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Village of Cloudcroft, NM PUReWater Project

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Wastewater Reuse

- Treated wastewater is a commodity.... Don’t throw it away!
- It is a water resource that is a known quantity, already have rights, renewable supply.... Only requires treatment
- Various uses: irrigation of green spaces, traded for potable, augment SW/GW
- Ultimate in water conservation

What is Potable Reuse ?

- Using treated wastewater to augment a potable water supply
  - Planned Indirect Potable Reuse
  - Unplanned Indirect Potable Reuse
  - Direct Potable Reuse = Toilet to Tap (Pipe-to-Pipe)

Unplanned Indirect Reuse

- Occurs anywhere wastewater effluent is discharged into a surface water body (lake or river) that is used for drinking water supply by a downstream user
- Mississippi, Colorado, Rio Grande, etc.
- Drinking water receives “standard” treatment

Planned Direct Reuse

- Pipe-to-Pipe... from wastewater plant to drinking water system
- Not allowed by USEPA
- Windhoek, Nambia South Africa - since 1968 as supplement to reservoir supply, now 24,000 m3/day (100%)

Planned Indirect Potable Reuse (NRC)

- "... the abstraction, treatment and distribution of water for drinking from a natural source water that is fed in part by the discharge of wastewater effluent... The water receives additional treatment prior to distribution... In contrast, with direct potable reuse, the water is reused with no intervening environmental buffer," Issues in Potable Reuse, NRC, 1998 (p. 20, 21)

Planned Indirect Potable Reuse (EPA)

- "… the augmentation of a community's raw water supply with treated wastewater followed by an environmental buffer. The treated wastewater is mixed with surface and/or groundwater and the mix typically receives additional treatment before entering the water distribution system." Guidelines for Water Reuse, USEPA 2004, Ch. 2.6, p. 41

Indirect Potable Reuse

- Water Factory 21, California - 1976 treat 15 mgd for aquifer recharge
- Los Angeles County - 45 mgd for GW recharge (33% of total recharge)
- El Paso, Tx. - 1985 recharge Hueco
- North Texas Municipal Water District (Dallas) - 1987 24 mgd into watershed of the water supply reservoir

Indirect Potable Reuse

- Clayton Co. Ga., - 15 mgd to forest, river watershed supplying Atlanta
- Water Campus, Scottsdale Az. - 1998 recharges aquifer 10 mgd
- Singapore - 2003 NEWater Project supplies 4.3 million residents

Large IPR Projects

- Miami-Dade County, Florida is planning a $1.1-billion indirect potable reuse project, with an ultimate capacity of 100-million gallons per day. The proposed treatment process includes microfiltration, reverse osmosis, advanced oxidation and UV disinfection (the treatment process is almost identical to that proposed by Cloudcroft).
- The City of Aurora, Colorado is planning a $754-million indirect potable reuse project (the Prarie Waters Project), which will treat South Platte River water diverted downstream from the Denver Metro Wastewater Reclamation Plant. The project will provide 20 percent of Aurora's water supply, and will use filtration, activated carbon and UV disinfection.

Large IPR Projects

- The $487-million Groundwater Replenishment (GWR) System in Orange County, California is designed to ultimately reuse approximately 140,000 acre-feet per year of advanced treated wastewater. The treatment process consists of microfiltration, reverse osmosis and UV-oxidation.

EPA Guidelines

- "For many cities or regions, the growing demand for water, lack of new water resources, and frequent calls for water conservation in low and consecutive low rainfall years have resulted in the need to augment potable supplies with reclaimed water. Indeed, in some situations, indirect potable reuse may be the next best alternative to make beneficial use of the resource." (p. 43, emphasis added).

Water Environment Federation Statement of Support for IPR

- "…WEF supports the consideration and use of highly treated reclaimed water for indirect potable reuse…Indirect potable reuse is the introduction of highly treated reclaimed water to a surface water or groundwater system that is ultimately used as a potable water supply. Current engineering practice can provide treatment systems that are capable of reliably eliminating pathogens and reducing organic and inorganic contaminant concentrations to very low levels in reclaimed water. Therefore, local authorities should consider indirect potable reuse of reclaimed water as part of an integrated water resources management strategy." (10/2/98, emphasis added).

EPA Guidelines

- "On the basis of available information, there is no indication that health risks from using highly treated reclaimed water for potable purposes are greater than those from using existing water supplies (National Research Council, 1994)." (p. 104, emphasis added).

Cloudcroft, NM

- Population 750 permanent
- Swells to >2,000 weekends/holidays
- Avg. Demand 180,000 gpd
- Peak Demand 360,000 gpd
- Mountain community elev. 8600 ft.

Current Water Supply

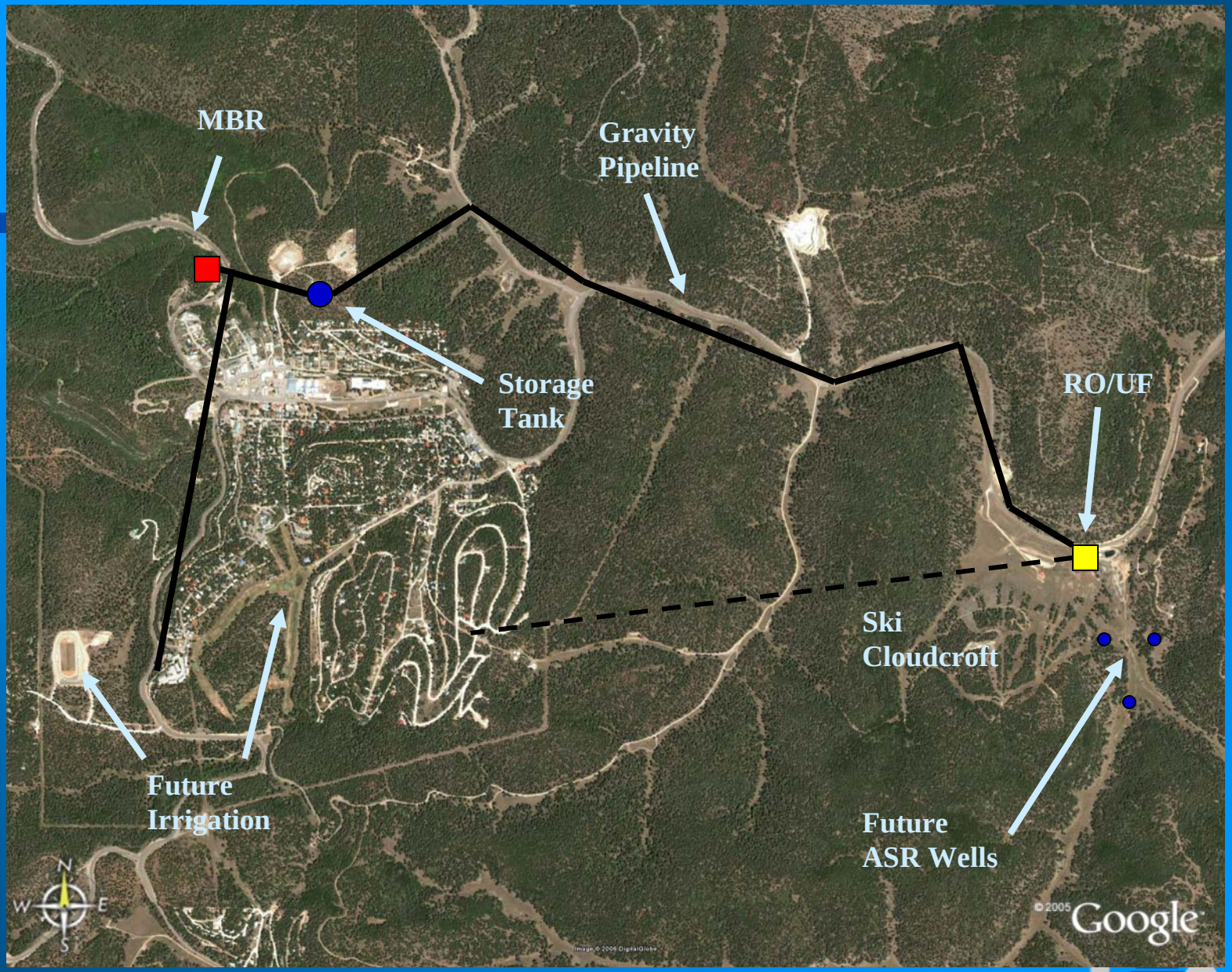
- Water sources include springs and wells
- Drought has caused a reduction in spring flows and ground water levels
- More than 7 exploratory wells drilled
- Additional groundwater not available
- Conservation measures undertaken
- Water hauling during weekends

‘PURe Water’ Project Plan

- Augment potable water system with advanced treated wastewater
- Treat 100,000 GPD and blend up to 50/50 with natural spring/well water
- Treat blended mix again and place into distribution system
- Multi barrier treatment approach

‘PURe Water’ Treatment

- Membrane Bioreactor (MBR)
- Disinfection
- Reverse Osmosis (RO)
- Advanced Oxidation (UV/peroxide)
- Blending with Natural Waters
- Ultrafiltration (UF) and UV
- Activated Carbon (GAC)
- Disinfection


MBR
Gravity
Pipeline
Storage
Tank
RO/UF
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Cloudcroft
Future
Irrigation
Future
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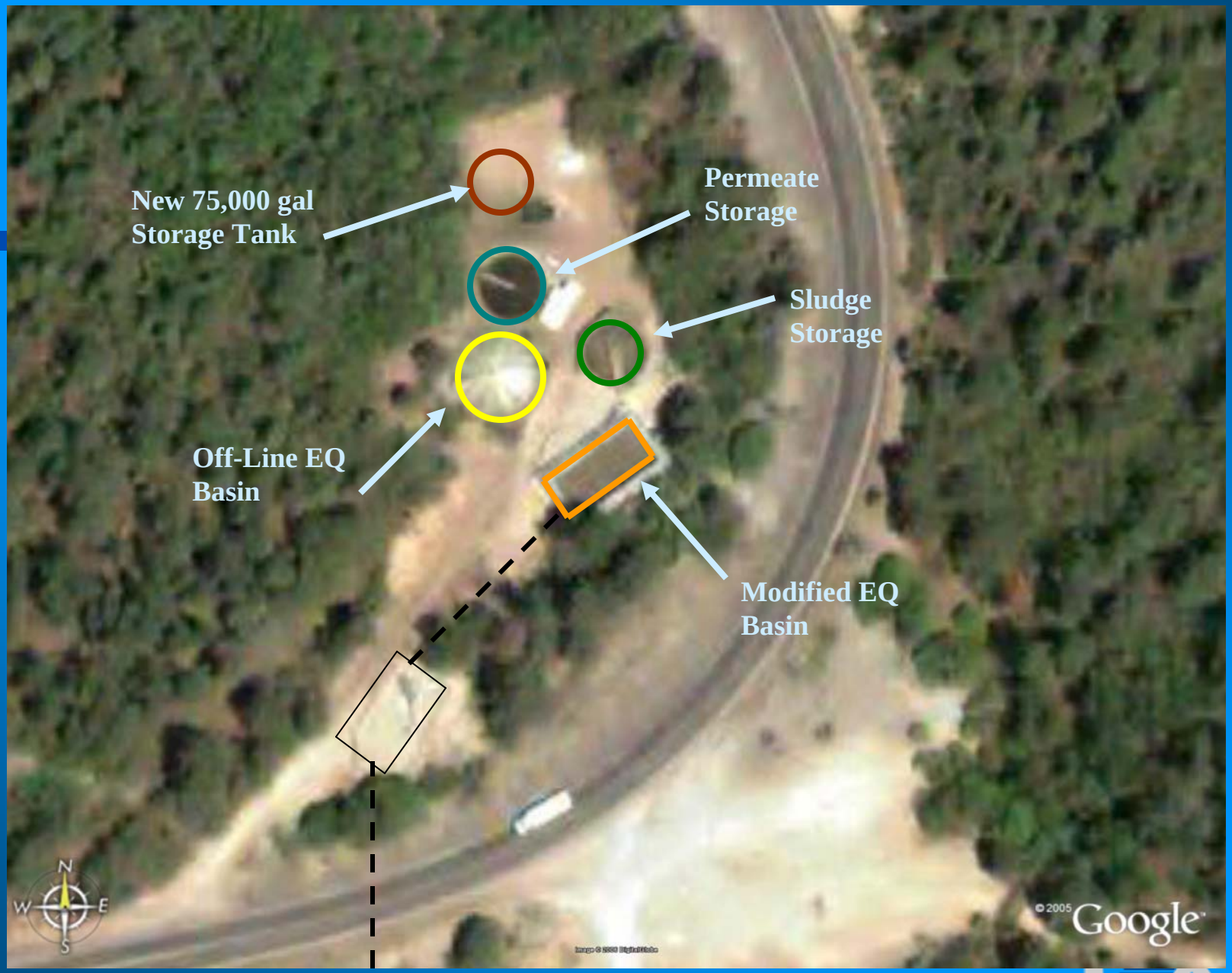
Water Quality

- WW BOD/TSS 300/380 mg/L
- WW TDS 650 mg/L
- GW TDS 480 mg/L
- SW TDS 330 mg/L
- Distribution Exist TDS 400 mg/L
- RO TDS 25 mg/L
- New Blended TDS 250 mg/L


New 75,000 gal
Storage Tank
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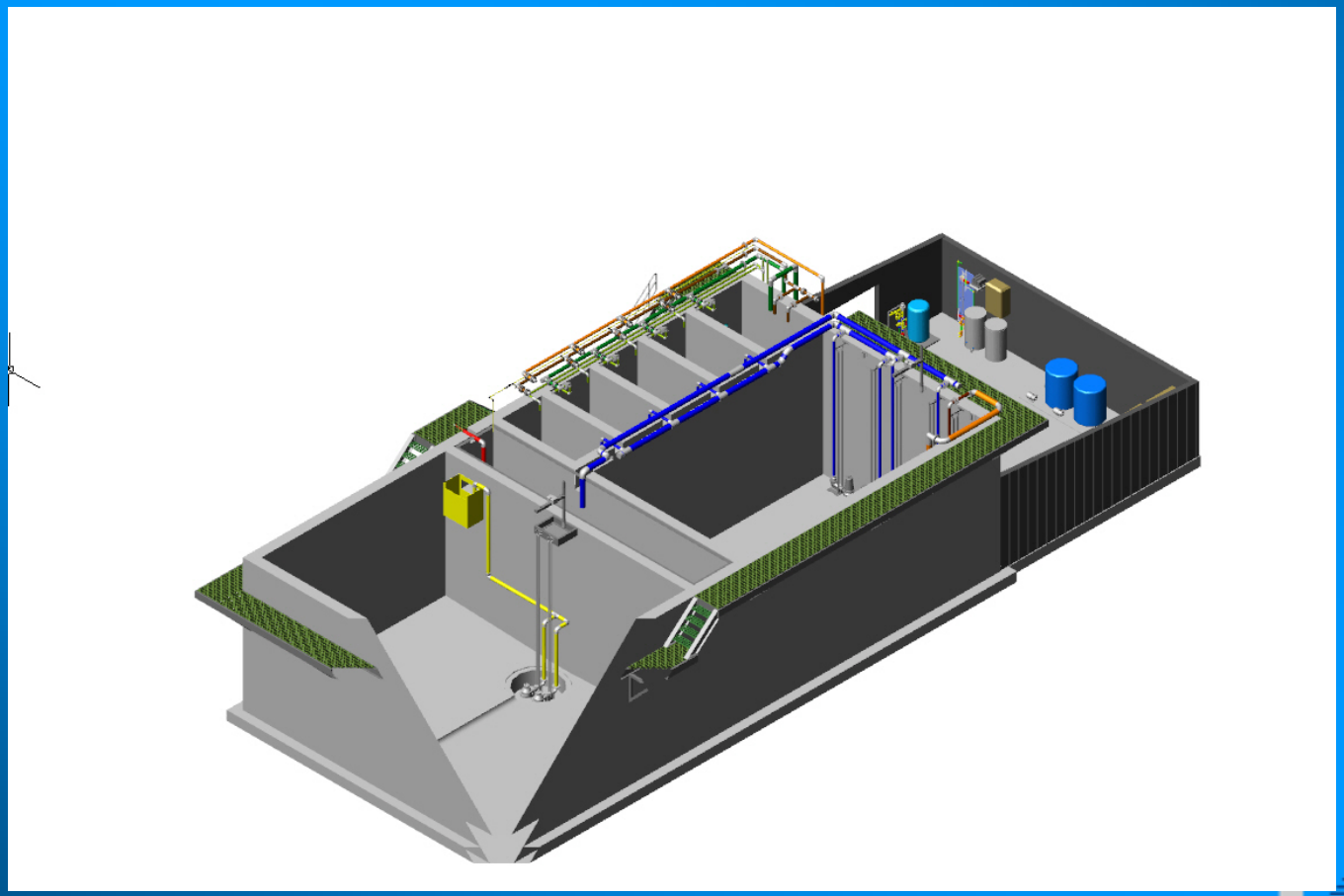
Membrane Bioreactor (MBR)

- Retrofit of existing wastewater treatment facility.
- Q_{avg} of 100,000 gpd.
- Pretreatment for reverse osmosis system.
- Disinfection with chloramines (Cl_2 + NH_3).

Constraint	Effluent Limit
BOD_5	<5 mg/L
TSS	<5 mg/L
Total N	<10 mg/L
Turbidity	<1 NTU
SDI (15 min)	<3

Membrane Bioreactor



MBR-EQ Basin

MBR Building

MBR Building

MBR Basin


RO/UF
2-MG Pond
Concentrate
Pond
Recharge Wells
N
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RO/UF Site

RO/UF Building

Reverse Osmosis (RO)

- Follows MBR treatment step.
- Utilize elevation difference for gravity feed to RO.
- Disinfection with UV and hydrogen peroxide.
- Removal of total dissolved solids (TDS) and emerging pollutants of concern (EPOCs).

Constraint	Operating Limit
TDS	<50 mg/L
Salt Rejection	99.20%
Min Permeate Recovery	80%
Max Feed Pressure	175 psi

RO System

Rio Rancho IPR Pilot Study Conclusions

- "The RO permeates tested…all were lower than the SDWA and NMWQCC standards. A majority of the constituents tested were well below the standards and below laboratory detection limits. Two samples of raw influent, MBR permeate and RO permeate were analyzed for a group of emerging contaminates. Many of the compounds were removed through the activated sludge portion of the process, and all of the contaminates were removed *to below detection limits by the RO process*…" (*Water Reuse Program Pilot-Scale Evaluation for an Integrated Membrane System (IMS) Final Report*, August 2005, MWH-Americas, Inc. in association with the University of New Mexico, p. ES-2, emphasis added).

UV Oxidation

- Hydrogen peroxide dosed ahead of UV
- hydroxyl radicals break apart organics
- Reduction of EDC's, PPCP's, NDMA
- California DHS action level 1-log reduction of NDMA (10 ppt)
- Trojan UVPhox used for OCWD 70-MGD Groundwater Replenishment System

Environmental Buffer

- Natural water body that separates treated ww and intake to DW plant
- May be reservoir, river, lake, aquifer
- Opportunity for contaminant reduction (level of protection unknown)
- Lag-time from ww treatment to potable system (operator response time)
- Blending with natural waters

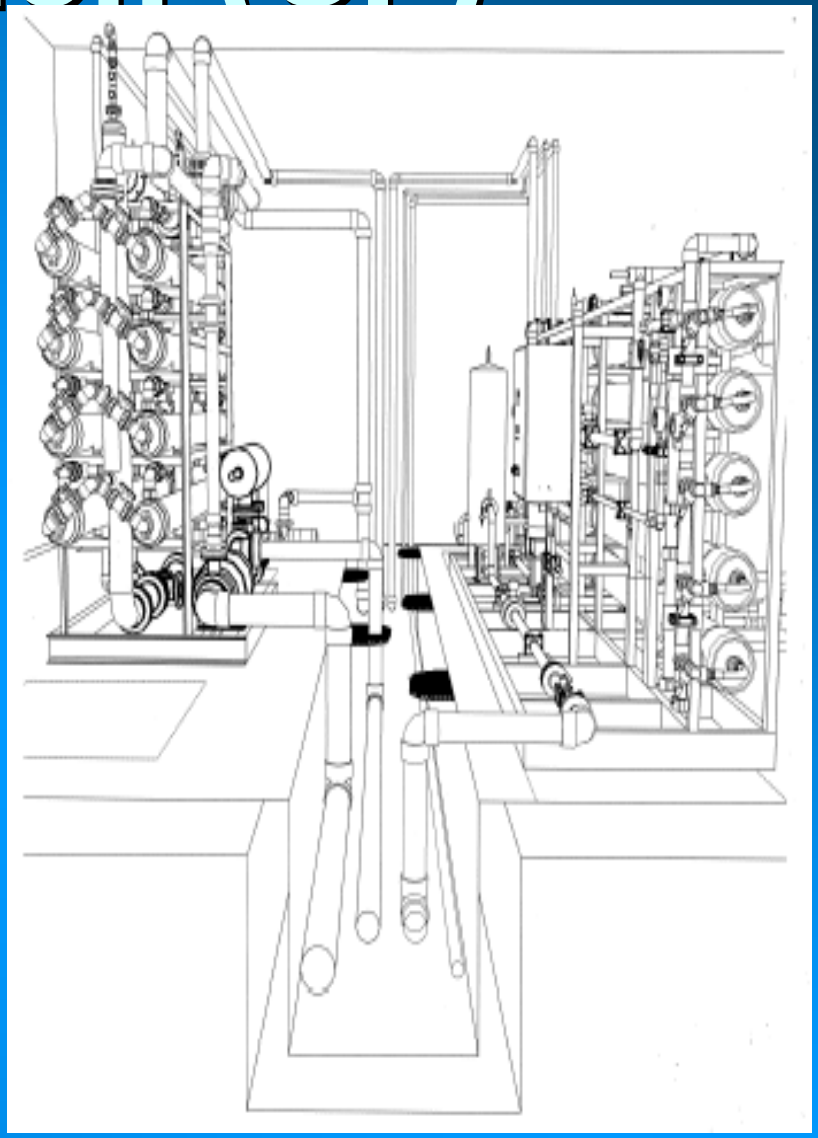
Where is your Buffer?

- Covered Reservoir Storage
- Provides 40-60 Days Detention
- RO treatment
- UV Ox treatment
- UF/UV treatment
- GAC treatment

Ultrafiltration (UF)

- Feed water from covered storage reservoir.
- Removal of solids, bacteria and viruses.
- Disinfection with sodium hypochlorite.
- Q_{avg} of 180,000 gpd.

Constraint	Operating Limit
Max Turbidity	0.3 NTU
Avg Turbidity	0.1 NTU
Giardia/Crypto Removal	>4-log
Virus Removal	>2-log
Bacteria Removal	>5-log
Min Filtrate Recovery	95%



Ultrafiltration (UF) System

Activated Carbon

- Blended treated RO perm and natural waters, post UF and UV
- Polish UF filtrate
- Demonstrated removals of organics and certain PPCPs and EDCs

Concentrate Management

- Concentrate TDS approx. 2,000 mg/L
- Evaporation/Storage Pond
- Snow making (blended w/MBR perm)
- Irrigation of Ski Area (blended)
- Dust control/Construction/Gravel Wash
- Deep well injection
- Additional recovery/Others

Ski Area

Aquifer Recharge

- Phase 3 Program
- Limited to Pumphouse Canyon
- Estimated 90-120 day detention
- May lose >50% (not captured)
- Considered secondary/alternate storage location (for excess flows, emergencies, reservoir maintenance)

Project Costs

Capital	$3,500,000
Equipment O&M	$0.80/1,000 gal
Operator/Misc.	$50,000/yr
Cost of Water (O&M)	$2.40/1,000 gal
Total Cost of Water	$9.00/1,000 gal

NMED Approvals

- NMED Drinking Water Bureau approved
- Department supports indirect reuse and comfortable with technology, review included EPA SDWA LT2 (ESWTR)
- Village must ensure proper operators, system monitoring, alarming and shutdown procedures

Public Involvement

- Public Meetings
- Discussed in WW Master Plan
- Discussed in Comp Plan
- Village Council Meetings
- Business leaders understand need
- No negative comment from general population

Schedule

- MBR start-up early 2009
- RO/UF start-up spring 2009
- Certification/testing May/June 2009
- Introduce water into PWS July 2009

Questions?