

This presentation premiered at WaterSmart Innovations

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Best Place to reuse wastewater – your Cooling Tower!

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AGENDA

Why are Cooling Towers (CT) best place for water reuse?

Cooling Towers – what do they do?

Water Sources for Cooling Tower Makeup

Testing reuse water

Water Savings and rebates

Disclaimer

- The materials in this presentation are meant to examine recycling and cooling tower systems and water treatment, to clarify and illustrate typical situations based on personal experience. The materials are not intended to provide legal advice, or to establish legal standards of reasonable behavior or to discredit any companies involved in the cooling tower or water reuse industry.

Why Cooling Towers?

- Easier to pipe
- No dual piping
- Steady source of water needed
- Less costly
- Water treatment already being done in C.T.

What types of buildings have cooling towers/ECs?

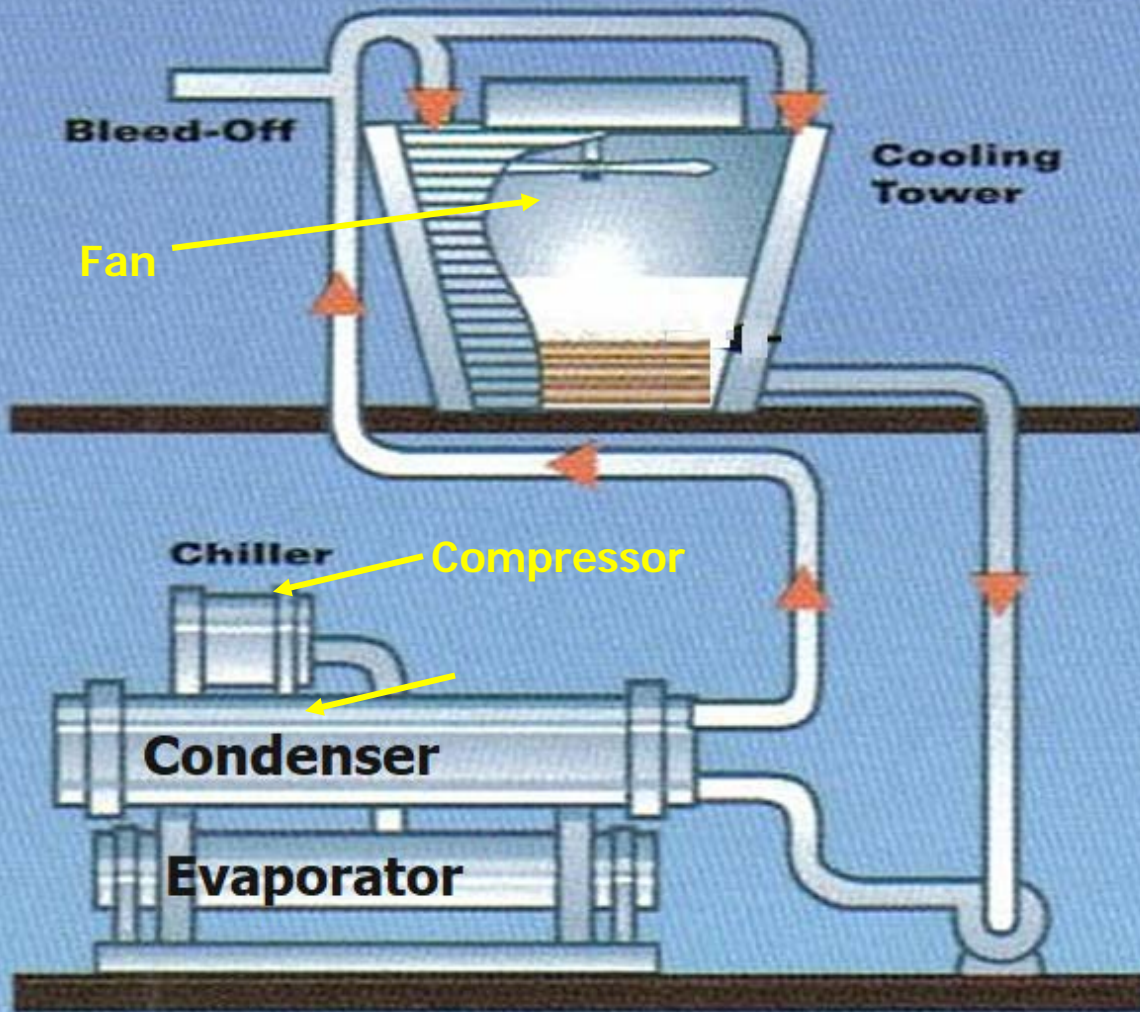
- Supermarkets
- Office Buildings
- Schools
- Industrial – cold storage, dye houses, factories, food processors, restaurants
- Most dry cleaners



Water sprayed into top section of CT

Hot Water

Condenser

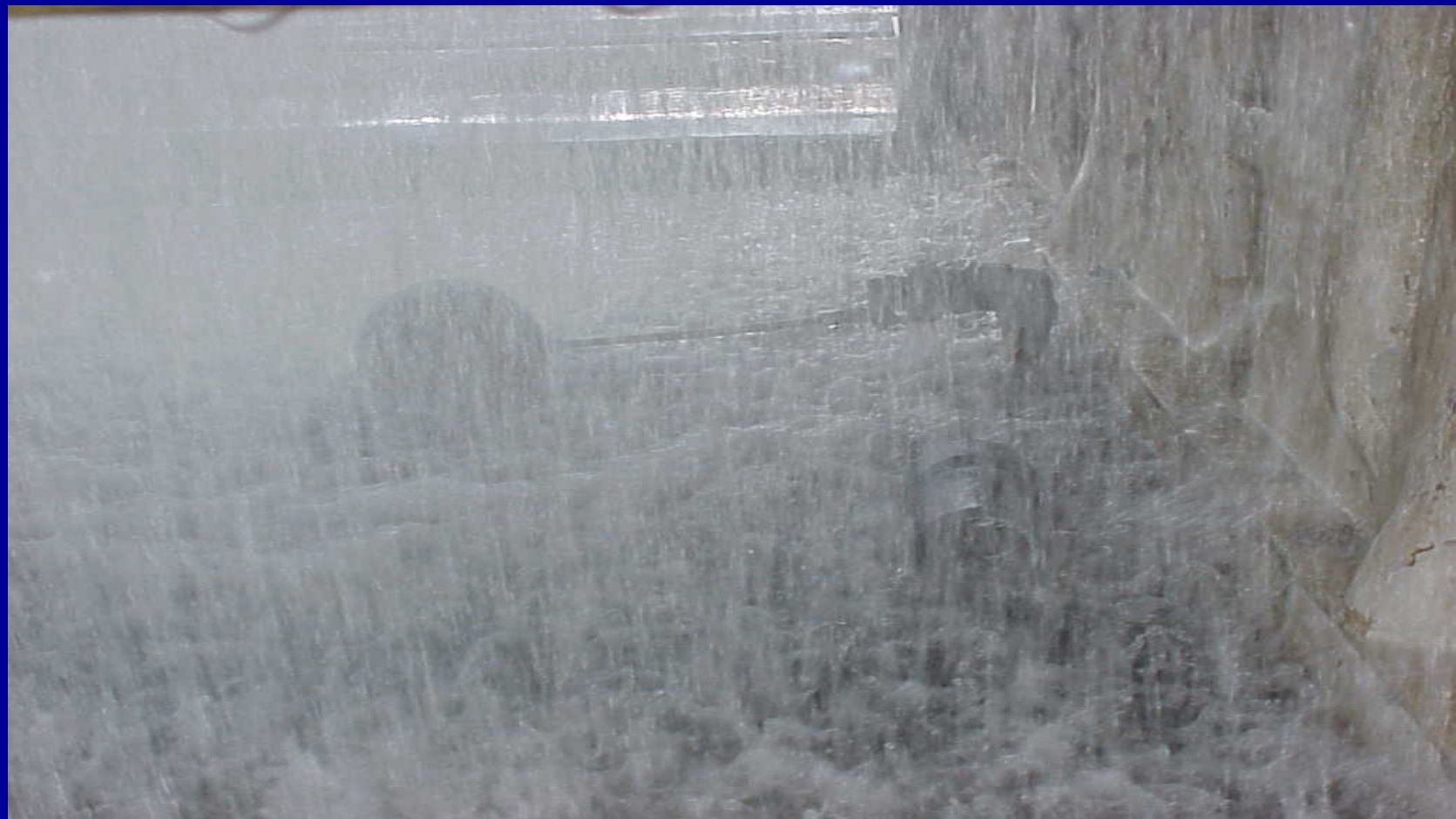




20,000-Ton Cooling Towers serving 13 buildings











Cooling tower (C.T.) reuse sources

- Wash water on property (W.W.)
- Storm water runoff (S.W.)
- Condensation – from evaporative coils (C.)
- Gray water (G.W.)
- Groundwater (Gnd.W.)
- Recycled water from a treatment plant (R.W.)

Testing potential reuse water

- Analyze site reuse water quality
- Map out and measure reuse water quantities
- Identify treatment factors
- Financially assess reuse of the water source

Identify treatment factors

1. Phosphates	6. Total Suspended Solids
2. Ammonia	7. Microbiological content
3. Hardness	8. Silica
4. Alkalinity	9. VOC
5. Heavy metals	

1. Phosphates

Which water source could have high levels of it?	W.W., G.W., R.W.
What problems can it cause in CTs?	It joins with the chemicals in the CTs that are already being used and can form Calcium Phosphate scale, which is very hard to remove.
Generally mitigated by CT water Treatment and/or removed by pretreatment (P.T.)	Can be mitigated by reformulating C/S to contain less phosphates. Generally not removed as a pre-treatment.

2. Ammonia

Which water source could have high levels of it?	R.W.
What problems can it cause in CTs?	Ammonia attacks Copper and causes corrosion
Generally mitigated by CT water Treatment and/or removed by pretreatment?	Corrosion/scaling inhibitor concentration could be reformulated to prevent Cu corrosion. Most likely not P.T.

3 & 4 Hardness & Alkalinity

Which water source could have high levels of it?	All except condensation
What problems can it cause in CTs?	High Calcium hardness and/or high Alkalinity can cause Calcium Carbonate scale.
Generally mitigated by CT water Treatment and/or removed by pretreatment?	Yes, if customer wants to increase efficiency by upgrading water treatment. Yes, adding sulfuric acid is Necessary.

5. Heavy Metals

Which water source could have high levels of it?	W.W., C., Gnd.W.
What problems can it cause in CTs?	Heavy metals such as Copper can concentrate in CT and go in the Blow-Down and cause a level that violates the sewer discharge limit they are permitted for. Could cause owner of cooling tower to be fined.
Generally mitigated by CT water Treatment and/or removed by pretreatment?	Generally cannot mitigate in CT but may be able to remove with precipitation chemistry

6. Total Suspended Solids

Which water source could have high levels of it?	All sources except condensation.
What problems can it cause in CTs?	Provides a substrate for bacteria to grow. Settles in the condenser rifle tubes.
Generally mitigated by CT water Treatment and/or removed by pretreatment?	Different filters may be used as pretreatment or as side stream filtration (bag filters, sand filters)

7. Microbiological Content

Which water source could have high levels of it?	All sources except Condensation can bring in high food source levels for bacteria to live on such as ammonia, TSS, phosphates.
What problems can it cause in CTs?	Cause bio-fouling in the condenser and throughout the CT system.
Generally mitigated by CT water Treatment and/or removed by pretreatment?	Generally, can treat in the CTs without pre-treatment. Biocide could be added to collection tanks or cisterns including agitation.

8. Silica

Which water source could have high levels of it?	Gnd.W.
What problems can it cause in CTs?	Joins with Magnesium in C.T. water and forms Magnesium Sulfate, severe scale which is almost impossible to remove.
Generally mitigated by CT water Treatment and/or removed by pretreatment?	Usually have to mitigate with a "super soft" softener that can really cut the Magnesium level cannot form.

9. VOCs

Which water source could have high levels of it?	S.W., Gnd.W.
What problems can it cause in CTs?	Would have to be removed if high concentration, depends on sewer permit.
Generally mitigated by CT water Treatment and/or removed by pretreatment?	Usually not mitigated in CT but as pretreatment by activated carbon tower or scrubbing.

Technical Assistance Program (TAP)

- Provides rebates and/or water meters for custom water conservation projects
- Rebate is \$1.75/1,000 gallons of water conserved during 1st 2 years
- Eligible projects: Reuse of groundwater-condensation-storm water reuse-gray water: in C.T.s

Recycling/Recirculating systems technologies

- Filtering: activated carbon, disc, bag
- Bioreactors
- Ceramic filtration
- Softeners
- R.O., Softeners

TAP PROJECTS: Recirculation

LADWP Business Customer

- Waste stream from their Reverse Osmosis equipment of 7.8 million gallons annually
- Water treatment vendor suggested reusing waste stream as make-up water for CTs

LADWP Water Conservation Staff

- Customized rebate program for installation of a two-tank storage system to hold wastewater until needed for cooling tower
- Provided FREE meter to measure water pumped from RO system to cooling tower

Total Project Cost
\$15,000

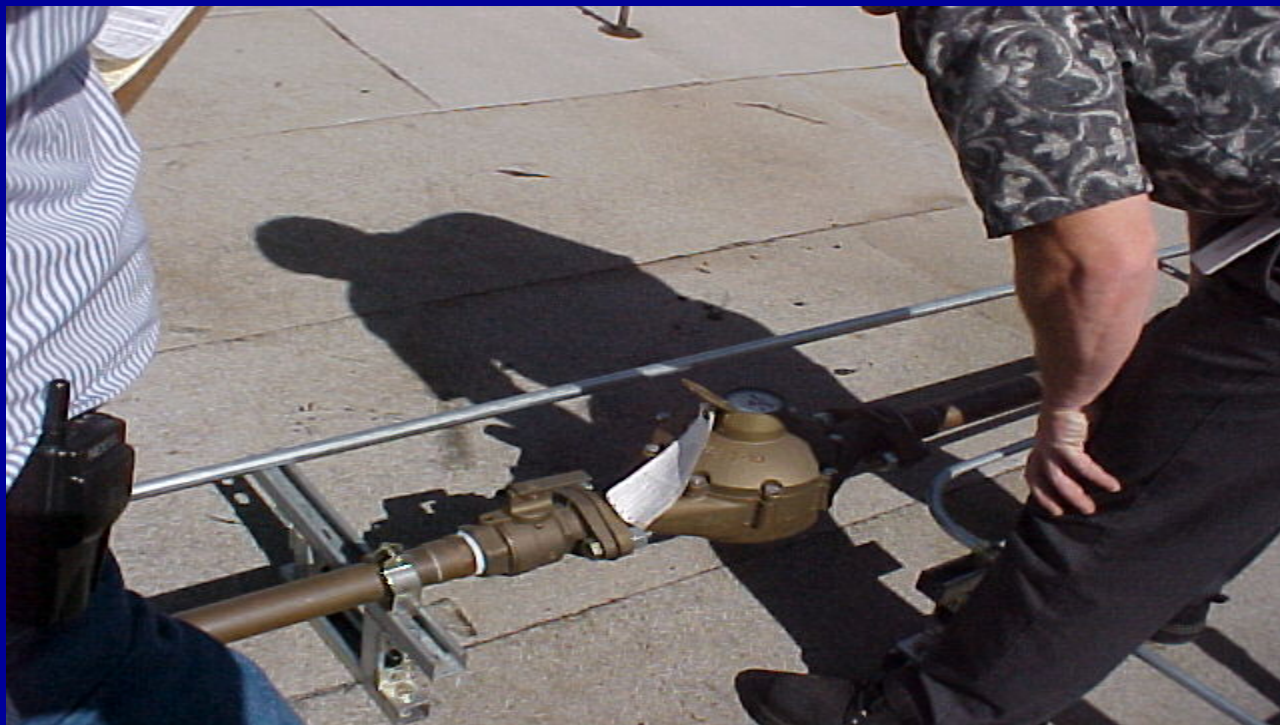
Total rebate
\$14,141

Estimated Annual
Water Savings
5,656,533 gallons

Estimated Annual
LADWP Bill Savings
\$45,000 (<1 month payback)



Holding Tanks



Metering



Wastewater back to cooling tower instead of sewer

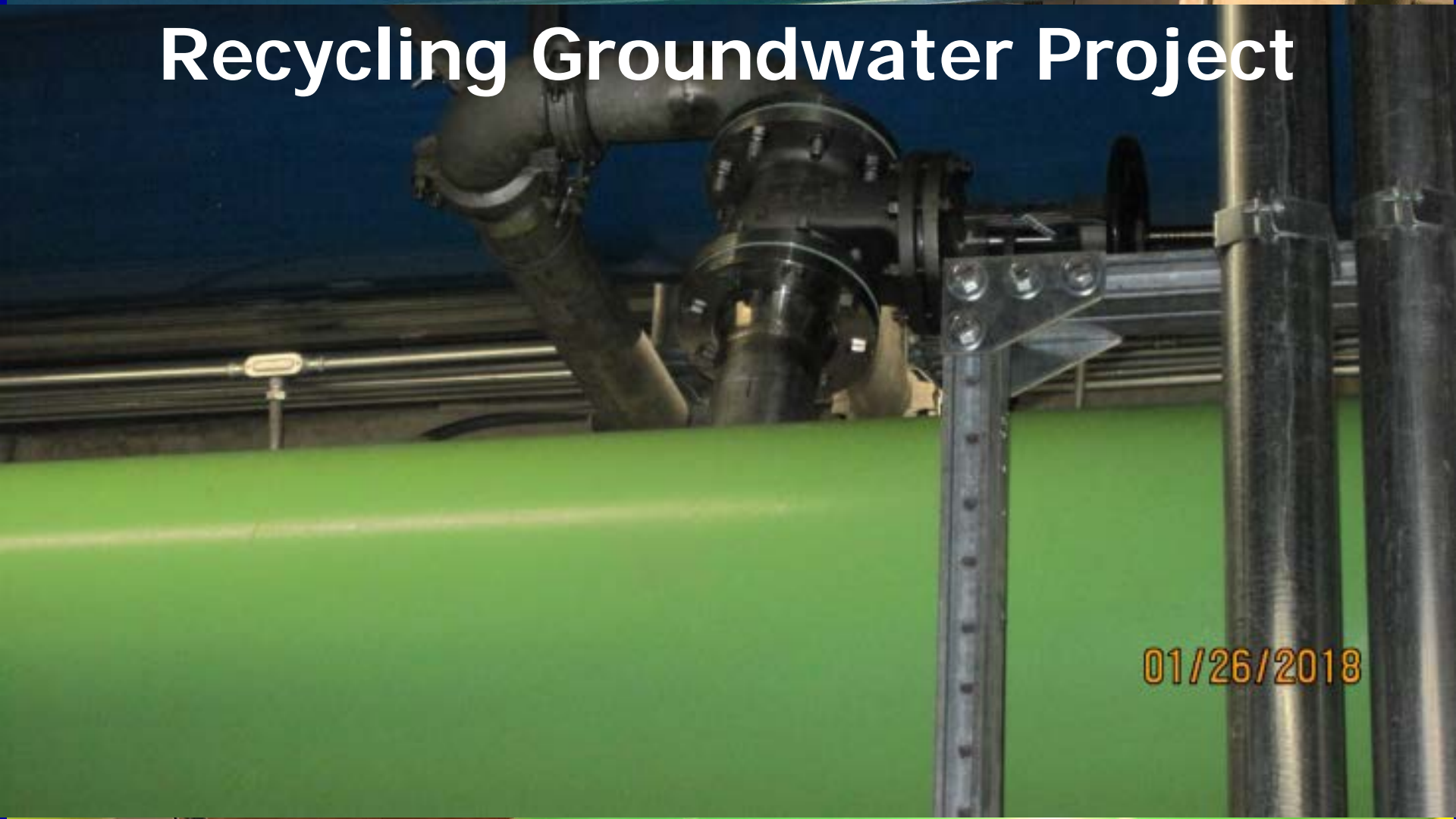
Case Study: Groundwater Recycling

- Reuse groundwater that was being discarded to the sewer
- Offset cooling tower makeup potable water by 50-80%

LADWP Rebate		
\$155,000		
Metered Water		
Savings expected		
21,900,000 gpy		
Estimated Annual		
LADWP Bill Savings		
\$263,500		
Payback in		
7.0 yrs		



Recycling Groundwater Project



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