FOR DISTRICT

# RECYCLED WATER SUPPLY SYSTEM

## Proposed SMCSD Title 22 Recycled Water Transmission Pipeline Aligment



# PRELIMINARY WWTP EXPANSION / UPGRADE CAPITAL COST ESTIMATES

# COMPARISON OF ESTIMATED CAPITAL COSTS

- RETROFITTED EXISTING POND SYSTEM – $4,360,000
- SEQUENCING BATCH REACTOR SYSTEM – $4,950,000
- MEMBRANE BIO-REACTOR SYSTEM – $5,950,000

ESTIMATED WWTP EXPANSION / UPGRADE ESTIMATE PER 2017 MASTER PLAN UPDATE – $4,559,300

- Note: Not included in each of these configurations cost estimates is the estimated cost of for a Recycled Water Storage / Pumping / Transmission System to Deliver Treated Effluent to Large Vineyards for Irrigation Purposes is $2,380,000.

# WHATS NEXT?

- Complete Engineering Report and Delivered to Board
- Initiate CEQA Process
- Meet with Water Board to Solicit Input and Direction
- Initiate District Operations Staff Diligence Investigations
- Selection of Final WWTP Expansion / Upgrade Configuration
- Submittal of Grant Funding Applications
- WWTP Expansion / Upgrade Design Development
- Initiate Permitting Process
- WWTP Expansion / Upgrade Construction Documentation
- Initiate Project Financing Activities
- Complete CEQA Process and Permitting
- Initiate Project Solicitation for Bids
- Contract Award and Begin Construction