RECLAMATION

*Managing Water in the West*

**Desalination and Water Purification Research and Development Program Report No. 207**

# Updated and Extended Survey of U.S. Municipal Desalination Plants: Appendix B: Facility Summaries

**U.S. Department of the Interior**
**Bureau of Reclamation**
**Technical Service Center**
**Denver, Colorado**

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## Contents

Note that blue text indicates that information was not obtainable.

# Aliso Creek WRF, CA

GENERAL

- Facility name = Aliso Creek WRF
- Facility owner = South Coast Water District
- Purpose of facility = reuse (irrigation)
- Type of desalination technology = ultrafiltration/reverse osmosis
- Start year of RO operation = 2015
- Reason for RO facility as opposed to conventional treatment = TDS, nitrate, hardness,

TREATMENT CAPACITY

- RO Design production (mgd) = 0.65
- RO average production (mgd) = 0.50

TREATMENT PROCESS

- Source water = from the SCWD AWT facility (sand filter, chlorination) via their reservoir
- Raw water TDS (mg/l) = 1100-1500
- Pretreatment steps = sodium hypochlorite, UF, cartridge filter, sulfuric acid, antiscalant
- Feed pressure to RO (psi) = 165-230
- TDS of permeate (mg/l) = 800
- Membrane recovery (percent) = 85% for UF; 80% for RO
- Age of membrane at last replacement = on original membranes

BLENDING

- Blending = no

WASTE MANAGEMENT

- Concentrate disposal = to Coastal Treatment Plant ocean outfall
- Fate of cleaning wastewater = neutralized and send to WWTP

POST-TREATMENT

- Post-treatment of permeate = decarbonation (reduce CO2 and increase pH); then pumped to AWT (Advanced Wastewater Treatment) system to reduce salinity
- Post-treatment of concentrate = none

# Cal Pomona, CA

GENERAL

- Name of facility = Cal Pomona WTP
- Facility owner = Cal Pomona Department of Water Operations
- Purpose of facility = drinking water
- Type of technology = reverse osmosis
- Start year of RO operation = 2017
- Reason for RO facility = for more sustainable water supply

TREATMENT CAPACITY

- RO Design production (mgd) = 0.41
- RO Average Production (mgd) =
- Plant Design production (mgd) =
- Plant average production (mgd) =

TREATMENT PROCESS

- Source = groundwater
- Raw water TDS (mg/l) = 800
- Feed pressure to RO (psi) = 120
- Pre-treatment steps = cartridge filters, antiscalant
- TDS of permeate (mg/l) =
- Membrane recovery (percent)= 75%
- Age of membrane at last replacement =

BLENDING

- Blending of permeate = yes
- Blend water source = bypass
- Blend ratio (permeate : other) = ~ 75 : 25
- TDS of blend =

WASTE MANAGEMENT

- Concentrate disposal = to brine line – LA sanitation
- Fate of cleaning wastewater =

POST-TREATMENT

- Post-treatment of permeate = chlorination, pH adjustment, CO2 stripping
- Post-treatment of concentrate = none

# Cambria Project, CA

GENERAL

- Name of facility = Cambria Emergency Water Supply Project
- Owner of facility = Cambria Community Services District (CCSD)
- Purpose of facility = emergency supply – drinking water
- Type of technology = UF/RO
- Start year of RO operation = 2014
- Reason for RO = emergency supply
- Current status = off line; system undergoing redesign considerations

TREATMENT CAPACITY

- RO Design production (mgd) = 0.58
- RO Average Production (mgd) =

TREATMENT PROCESS

- Source = groundwater
- Raw water TDS (mg/l) =
- Feed pressure (psi) =
- Pre-treatment steps =
- TDS of permeate (mg/l) =
- Membrane recovery (percent) =
- Age of membrane at last replacement =

BLENDING

- Blending = no

WASTE MANAGEMENT

- Concentrate disposal = to evaporation pond
- Fate of cleaning wastewater =

POST TREATMENT

- Post-treatment of permeate = advanced oxidation, disinfection, reinjection
- Post-treatment of concentrate =

# City Of Oxnard, CA

GENERAL

- Name of facility = City of Oxnard Advanced Water Purification Facility (AWPF)
- Facility owner = City of Oxnard
- Purpose of facility = water reclamation
- Type of technology = reverse osmosis
- Start year of RO operation = 2015
- Reason for RO facility as opposed to conventional facility =

TREATMENT CAPACITY

- RO Design production (mgd) = 6.25
- RO Average Production (mgd) = production is based on demand; high flow average ~ 4; low flow average ~ 1 - 2

TREATMENT PROCESS

- Source water = secondary effluent from WWTP
- Raw water TDS (mg/l) = varies between 2000-3500 µS/cm
- Feed pressure to RO (psi) = 190
- Pre-treatment steps = cartridge filter, microfiltration
- TDS of permeate (mg/l) =
- Membrane recovery (percent) = depends on demand; 85% at high flow
- Age of membrane at last replacement = on original membranes

BLENDING

- Blending = no

WASTE MANAGEMENT

- Concentrate disposal = to outfall
- Fate of cleaning wastewater =

POST-TREATMENT

- Post-treatment of permeate = UV, pH adjustment via decarbonation and lime
- Post-treatment of concentrate = none

# Claude 'Bud' Lewis Carlsbad Desalination Plant, CA

GENERAL

- Name of facility = Claude 'Bud' Lewis Carlsbad Desalination Plant
- Facility owner = Poseidon Water
- Purpose of facility = drinking water
- Type of technology = reverse osmosis
- Start year of RO operation = 2015
- Reason for RO facility as opposed to a conventional treatment facility = demand for drinking water

TREATMENT CAPACITY

- RO Design production (mgd) = 54
- RO average production (mgd) = 50

TREATMENT PROCESS

- Source water = seawater (used cooling water from power plant)
- Raw water TDS (mg/l) = 34,000
- Feed pressure (psi) =
- Pretreatment = multimedia filter, cartridge filters, microfiltration
- TDS of permeate (mg/l) =
- Membrane recovery (percent) = 50
- Age of membrane at last replacement = on original membranes

BLENDING

- Blending = no

WASTE MANAGEMENT

- Concentrate disposal = power plant outfall
- Fate of cleaning wastewater =
- Fate of backwash waste =

POST-TREATMENT

- Post treatment of permeate = stabilization, disinfection (chloramination), carbon dioxide and lime, fluoride
- Post-treatment of concentrate = blended with seawater leaving the power station

# East Bay Mud Rare, CA

GENERAL

- Name of facility = RARE Water Plant
- Facility owner = East Bay Municipal Utility District
- Type of facility = water reclamation facility at Chevron refinery
- Type of technology = reverse osmosis
- Start year of RO operation = 2010
- Reason for treatment = for reuse – Chevron boilers

TREATMENT CAPACITY

- RO Design production (mgd) = 3.5
- RO Average Production (mgd) = 3.2

TREATMENT PROCESS

- Source water = secondary-treated wastewater from nearby West County Wastewater District
- Raw water TDS (mg/l) = 600-700
- Pretreatment = Amiad filters, MF, cartridge filters
- Feed pressure to RO (psi) = 150-200
- TDS of permeate (mg/l) =
- Membrane recovery (percent) = 85%
- Age of membrane at last replacement = about 5 years

BLENDING

- Blending of permeate = no

WASTE MANAGEMENT

- Concentrate disposal = to refinery WWTP; after primary treatment some goes to wetlands, some goes to outfall at San Pablo Bay
- Fate of membrane cleaning solutions = neutralization and discharged to sewer
- Fate of MF reject = discharged to sewer

POST-TREATMENT

- Post-treatment of permeate = sent to Chevron for reuse in boilers
- Post-treatment of concentrate = sent to refinery WWTP

# Irvine Ranch Wells 21/22 Desalter, CA

GENERAL

- Name of facility = Wells 21/22 Desalter
- Facility owner = Irvine Ranch Water District
- Purpose of facility = drinking water
- Type of technology = reverse osmosis
- Start year of RO operation = 2013
- Reason for RO facility as opposed to a conventional treatment facility = TDS, nitrate

TREATMENT CAPACITY

- RO Design production (mgd) = 1.44
- RO average production (mgd) = 0.29
- Plant (RO + blend) production (mgd) =
- Plant average production (mgd) =

TREATMENT PROCESS

- Source water = groundwater
- Raw water TDS (mg/l) = 790-820
- Feed pressure to RO (psi) = 145-175 (depends on wells used)
- Pretreatment = antiscalant, cartridge filter
- TDS of permeate (µS/cm) = permeate usually ~ 300-350
- Membrane recovery (percent) = 85%
- Age of membrane at last replacement = original membranes

BLENDING

- Blending = yes
- Bending source = raw water bypass
- Blend ratio (permeate : other) = currently 77 : 23
- TDS of blend (mg/l) =

WASTE MANAGEMENT

- Concentrate disposal = pipeline to OCSD WWTP
- Fate of cleaning wastewater = same

POST-TREATMENT

- Post treatment of permeate = chloramination, caustic for pH adjustment
- Post-treatment of concentrate = none

# Irwin Water Works, CA

GENERAL

- Name of facility = Irwin Water Works
- Facility owner = Fort Irwin
- Type of facility = drinking water
- Type of technology = primarily EDR; concentrate (in water recovery operation) is then lime softened followed by MF, RO, IX, and MVC evaporation; product water from water recovery is recycled to front of EDR
- Type of operation = EDR is either batch or continuous; water recovery is generally batch
- Start year of EDR operation = 2016
- Reason for system as opposed to a conventional water treatment facility = highly variable volume flow; nitrate, silica, TDS; removal of fluoride and arsenic (in presence of silica and TDS)

TREATMENT CAPACITY

- Plant design production (mgd) = 6.0
- Plant design average production (mgd) = 1.9-2.0

TREATMENT PROCESS

- Source water = groundwater
- Raw water TDS (mg/l) = 720
- Pre-treatment steps = chlorination at well or raw water booster stations, cartridge filters before EDR; degasification, strainer prior to MF/RO; IX before evaporator
- TDS of permeate (mg/l) = 100
- System water recovery (percent) = ~92% from EDR; ~99+% overall
- Age of membrane at last replacement = EDR membrane not replaced; 3$^{rd}$ stage RO replaced last year (after ~ 18 months)

BLENDING

- Blending = not currently used

WASTE MANAGEMENT

- Concentrate disposal = evaporation pond
- Fate of cleaning, backwash wastes, and other process wastes = evaporation ponds

POST TREATMENT

- Post treatment of permeate = additional CO2 and lime for stabilization, hypochlorite for disinfection
- Post-treatment of concentrate = lime softening followed by MF, RO, IX, MVC evaporation

# Mesa WRF, CA

GENERAL

- Name of facility = Mesa WRF
- Facility owner = Mesa Water District
- Purpose of facility = drinking water
- Type of technology = nanofiltration
- Start year of NF operation = 2012
- Reason for NF facility = remove color

TREATMENT CAPACITY

- NF Design production (mgd) = 8.6
- RO or NF Average Production (mgd) =

TREATMENT PROCESS

- Source water = groundwater
- Raw water TDS (mg/l) = 390-460
- Feed pressure (psi) =
- Pre-treatment steps = sand filter, antiscalant, cartridge filter
- TDS of permeate (mg/l) = 330-410
- Membrane recovery (percent) = 98%
- Age of membrane at last replacement = on original membranes

BLENDING

- Blending = no

WASTE MANAGEMENT

- Concentrate disposal = to sanitary sewer; some concentrate is recycled
- Fate of cleaning wastewater = to sewer

POST-TREATMENT

- Post treatment of permeate = pH adjustment, air stripping, pH adjustment again, chloramination
- Post-treatment of concentrate = antifoam agent

# Round Mountain WTP, CA

GENERAL

- Name of facility = Round Mountain WTP
- Facility owner = Camrosa Water District
- Purpose of facility = drinking water
- Type of technology = reverse osmosis
- Start year of RO operation = 2014
- Reason for RO facility = TDS, increased water demand, reduces import need

TREATMENT CAPACITY

- RO Design production (mgd) = 1
- RO Average Production (mgd) = close to 1
- Plant (RO + blend) design production (mgd) =
- Plant average production (mgd) =

TREATMENT PROCESS

- Source = ground water
- Feed water TDS (mg/l) = 1200
- Feed pressure to RO (psi) = 125-150
- Pre-treatment steps = iron-manganese oxidation (chlorine); dichlorination (bisulfate); antiscalant; cartridge filter
- TDS of permeate (mg/l) =
- Membrane recovery (percent) = 75
- Age of membrane at last replacement = had membranes replaced under warranty during startup due to start-up issues

BLENDING

- Blending = yes
- Blend water source = bypass
- Blend ratio (permeate : other) = about 600 gpm : 85 gpm
- TDS of blend =

WASTE MANAGEMENT

- Concentrate disposal = discharge to SMP pipeline going to outfall
- Fate of cleaning wastewater = neutralization prior to sewer disposal

POST-TREATMENT

- Post treatment of permeate = blend; pH adjustment (caustic); chlor-amination
- Post treatment of concentrate = none

# Santa Monica W TX Works, CA

GENERAL

- Facility name = Santa Monica Arcadia Water Treatment Plant
- Facility owner = City of Santa Monica
- Purpose of facility =Drinking Water
- Type of desalination technology = reverse osmosis
- Start year of RO operation = 2011
- Reason for RO facility as opposed to a conventional water treatment facility = TDS

TREATMENT CAPACITY

- RO Design production (mgd) = 10
- RO Average Production (mgd) = 6.9
- Plant Design (RO + blend) production (mgd) =
- Plant average production (mgd) =

TREATMENT PROCESS

- Source water = groundwater
- Raw water TDS (mg/l) = 500
- Pre-treatment steps = greensand filter, GAC, cartridge filters, antiscalant
- Feed pressure (psi) = 90
- Conductivity of permeate (µS/cm) = 200 µS/cm MAX.
- Membrane recovery (percent) = 82%
- Age of membrane at last replacement = Approximately 6 years

BLENDING

- Blending = Yes
- Blend water source = bypass after same filtering process
- Blend ratio (permeate : other) = 80 : 20
- Conductivity of blend = Approximately 400 µS/cm

WASTE MANAGEMENT

- Concentrate disposal = sewer
- Fate of cleaning solution waste = sewer
- Fate of backwash wastes = sewer

POST-TREATMENT

- Post treatment of permeate = blended, air stripper, caustic, fluoride, chloramination
- Post-treatment of concentrate = none

# Signal Hill, CA

GENERAL

- Name of Facility = Signal Hill WTP
- Facility owner = City of Signal Hill
- Purpose of facility = drinking water
- Type of technology = nanofiltration
- Start year of NF operation = 2017
- Reason for NF treatment as opposed to conventional treatment = color

TREATMENT CAPACITY

- NF Design production (mgd) = 1.8
- NF Average Production (mgd) = 0.9 (running 1 of 2 skids)

TREATMENT PROCESS

- Source water = groundwater
- Raw water TDS (mg/l) =
- Feed pressure into NF (psi) = 77
- Pretreatment = 25 micron filter
- TDS of permeate (mg/l) =
- Membrane recovery (percent) = 98
- Age of membrane at last replacement = have original membrane

BLENDING

- Blending = no

WASTE MANAGEMENT

- Concentrate disposal = sanitary sewer
- Fate of cleaning wastewater = sewer

POST-TREATMENT

- Treatment of concentrate = none
- Post-treatment of concentrate = none

# Wochholz Regional WRF, CA

GENERAL

- Name of facility = Wochholz Regional WRF
- Facility owner = Yucaipa Valley Water District
- Purpose of facility = WRF - reuse
- Type of technology = MF/reverse osmosis
- Start year of RO operation = 2017
- Reason for RO facility as opposed to a conventional treatment facility = for reuse (landscape irrigation)

TREATMENT CAPACITY

- RO Design production (mgd) = 2
- RO average production (mgd) = 2
- Plant Design production (mgd) = 8
- Plant Average Production (mgd) = 4

TREATMENT PROCESS

- Source water = groundwater
- Raw water TDS (mg/l) = depends; currently on well water
- Feed pressure to RO (psi) = 80
- Pretreatment = antiscalant, cartridge filters, sulfuric acid,
- TDS of permeate (mg/l) = no target currently
- Membrane recovery (percent) = 80
- Age of membrane at last replacement =

BLENDING

- Blending = yes
- Blend water source = same, bypass goes through MF
- Blend ratio (permeate : other) = 50 : 50
- TDS of blend = no target currently

WASTE MANAGEMENT

- Concentrate disposal = surface water via brine line
- Fate of cleaning wastewater = recirculate back to front of process

POST-TREATMENT

- Post treatment of permeate = blend, UV
- Post-treatment of concentrate = none

# Arapahoe County Joint Water Purification Plant, CO

GENERAL

- Name of facility = Arapahoe County Joint Water Purification Plant (JWPP)
- Facility owner =
- Purpose of facility = drinking water
- Type of technology = reverse osmosis
- Start year of RO operation = 2010
- Reason for the RO facility as opposed to a conventional treatment facility =
- Operational status = RO plant ran about 1 year; shut down due to selenium violation; will implement a biological Sn removal in 2019; currently running only an MF facility

TREATMENT CAPACITY

- RO Design production (mgd) = 9
- RO Average Production (mgd) =
- Plant (RO + blend) design production (mgd) =
- Plant average production (mgd) =

TREATMENT PROCESS

- Source water = groundwater
- Raw water TDS (mg/l) =
- Feed pressure (psi) =
- Pretreatment steps =
- TDS of permeate (mg/l) =
- Membrane recovery (percent) =
- Age of membrane at last replacement =

BLENDING

- Blending = yes
- Blend water source = MF permeate
- Blend ratio (RO permeate : other) = 50 : 50
- TDS of blend =

WASTE MANAGEMENT

- Concentrate disposal = discharge to surface water
- Fate of cleaning wastewater =

POST-TREATMENT

- Post-treatment of permeate =
- Post-treatment of concentrate =

# Northern WTP, CO

GENERAL

- Facility name = Northern WTP
- Facility owner = East Cherry Creek Village
- Purpose of facility = drinking water
- Type of desalination technology = reverse osmosis
- Start year of RO operation = 2012
- Reason for RO facility as opposed to conventional treatment = TDS, hardness

TREATMENT CAPACITY

- RO Design production (mgd) = 7
- RO average production (mgd) = 6.5
- Plant design production (mgd) = 11
- Plant average production (mgd) = 7.7

TREATMENT PROCESS

- Source water = groundwater
- Raw water TDS (mg/l) = 900 - 1100
- Feed pressure to RO (psi) = 140-170
- Pretreatment steps = cartridge filtration, antiscalant
- TDS of permeate (mg/l) =
- Membrane recovery (percent) = 75%
- Age of membrane at last replacement = low pressure membranes are original; one replacement on one high pressure skid

BLENDING

- Blending = yes
- Blend Water source = bypass (UV treated)
- Blend ratio (permeate : other) = 70:30
- TDS of blend = 250 - 300

WASTE MANAGEMENT

- Concentrate disposal = deep well injection
- Fate of cleaning wastewater =

POST-TREATMENT

- Post-treatment of permeate = disinfection (sodium hypochlorite) pH adjustment (caustic)
- Post-treatment of concentrate = none

# Sterling, CO

GENERAL

- Facility name = City of Sterling WTF
- Facility owner = City of Sterling
- Purpose of facility = drinking water
- Type of technology = reverse osmosis
- Start year of RO operation = 2013
- Reason for treatment = TDS, uranium, hardness

TREATMENT CAPACITY

- RO Design production (mgd) = 9.6
- RO Average Production (mgd) = 4
- Plant Design production (mgd) =
- Plant average production (mgd) =

TREATMENT PROCESS

- Source water = groundwater
- Raw water conductivity (µS/cm) = 700 – 1900
- Feed pressure to RO (psi) = 112-130
- Pretreatment = 25 micron filter, antiscalant
- TDS of permeate (mg/l) =
- Membrane recovery (percent) = 82%
- Age of membrane at last replacement =

BLENDING

- Blending = yes
- Blend water source = groundwater, same wells except for one that only goes to the RO; filtered at 1 micron
- Blend ratio = 80 : 20
- TDS of blend =

WASTE MANAGEMENT

- Concentrate disposal = deep well injection; portion to sewer
- Fate of cleaning wastewater =

POST-TREATMENT

- Post-treatment of permeate = bioscrub to remove odor, stabilization, disinfection, pH adjustment
- Post-treatment of concentrate = 25µ screen, antiscalant

# Babcock Ranch Water, FL

GENERAL

- Name of facility = Babcock Ranch Water
- Facility owner = BRW Utilities
- Purpose of facility = drinking water
- Type of technology = nanofiltration
- Start year of NF operation = 2017
- Reason for NF facility as opposed to a conventional treatment facility = hardness, color

TREATMENT CAPACITY

- NF Design production (mgd) = 0.25
- NF average production (mgd) =
- Plant Design production (mgd) =
- Plant Average Production (mgd) =

TREATMENT PROCESS

- Source water = groundwater
- Raw water conductivity (µS/cm) = 800-950
- Feed pressure (psi) = 108-117
- Pretreatment = antiscalant, cartridge filters, sulfuric acid,
- TDS of permeate (mg/l) = 200-250, depends on wells
- Membrane recovery (percent) = 84%
- Age of membrane at last replacement = had to replace original membrane due to super chlorination incident at start-up

BLENDING

- Blending = yes
- Blend water source = raw water bypass
- Blend ratio (permeate : other) = ~ 8 : 1
- Target TDS of blend =

WASTE MANAGEMENT

- Concentrate disposal = combined with effluent from WWTP; goes to pond, used for irrigation
- Fate of cleaning wastewater = same; haven't cleaned yet

POST-TREATMENT

- Post treatment of permeate = blending, degasification, disinfection, caustic, CO2
- Post-treatment of concentrate = none

# City of Deerfield Beach, FL

GENERAL

- Facility name = City of Deerfield Beach West WTP
- Facility owner = City of Deerfield Beach
- Purpose of facility = drinking water
- Type of desalination technology = NF and reverse osmosis
- Start year of RO operation = 2012 (for RO)
- Reason for RO facility as opposed to conventional treatment =

TREATMENT CAPACITY

- RO Design production (mgd) = 3
- RO average production (mgd) =
- Plant design (RO + NF) production (mgd) = 14.5 (RO = 3, NF = 11.5)
- Plant average production (mgd) =

TREATMENT PROCESS

- Source water = groundwater and NF concentrate (up to 30%)
- Raw water conductivity (µS/cm) = 1800-2000
- Feed pressure to RO (psi) = 186-210 (high level where less NF concentrate in feed)
- Pretreatment steps = acid, antiscalant, cartridge filter (5µ)
- TDS of permeate (mg/l) =
- Membrane recovery (percent) = 78%
- Age of membrane at last replacement = no replacement yet on RO

BLENDING

- Blending of permeate = no bypass blending; blend with NF permeate
- Blend Water source = NF permeate
- Blend ratio (permeate : other) = 3 : 11.5
- TDS of blend =

WASTE MANAGEMENT

- Concentrate disposal = deep well injection
- Fate of cleaning waste = sanitary sewer

POST-TREATMENT

- Post-treatment of RO permeate = orthophosphate, caustic, chlorine
- Post-treatment of concentrate = none

# City of Labelle, FL

GENERAL

- Name of facility = City of Labell WTP
- Facility owner = City of Labelle
- Purpose of facility = drinking water
- Type of technology = reverse osmosis
- Start year of RO operation = 2014
- Reason for RO facility as opposed to conventional treatment = previously out of compliance with THMs, etc.; new source water requires TDS removal

TREATMENT CAPACITY

- RO Design production (mgd) = 1.5
- RO Average Production (mgd) = 0.75
- Plant (RO + blend) Design production (mgd) = 1.68
- Plant average production (mgd) =

TREATMENT PROCESS

- Source water = groundwater
- Raw water conductivity (µS/cm) = depends on which of 2 wells used; 3400 & 4300
- Pretreatment steps = antiscalant, cartridge filters
- Feed pressure (psi) = 150-160
- TDS of permeate (mg/l) = <100
- Membrane recovery (percent) = 70%
- Age of membrane at last replacement = on original membranes

BLENDING

- Blending = yes
- Blend water source = raw water
- Blend ratio (permeate : other) = 10-12%
- Conductivity of blend = 700 µS/cm

WASTE MANAGEMENT

- Concentrate disposal = deep well injection
- Fate of cleaning wastewater =

POST-TREATMENT

- Post-treatment of permeate = degasification (for H2S), chlorine, fluoride
- Post-treatment of concentrate = none

# Clearwater RO Plant #2, FL

GENERAL

- Name of facility = RO Plant #2
- Facility owner = City of Clearwater
- Purpose of facility = drinking water
- Type of technology = reverse osmosis
- Start year of RO operation = 2015
- Reason for RO facility as opposed to a conventional treatment facility = TDS, iron, hardness

TREATMENT CAPACITY

- RO Design production (mgd) = 6.25
- RO average production (mgd) = 2.5 (original design flaw led to serious scaling early on; now operating 1 skid; in a redesign phase – RFQs)
- Plant Design production (mgd) =
- Plant Average Production (mgd) =

TREATMENT PROCESS

- Source water = groundwater
- Raw water TDS (mg/l) = 2800-4500 (dependent on well mix)
- Feed pressure (psi) = 180-190
- Pretreatment = antiscalant, cartridge filters
- TDS of permeate (mg/l) =
- Membrane recovery (percent) = 80
- Age of membrane at last replacement = design flaw led to scaling issue early on with damage to some membranes; still using original membranes on operating skid

BLENDING

- Blending = yes
- Blend water source = surficial aquifer
- Blend ratio (permeate : other) =
- TDS of blend =

WASTE MANAGEMENT

- Concentrate disposal = deep well injection
- Fate of cleaning wastewater = sanitary sewer

POST-TREATMENT

- Post treatment of permeate = ozone (sulfide removal), chloramination, caustic
- Post-treatment of concentrate = none

# Coral Springs, FL

GENERAL

- Name of Facility = Coral Springs RO WTP
- Facility owner = Coral Springs Improvement District
- Purpose of facility = drinking water
- Type of technology = reverse osmosis
- Start year of RO operation = 2016
- Reason for RO facility as opposed to conventional treatment = better water quality

TREATMENT CAPACITY

- RO Design production (mgd) = 6.75
- RO Average Production (mgd) = ~4
- Plant Design production (mgd) =
- Plant average production (mgd) =

TREATMENT PROCESS

- Source water = groundwater
- Raw water TDS (mg/l) = 600-700
- Feed pressure to RO (psi) = 93-105
- Pretreatment = sand strainer, cartridge filter, antiscalant
- TDS of permeate (mg/l) = 20-45
- Membrane recovery (percent) = 85%
- Age of membrane at last replacement = on original membranes

BLENDING

- Blending = yes
- Blend water source = raw water bypass after sand strainer and cartridge filters
- Blend ratio (permeate : other) = 85-92 : 8-15
- TDS of blend = 140

WASTE MANAGEMENT

- Concentrate disposal = to tail end of WWTP for deep well injection
- Fate of cleaning wastewater = same; just did first cleaning

POST-TREATMENT

- Post-treatment of permeate =
- Post-treatment of concentrate = none

# Dania Beach, WTP FL

GENERAL

- Name of facility = Dania Beach WTP
- Facility owner = City of Dania Beach
- Purpose of facility = drinking water
- Type of technology = nanofiltration
- Start year of NF operation = 2012
- Reason for NF facility as opposed to a conventional treatment facility = iron removal, softening

TREATMENT CAPACITY

- NF Design production (mgd) = 2.0
- NF Average Production (mgd) = 1.0
- Plant Design (NF + blend) production (mgd) = 5
- Plant average production (mgd) = 2.2

TREATMENT PROCESS

- Source water = purchased from Broward County Large User System
- Raw water TDS (mg/l) = 400
- Pretreatment steps = sulfuric acid 93%, antiscalant
- Feed pressure (psi) = 42
- TDS of permeate (mg/l) = 50-60
- Membrane recovery (percent) = 90%
- Age of membrane at last replacement = on original elements; cleaning cycle is 18-24 months

BLENDING

- Blending = yes
- Blend water source = bypass
- Blend ratio (permeate : other) = 2 : 3
- TDS of blend = 130-150

WASTE MANAGEMENT

- Concentrate disposal = sanitary sewer
- Fate of cleaning wastewater=

POST-TREATMENT

- Post-treatment of permeate =
- Post-treatment of concentrate =

# Green Meadows, Fl

GENERAL

- Name of facility = Green Meadows WTP
- Facility owner = Lee County Utilities
- Purpose of facility = drinking water
- Type of technology = reverse osmosis
- Start year of NF operation = 2018
- Reason for treatment = Plant expansion & replacement of old existing facility

TREATMENT CAPACITY

- RO Design production (mgd) = 7.5
- RO Average Production (mgd) = New plant, not on line yet.
- Plant Design (RO + blend) production (mgd) This will vary, blending will be with IX and RO treated water.
- Plant average production (mgd) = New plant, not on line yet.

TREATMENT PROCESS

- Source water = groundwater
- Raw water TDS (mg/l) = 1860
- Feed pressure (psi)? 167
- Pretreatment = sand filter, cartridge filter, antiscalant, acid
- Target TDS of permeate (mg/l) 35.8
- Membrane recovery (percent) 85%
- Age of membrane at last replacement = New plant

BLENDING

- Blending = yes
- Blend water source = bypass and IX treated surficial water
- Blend ratio (permeate : other) = roughly 9 : 6
- Target TDS of blend? 223 mg/l

WASTE MANAGEMENT

- Concentrate disposal = deep well injection
- Fate of cleaning waste = deep well injection
- Fate of backwash waste Deep Injection Well

POST-TREATMENT

- Post-treatment of permeate – Sulfuric acid, degasification, disinfection (chlorine & ammonia) pH control (caustic soda), fluoride, and corrosion inhibitor
- Post-treatment of concentrate = none

# Hialeah RO WTP, FL

GENERAL

- Name of facility = Hialeah RO WTP
- Facility owner = City of Hialeah
- Purpose of facility = drinking water
- Type of technology = reverse osmosis
- Start year of RO operation = 2013
- Reason for RO facility as opposed to conventional treatment =

TREATMENT CAPACITY

- RO Design production (mgd) = 7.5
- RO Average Production (mgd) =

TREATMENT PROCESS

- Source water = groundwater
- Raw water conductivity (µS/cm) = 5000-5500
- Feed pressure to RO (psi) = 180-194
- Pretreatment = acid, antiscalant, cartridge filters
- TDS of permeate (mg/l) =
- Membrane recovery (percent) = 80%
- Age of membrane at last replacement = still have original membranes

BLENDING

- Blending of permeate = no

WASTE MANAGEMENT

- Concentrate disposal = deep well injection
- Fate of cleaning waste = deep well injection

POST-TREATMENT

- Post-treatment of permeate = lime, caustic, chlorine
- Post-treatment of concentrate = none

# Hood Road Membrane Water Plant – NF, FL

GENERAL

- Facility name = Hood Road Membrane Water Plant
- Facility owner = Seacoast Water Authority
- Purpose of facility = drinking water
- Type of desalination technology = nanofiltration
- Start year of NF operation = 2015
- Reason for NF facility as opposed to conventional treatment = replace lime softening (an RO facility also opened at the same location)

TREATMENT CAPACITY

- NF Design production (mgd) = 26
- NF average production (mgd) = varies with demand; at higher demand, NF portion is greater; 17.5
- Plant design production (mgd) = 29.5 (3.5 RO and 26 NF)
- Plant average production (mgd) = varies with demand

TREATMENT PROCESS

- Source water = surficial groundwater
- Raw water conductivity (µS/cm) = 800
- Feed pressure to NF (psi) = 95
- Pretreatment steps = sand filter, antiscalant, cartridge filters, acid (sulfuric)
- Conductivity permeate (µS/cm) = 350
- Membrane recovery (percent) = 80%
- Age of membrane at last replacement = on original membranes

BLENDING

- Blending = no raw water blend

WASTE MANAGEMENT

- Concentrate disposal = irrigation (blended with WWTP effluent); when not possible, disposal is to deep well injection
- Fate of cleaning and backwash waste = sewer

POST-TREATMENT

- Post-treatment of permeate = degassing, disinfection (chloramination), pH adjustment (caustic), corrosion inhibitor (phosphate)
- Post-treatment of concentrate = blend with WWTP effluent

# Hood Road Membrane Water Plant – RO, FL

GENERAL

- Facility name = Hood Road Membrane Water Plant
- Facility owner = Seacoast Water Authority
- Purpose of facility = drinking water
- Type of desalination technology reverse osmosis
- Start year of RO operation = 2015
- Reason for RO facility as opposed to conventional treatment = replace lime softening (an NF facility also opened at the same location)

TREATMENT CAPACITY

- RO Design production (mgd) = 3.5
- RO average production (mgd) = 2.5
- Plant (RO + NF) design production (mgd) = 29.5 (3.5 RO + 26 NF)
- Plant average production (mgd) = varies with demand

TREATMENT PROCESS

- Source water = groundwater
- Raw water conductivity (µS/cm) = 6000
- Feed pressure to RO (psi) = 240
- Pretreatment steps = antiscalant, cartridge filter, acid (sulfuric)
- TDS of permeate (mg/l) =
- Membrane recovery (percent) = 75%
- Age of membrane at last replacement = on original membranes

BLENDING

- Blending = no raw water blend

WASTE MANAGEMENT

- Concentrate disposal = deep well injection
- Fate of cleaning and backwash waste = sewer

POST-TREATMENT

- Post-treatment of permeate = degasification, disinfection (chloramination), pH adjustment (caustic), corrosion inhibitor (phosphate)
- Post-treatment of concentrate = none

# Lake Worth, FL

GENERAL

- Facility name = City of Lake Worth RO Plant
- Facility owner = City of Lake Worth
- Purpose of facility = drinking water
- Type of technology = reverse osmosis
- Start year of RO operation = 2011
- Reason for treatment = TDS, uranium; preparing for the future; need new source of water

TREATMENT CAPACITY

- RO Design production (mgd) = 4.5
- RO average production (mgd) = 2.7 (for 2017)
- Plant design capacity (mgd) = 17.4 (4.5 for RO; 12.9 for lime softening)
- Plant average production (mgd) = ~ 5.5

TREATMENT PROCESS

- Source water = groundwater
- Raw water TDS = 3000-4000 mg/l
- Feed pressure to RO (psi): stage one = 200; stage 2 = 230
- Pretreatment = cartridge filter; sulfuric acid, antiscalant
- TDS of permeate (mg/l) =
- Membrane recovery (percent) = 75%
- Age of membrane at last replacement = still on membranes installed in 2011

BLENDING

- Blending = yes
- Blend water source = lime softened water
- Blend ratio (permeate : other) = currently about 2.5 mgd : 3.0 mgd
- TDS of blend =

WASTE MANAGEMENT

- Concentrate disposal = deep well injection; backup is sewer
- Fate of cleaning and backwash waste =

POST-TREATMENT

- Post-treatment of permeate = aeration to remove H2S; chlorine and ammonia for disinfection
- Post-treatment of concentrate = none

# North Cape Coral, RO WTP FL

GENERAL

- Facility name = North Cape Coral RO WTP
- Facility owner = City of Cape Coral
- Purpose of facility = drinking water
- Type of desalination technology = reverse osmosis
- Start year of RO operation = 2010
- Reason for RO facility as opposed to conventional treatment = TDS

TREATMENT CAPACITY

- RO Design production (mgd) = 12
- RO average production (mgd) =
- Plant design (RO + blend) production (mgd) =
- Plant average production (mgd) = 8.5

TREATMENT PROCESS

- Source water = groundwater
- Raw water TDS (mg/l) = 2700
- Feed pressure to RO (psi) = 160
- Pretreatment steps = sulfuric acid, scale inhibitor, cartridge filters
- TDS of permeate (mg/l) = 100-118
- Membrane recovery (percent) = 80%
- Age of membrane at last replacement = on original membranes

BLENDING

- Blending = yes
- Blend Water source = same source, raw water
- Blend ratio (permeate : other) = 15-25% other
- TDS of blend =

WASTE MANAGEMENT

- Concentrate disposal = deep well injection
- Fate of cleaning = neutralize, then deep well

POST-TREATMENT

- Post-treatment of permeate = blend, degasification (for H2S removal), chlorine (disinfection and residual H2S removal), caustic (pH adjustment)
- Post-treatment of concentrate = neutralize

# North WTP – South Martin Regional District, FL

GENERAL

- Name of facility = North WTP
- Facility owner = South Martin Regional District
- Purpose of facility = drinking water
- Type of technology = nanofiltration
- Start year of NF operation = 2012
- Reason for NF facility as opposed to conventional treatment = hardness and color removal

TREATMENT CAPACITY

- NF Design production (mgd) = 0.41
- NF Average Production (mgd) =
- Plant Design (NF + blend) production (mgd) =
- Plant average production (mgd) =

TREATMENT PROCESS

- Source water = groundwater
- Raw water TDS (mg/l) =
- Feed pressure to NF (psi) =
- Pretreatment steps =
- TDS of permeate (mg/l) =
- Membrane recovery (percent) =
- Age of membrane at last replacement =

BLENDING

- Blending = yes
- Blend water source = bypass (chemically dosed raw water)
- Blend ratio (permeate : other) =
- TDS of blend =

WASTE MANAGEMENT

- Concentrate disposal = sanitary sewer
- Fate of cleaning wastewater =

POST-TREATMENT

- Post-treatment of permeate =
- Post-treatment of concentrate =

# NSID RO WTP, FL

GENERAL

- Name of facility = NSID NF WTP
- Facility Owner =
- Purpose of facility = drinking water
- Type of technology = nanofiltration
- Start year of NF operation = 2016
- Reason for NF facility as opposed to a conventional treatment plant treatment = color, taste, TOC, H2S

TREATMENT CAPACITY

- NF Design production (mgd) = 6.57
- NF Average Production (mgd) =
- Plant (NF + blend) Design production (mgd) =
- Plant average production (mgd) =

TREATMENT PROCESS

- Source water = groundwater
- Raw water TDS (mg/l) =
- Feed pressure (psi) =
- Pretreatment = strainer, cartridge filters, sulfuric acid, scale inhibitor
- TDS (mg/l) or conductivity (µS/cm) of permeate =
- Membrane recovery (percent) =
- Age of membrane at last replacement =

BLENDING

- Blending = yes
- Blend water source = same source after cartridge filtration
- Blend ratio (permeate : other) = bypass is 5 to 20 % of the final product
- TDS (mg/l) of blend =

WASTE MANAGEMENT

- Concentrate disposal = to river
- Fate of cleaning wastewater =

POST-TREATMENT

- Post-treatment of permeate = sulfuric acid, degasification (for H2S), disinfection (sodium hypochlorite), stability (NaOH), corrosion inhibitor, ammonium sulfide to form chloramine
- Post-treatment of concentrate =

# Oldsmar RO WTP, FL

GENERAL

- Name of facility = Oldsmar RO WTP
- Facility owner = City of Oldsmar
- Purpose of facility = drinking water
- Type of technology = reverse osmosis
- Start year of RO operation = 2012
- Reason for RO facility as opposed to a conventional facility = TDS reduction

TREATMENT CAPACITY

- RO Design production (mgd) = 3.0 design, 2.0 permitted
- RO Average Production (mgd) = 1
- Plant (RO + blend) Design production (mgd) = 3.3
- Plant average production (mgd) = 1.3

TREATMENT PROCESS

- Source water = groundwater
- Raw water conductivity (µS/cm) = 2800 - 3500
- Pretreatment = cartridge filter, antiscalant
- Feed pressure to RO (psi) = 135-145
- TDS of permeate (mg/l) = 75 - 100
- Membrane recovery (percent) = 75%
- Age of membrane at last replacement = on original membranes

BLENDING

- Blending = yes
- Blend water source = conventional plant product
- Blend ratio (permeate : other) = 90 : 10
- TDS of blend = 350-375

WASTE MANAGEMENT

- Concentrate disposal = deep well injection
- Fate of cleaning wastewater = neutralization, sent to sewer

POST-TREATMENT

- Post-treatment of permeate = degasification, CO2/caustic, chlorine fluoride, corrosion inhibitor
- Post-treatment of concentrate = none

# Springtree WTP, FL

GENERAL

- Name of facility = Springtree Sunrise WTP
- Facility owner = City of Springtree
- Purpose of facility = drinking water
- Type of technology = reverse osmosis
- Start year of RO operation = 2012
- Reason for RO facility as opposed to a conventional WTP = TDS

TREATMENT CAPACITY

- RO Design production (mgd) = 1.5
- RO Average Production (mgd) = plant is not in production every day; when in operation the average is close to design; 2017 average was 0.389 mgd
- Plant (RO + blend) Design production (mgd) = RO = 1.5; lime treatment plant = 24; total = 25.5
- Plant average production (mgd) = 2017 average was 10.06 mgd

TREATMENT PROCESS

- Source water = groundwater
- Raw water TDS (mg/l) = 1605
- Feed pressure to RO (psi) = ~160
- Pretreatment steps = antiscalant, cartridge filters
- TDS of permeate (mg/l) = 55
- Membrane recovery (percent) = 75
- Age of membrane at last replacement = on original membranes

BLENDING

- Blending = yes
- Blend water source = lime softened raw water (shallower aquifer)
- Blend ratio (permeate : other) = 1.5 : 11
- TDS of blend = ~ 70

WASTE MANAGEMENT

- Concentrate disposal = deep well injection
- Fate of cleaning waste water =

POST-TREATMENT

- Post-treatment of permeate = degasification, chloramination, fluoride
- Post-treatment of concentrate = none

# Tarpon Springs RO Facility, FL

GENERAL

- Name of facility = Tarpon Springs RO Facility
- Facility owner = City of Tarpon Springs
- Purpose of facility = drinking water
- Type of technology = reverse osmosis
- Start year of RO operation = 2015
- Reason for RO facility as opposed to conventional treatment = TDS

TREATMENT CAPACITY

- RO Design production (mgd) = 6.4
- RO Average Production (mgd) = 2.5
- Plant design production (mgd) =
- Plant average production (mgd) = ~2.5

TREATMENT PROCESS

- Source water = groundwater
- Raw water conductivity (µS/cm) = 18,000-20,000
- Feed pressure to RO (psi) = first stage = 350; second stage = 450
- Pretreatment = acid, antiscalant, cartridge filters
- Conductivity of permeate (µS/cm) = 297
- Membrane recovery (percent) = ~72%
- Age of membrane at last replacement = on original membranes

BLENDING

- Blending = yes
- Blend Water source = bypass
- Blend ratio (permeate : other) = presently, only 5 gpm
- TDS of blend =

WASTE MANAGEMENT

- Concentrate disposal = deep well injection
- Fate of cleaning waste = deep well; haven’t cleaned yet

POST-TREATMENT

- Post-treatment of permeate = pH adjustment (CO2), Alkalinity and hardness (lime and caustic), disinfectant (hypochlorite), fluoride
- Post-treatment of concentrate = none

# Town of Davie WTP/WRF, FL

GENERAL

- Facility Name = Town of Davie RO WTP
- Facility owner = Town of Davie
- Purpose of facility = drinking water
- Type of desalination technology = reverse osmosis
- Start year of RO operation = 2013
- Reason for RO facility as opposed to conventional treatment = no new permits for surficial aquifer

TREATMENT CAPACITY

- RO Design production (mgd) = 6.0
- RO average production (mgd) = 2.6

TREATMENT PROCESS

- Source water = groundwater
- Raw water conductivity (µS/cm) = 7000-9000
- Feed pressure to RO (psi) = 230
- Pretreatment steps = cartridge filter, antiscalant
- TDS of permeate (mg/l) = 300-450
- Membrane recovery (percent) = 80%
- Age of membrane at last replacement = still has original membranes

BLENDING

- Blending = no

WASTE MANAGEMENT

- Concentrate disposal = deep well injection
- Fate of cleaning and backwash waste = haven’t cleaned yet; it will go to deep well

POST-TREATMENT

- Post-treatment of permeate = aerated, disinfected (sodium hypochlorite), fluoridated.
- Post-treatment of concentrate = none

# East Putnam County WTP, FL

GENERAL

- Name of facility = East Putnam County WTP
- Facility owner = East Putnam County
- Purpose of facility = drinking water
- Type of technology = reverse osmosis
- Start year of RO operation = 2010
- Reason for RO facility as opposed to a conventional treatment facility = needed alternative source

TREATMENT CAPACITY

- RO Design production (mgd) = 1
- RO average production (mgd) = 0.225
- Plant (RO + blend) design production (mgd) =
- Plant average Production (mgd) =

TREATMENT PROCESS

- Source water = groundwater
- Raw water TDS (mg/l) = 800
- Feed pressure (psi) =
- Pretreatment = antiscalant, cartridge filters, sulfuric acid,
- TDS of permeate (mg/l) = 25
- Membrane recovery (percent) = 80
- Age of membrane at last replacement = 9 years (just replaces)

BLENDING

- Blending = yes
- Blend water source = bypass
- Blend ratio (permeate : other) = ~ 2.4 : 1
- TDS of blend = 250

WASTE MANAGEMENT

- Concentrate disposal = surface water (St. Johns River)
- Fate of cleaning wastewater = sewer

POST-TREATMENT

- Post treatment of permeate = degasification, sodium hypochlorite, fluoride
- Post-treatment of concentrate = none

# Kings Bay Naval Base WTP, GA

GENERAL

- Name of facility = Kings Bay Naval Base WTP
- Facility owner = Kings Bay Naval Base
- Purpose of facility = drinking water
- Type of technology = nanofiltration
- Start year of RO operation = 2011
- Reason for RO facility as opposed to a conventional treatment facility =

TREATMENT CAPACITY

- RO design production (mgd) = 2.0
- RO average production (mgd) =

TREATMENT PROCESS

- Source water =
- Raw water TDS (mg/l) =
- Feed pressure (psi) =
- Pretreatment = acid, antiscalant
- TDS of permeate (mg/l) =
- Membrane recovery (percent) =
- Age of membrane at last replacement =

BLENDING

- Blending =
- Blending source =
- Blend ratio (permeate : other) =
- TDS of blend (mg/l) =

WASTE MANAGEMENT

- Concentrate disposal = sewer
- Fate of cleaning wastewater =

POST-TREATMENT

- Post treatment of permeate =
- Post-treatment of concentrate =

# Brimfield Water Plant, IL

GENERAL

- Facility name = Brimfield Water Plant
- Facility owner = City of Brimfield
- Purpose of facility = drinking water
- Type of desalination technology = reverse osmosis
- Start year of RO operation = 2012
- Reason for RO facility as opposed to conventional treatment = TDS, organics, radionuclides

TREATMENT CAPACITY

- RO Design production (mgd) = 0.25
- RO average production (mgd) =
- Plant design production (mgd) =
- Plant average production (mgd) =

TREATMENT PROCESS

- Source water = groundwater
- Raw water conductivity (µS/cm) =
- Feed pressure to RO (psi) =
- Pretreatment steps =
- TDS of permeate (mg/l) =
- Membrane recovery (percent) =
- Age of membrane at last replacement =

BLENDING

- Blending =
- Blend Water source =
- Blend ratio (permeate : other) =
- TDS of blend =

WASTE MANAGEMENT

- Concentrate disposal = sewer
- Fate of cleaning wastewater =

POST-TREATMENT

- Post-treatment of permeate =
- Post-treatment of concentrate = none

# City of Atkins WTP, IA

GENERAL

- Name of facility = City of Atkins WTP
- Facility owner = City of Atkins
- Purpose of facility = drinking water
- Type of technology = reverse osmosis
- Start year of RO operation = 2010
- Reason for RO facility = NH3, system easy to expand in future

TREATMENT CAPACITY

- RO design production (mgd) = 0.58
- RO average production (mgd) =

TREATMENT PROCESS

- Source = groundwater
- Raw water conductivity (µS/cm) = 820
- Feed pressure to RO (psi) =
- Pretreatment steps = 25µ followed by 1µ woven filter, antiscalant
- TDS of permeate (mg/l) =
- Membrane recovery (percent) =
- Age of membrane at last replacement =

BLENDING

- Blending = no

WASTE MANAGEMENT

- Concentrate disposal = sewer
- Fate of cleaning wastewater =

POST-TREATMENT

- Post-treatment of permeate = CaCl2, NaHCO3, caustic, chlorine, orthophosphate
- Post-treatment of concentrate = none

# City of Pella, IA

GENERAL

- Facility name = City of Pella WTP
- Facility owner = City of Pella
- Purpose of facility = drinking water
- Type of technology = reverse osmosis
- Start year of NF operation = 2017
- Reason for RO facility as opposed to conventional treatment = current source had degraded over the years and had limited available water; had to go to different aquifer and RO was best treatment approach

TREATMENT CAPACITY

- RO design production (mgd) = 3
- RO average production (mgd) = 1.4
- Plant (RO + blend) production (mgd) = 6, if 3 mgd of lime softened water is added in an emergency
- Plant average production (mgd) = 1.8

TREATMENT PROCESS

- Source water = groundwater
- Raw water conductivity (mg/l) = 685
- Feed pressure to RO (psi) = first stage = 101; second stage = 105
- Pretreatment steps = antiscalant
- TDS of permeate (mg/l) =
- Membrane recovery (percent) = 80%
- Age of membrane at last replacement = on original membranes

BLENDING

- Blending = yes
- Blend Water source = bypass
- Blend ratio (permeate : other) = 80 : 20
- TDS of blend = 230

WASTE MANAGEMENT

- Concentrate disposal = to river
- Fate of cleaning wastewater =

POST-TREATMENT

- Post-treatment of permeate = pH adjustment (caustic), chorine, fluoride
- Post-treatment of concentrate = none

# Council Point WPP, IA

GENERAL

- Facility name = Council Point WPP
- Facility owner = Council Bluffs Water Works
- Purpose of facility = drinking water
- Type of desalination technology = reverse osmosis
- Start year of RO operation = 2013
- Reason for RO facility as opposed to conventional treatment = TDS, organics

TREATMENT CAPACITY

- RO Design production (mgd) = 5
- RO average production (mgd) = 1.68
- Plant design production (mgd) = 5
- Plant average production (mgd) = 2.4

TREATMENT PROCESS

- Source water = groundwater
- Raw water TDS (mg/l) = 550 -800
- Feed pressure to RO (psi) = 150
- Pretreatment steps = iron and manganese oxidation and UF filtration, antiscalant
- TDS of permeate (mg/l) = target is hardness
- Membrane recovery (percent) = 75%
- Age of membrane at last replacement = 3 years

BLENDING

- Blending = yes
- Blend Water source = bypass
- Blend ratio (permeate : other) = 70 : 30
- TDS of blend (mg/l) = target is hardness; TDS = 300-400

WASTE MANAGEMENT

- Concentrate disposal = surface water (Missouri River)
- Fate of cleaning and backwash waste =

POST-TREATMENT

- Post-treatment of permeate = disinfection, pH adjustment
- Post-treatment of concentrate = none

# City of Hartley RO WTF, IA

GENERAL

- Facility name = RO WTF
- Facility owner = City of Hartley
- Purpose of facility = drinking water
- Type of technology = reverse osmosis
- Start year of RO operation = 2010
- Reason for RO facility as opposed to conventional treatment = hardness, sulfate, TDS

TREATMENT CAPACITY

- RO Design production (mgd) = 0.44
- RO average production (mgd) = summer = 0.17; winter = 0.11
- Plant design production (mgd) =
- Plant average production (mgd) =

TREATMENT PROCESS

- Source water = groundwater
- Raw water TDS (mg/l) = 2100
- Pretreatment steps = antiscalant, cartridge filters
- Feed pressure to RO (psi) = ~158
- TDS of permeate (mg/l) =
- Membrane recovery (percent) = 75-77
- Age of membrane at last replacement = on original membranes

BLENDING

- Blending = yes
- Blend Water source = bypass
- Blend ratio (permeate : other) = 90 :10
- TDS of blend = 400

WASTE MANAGEMENT

- Concentrate disposal = sewer
- Fate of cleaning and backwash waste = sewer

POST-TREATMENT

- Post-treatment of permeate = aeration, chlorine, caustic, corrosion inhibitor, fluoride
- Post-treatment of concentrate = none

# City of Grimes WTP, IA

GENERAL

- Facility name = Grimes WTP
- Facility owner = City of Grimes
- Purpose of facility = drinking water
- Type of desalination technology = reverse osmosis
- Start year of RO operation = 2017
- Reason for RO facility as opposed to conventional treatment = better quality

TREATMENT CAPACITY

- RO Design production (mgd) = 0.8
- RO average production (mgd) =
- Plant (permeate + blend) design production (mgd) =
- Plant average production (mgd) =

TREATMENT PROCESS

- Source water = groundwater
- Raw water TDS (mg/l) = 110
- Pretreatment steps = bag filter, cartridge filter, antiscalant
- Feed pressure to RO (psi) =
- Membrane recovery (percent) = 85%
- TDS of permeate (mg/l) =
- Age of membrane at last replacement = on original membranes

BLENDING

- Blending = yes
- Blend Water source = lime softened water; source water from a different aquifer
- Blend ratio (permeate : other) = 2 : 1
- TDS of blend (mg/l) = 80

WASTE MANAGEMENT

- Concentrate disposal = sanitary sewer (to WWTP)
- Fate of cleaning wastewater = haven’t had to clean yet

POST-TREATMENT

- Post-treatment of permeate = blend, chloramination, corrosion inhibitor
- Post-treatment of concentrate = blend with lime softening waste

# Hills Water Supply, IA

GENERAL

- Name of facility = Hills Water Supply
- Facility owner = Hills Municipal Water
- Purpose of facility = drinking water
- Type of desalination technology = reverse osmosis
- Start year of RO operation = 2015
- Reason for the RO facility as opposed to a conventional facility = perchlorate, ammonia, TDS, hardness

TREATMENT CAPACITY

- RO design production (mgd) = 0.317
- RO average Production (mgd) =

TREATMENT PROCESS

- Source = groundwater
- Raw water TDS (mg/l) =
- Pre-treatment steps =
- Feed pressure to RO (psi) =
- TDS of permeate (mg/l) =
- Membrane recovery (percent) =
- Age of membrane at last replacement =

BLENDING

- Blending of permeate = no

WASTE MANAGEMENT

- Concentrate disposal = sewer
- Fate of cleaning wastewater =

POST-TREATMENT

- Post-treatment of permeate =
- Post-treatment of concentrate = none

# PWWSD #26, KS

GENERAL

- Facility name = PWWSD #26
- Facility owner = Strong City
- Purpose of facility = drinking water
- Type of desalination technology = reverse osmosis
- Start year of RO operation = 2015
- Reason for RO facility as opposed to conventional treatment = hardness

TREATMENT CAPACITY

- RO Design production (mgd) = 0.46 (2 RO skids; typically run both in summer; currently run 1 about 16 hr/day)
- RO average production (mgd) = 0.12
- Plant design (RO + blend) production (mgd) =0.6
- Plant average production (mgd) = 0.14

TREATMENT PROCESS

- Source water = groundwater
- Raw water conductivity (µS/cm) = 820-915
- Feed pressure to RO (psi) = 150
- Pretreatment steps = chlorination, green sand filter, dichlorination (bisulfite), antiscalant, cartridge filters
- TDS of permeate (mg/l) = 15
- Membrane recovery (percent) = 80%
- Age of membrane at last replacement = on original membranes

BLENDING

- Blending = yes
- Blend Water source = raw water through the green sand filter
- Blend ratio (permeate : other) = 80 : 20
- TDS of blend (mg/l) = 200

WASTE MANAGEMENT

- Concentrate disposal = surface water (river)
- Fate of cleaning wastes = to sanitary sewer; clean only once every 3 years
- Fate of backwash waste = to settling tank, solids to lagoon and evaporation pond; retentate back to front of process before the green sand filters

POST-TREATMENT

- Post-treatment of permeate = caustic, chlorine
- Post-treatment of concentrate = none

# Clay Center, KS

GENERAL

- Name of facility = Clay Center PUC Treatment RO Plant
- Facility owner = City of Clay Center
- Type of facility = drinking water
- Type of technology = reverse osmosis
- Start year of RO operation = 2010
- Reason for RO facility = will meet present and future needs

TREATMENT CAPACITY

- RO design production (mgd) = 1.67
- RO average Production (mgd) = 0.41
- Plant (RO + blend) design production (mgd =1.95
- Plant average production (mgd) = 0.49

TREATMENT PROCESS

- Source water = groundwater
- Raw water conductivity (µS/cm) = 1430
- Feed pressure (psi) to RO =
- Pretreatment steps = greensand filter, cartridge filter, antiscalant
- TDS of permeate (mg/l) =
- Membrane recovery (percent) =75
- Age of membrane at last replacement = on original membranes

BLENDING

- Blending = yes
- Blend water source = bypass
- Blend ratio (permeate : other) = ~ 80 : 20
- TDS of blend =

WASTE MANAGEMENT

- Concentrate disposal = surface (discharge to river)
- Fate of cleaning wastewater =

POST-TREATMENT

- Post-treatment of permeate = decarbonation, Caustic, chlorine
- Concentrate treatment = none

# Big Springs WTP, KS

GENERAL

- Name of facility = Big Springs WTP
- Facility owner = Douglas County RWD #3
- Purpose of facility = drinking water
- Type of technology = reverse osmosis
- Start year of RO operation = 2014
- Reason for the RO facility as opposed to a conventional facility = hardness removal, TDS

TREATMENT CAPACITY

- RO Design production (mgd) = 1.14
- RO Average Production (mgd) = 0.31
- Plant (RO + blend) design production (mgd) =
- Plant average production (mgd) = 0.67

TREATMENT PROCESS

- Source water = groundwater
- Raw water TDS (mg/l) = 280
- Feed pressure to RO (psi) = 146
- Pretreatment =
- TDS of permeate (mg/l) =
- Membrane recovery (percent) =
- Age of membrane at last replacement = almost 4 years; replacement needed due to process upset

BLENDING

- Blending = yes
- Blend water source = bypass after he Fe-Mn oxidation step
- Blend ratio (permeate : other) = ~ 75:25
- TDS of blend =

WASTE MANAGEMENT

- Concentrate disposal = discharge to a lagoon and then to a river
- Cleaning wastewater fate = goes to lagoon

POST-TREATMENT

- Post-treatment of permeate = caustic, chloramination
- Treatment of concentrate = none

# Swansea WTP, MA

GENERAL

- Name of facility = Swansea Desalination Treatment Facility
- Facility owner = Swansea Water District
- Purpose of facility = drinking water
- Type of technology = reverse osmosis
- Start year of RO operation = 2013
- Reason for RO facility as opposed to a conventional treatment facility = TDS

TREATMENT CAPACITY

- RO Design production (mgd) = 1.2
- RO average production (mgd) = 0.4
- Plant (RO + blend) design production (mgd) = 2.18
- Plant Average Production (mgd) = 0.85

TREATMENT PROCESS

- Source water = surface water
- Raw water TDS (mg/l) =
- Feed pressure (psi) = 250 – 550 depending on conductivity
- Pretreatment = intake screen, caustic, coagulant, strainers, microfiltration
- TDS of permeate (mg/l) =
- Membrane recovery (percent) = 30 – 50 depending on feed conductivity
- Age of membrane at last replacement = on original membranes

BLENDING

- Blending = yes
- Blend water source = groundwater
- Blend ratio (permeate : other) = 40 : 60
- TDS of blend = 250

WASTE MANAGEMENT

- Concentrate disposal = surface water – returned to River on high tide events
- Fate of cleaning wastewater = neutralized, mixed with concentrate
- Fate of backwash waste = through sand lined lagoon then mixed with concentrate

POST-TREATMENT

- Post treatment of permeate = caustic, soda ash, chlorine
- Post-treatment of concentrate = none

# City of Allegan MI

GENERAL

- Name of facility = City of Allegan WTP
- Facility owner = City of Allegan
- Purpose of facility = drinking water
- Type of technology = reverse osmosis
- Start year of RO operation = 2011
- Reason for RO = hardness; less complicated/less labor intense than lime softening

TREATMENT CAPACITY

- RO Design production (mgd) = 2.25
- RO Average Production (mgd) = ~ 1.2; perhaps 0.9 in winter and 1.5 in summer
- Plant (RO + blend) Design production (mgd) =
- Plant average production (mgd) =

TREATMENT PROCESS

- Source water = groundwater
- Raw water conductivity (µS/cm) = 700
- Feed pressure (psi) = 40 from wells; 150 to RO
- Pretreatment steps = spiral wound filter, antiscalant
- TDS (mg/l) or conductivity (µS/cm) of permeate =
- Membrane recovery (percent) =
- Age of membrane at last replacement = still on original membranes

BLENDING

- Blending = yes
- Blend water source = bypass (treated for iron removal)
- Blend ratio (permeate : other) = 70:30
- TDS of blend =

WASTE MANAGEMENT

- Concentrate disposal = discharge to river
- Fate of cleaning wastewater = have not had to clean membranes yet since installation

POST-TREATMENT

- Post-treatment of permeate = fluoride, orthophosphate
- Treatment of concentrate = none

# Glassboro WTP, NJ

GENERAL

- Facility name = Borough of Glassboro WTP
- Facility owner = Borough of Glassboro
- Purpose of facility = drinking water
- Type of technology = reverse osmosis/VSEP
- Start year of RO operation = 2012
- Reason for RO facility as opposed to conventional treatment = high sodium

TREATMENT CAPACITY

- RO/VSEP Design production (mgd) = 1.13
- RO average production (mgd) =
- Plant design production (mgd) = ~ 1.5
- Plant average production (mgd) = ~ 1

TREATMENT PROCESS

- Source water = groundwater
- Raw water conductivity (µS/cm) =
- Feed pressure to RO (psi) = ~ 200 to RO
- Pretreatment steps = 1µ prefilters
- TDS of permeate (mg/l) =
- Membrane recovery (percent) =
- Age of membrane at last replacement = on original membranes

BLENDING

- Blending = yes
- Blend Water source = bypass
- Blend ratio (permeate : other) = varies, but roughly 1 : 1
- TDS of blend =

WASTE MANAGEMENT

- Concentrate disposal = sanitary sewer
- Fate of cleaning wastewater =

POST-TREATMENT

- Post-treatment of permeate = chlorine and orthophosphate
- Post-treatment of concentrate = none

# Keansburg Freese Street, WTP NJ

GENERAL

- Name of facility = Freese Street WTP
- Facility owner = City of Keansburg
- Purpose of facility = drinking water
- Type of technology = reverse osmosis
- Start year of RO operation = 2011
- Reason for RO facility as opposed to a conventional treatment facility = TDS

TREATMENT CAPACITY

- RO Design production (mgd) = 1.15
- RO average production (mgd) = 0.85
- Plant (RO + blend) design production (mgd) =
- Plant average production (mgd) =

TREATMENT PROCESS

- Source water = groundwater
- Raw water TDS (mg/l) = 1200-1300
- Feed pressure (psi) = 180-200
- Pretreatment = antiscalant, cartridge filters, sulfuric acid,
- TDS of permeate (mg/l) = 40
- Membrane recovery (percent) = 85
- Age of membrane at last replacement =

BLENDING

- Blending = yes
- Blend water source = bypass
- Blend ratio (permeate : other) = 400 : 100 (gpm)
- TDS of blend =

WASTE MANAGEMENT

- Concentrate disposal = surface water
- Fate of cleaning wastewater = same

POST-TREATMENT

- Post treatment of permeate = chlorine, caustic
- Post-treatment of concentrate = none

# Craven County, NC

GENERAL

- Facility name = Craven County Potable Water Supply and Treatment Facility
- Facility Owner = Craven County
- Purpose of facility = drinking water
- Type of desalination technology = nanofiltration
- Start year of NF operation = 2017
- Reason for NF plant = reduce reliance on Black Creek Aquifer; remove THM and HAA5 precursors

TREATMENT CAPACITY

- NF design production (mgd) = 3
- NF average production (mgd) = 1.33

TREATMENT PROCESS

- Source water = ground water
- Raw water TDS (mg/l) = 296
- Feed pressure to NF (psi) = 38-52
- Pretreatment steps = antiscalant, cartridge filters
- TDS of permeate (mg/l) =
- Concentrate TDS (mg/l) = 800 – 1200 depending on well combo
- Age of membrane at last replacement = on original membranes

BLENDING

- Blending = no

WASTE MANAGEMENT

- Concentrate disposal = discharge to Neuse River (tidally influenced)
- Fate of cleaning wastewater =

POST-TREATMENT

- Post treatment of permeate = calcite stabilization, chlorination
- Post-treatment of concentrate = none

# Dixon WTP, NC

GENERAL

- Name of facility = Dixon WTP
- Facility owner = ONWASA (Onslow Water and Sewer Authority)
- Purpose of facility = drinking water
- Type of technology = reverse osmosis
- Start year of NF operation = 2013
- Reason for treatment = silica removal with side benefit of TOC reduction

TREATMENT CAPACITY

- RO Design production (mgd) = 3
- RO Average Production (mgd) = 2
- Plant (RO + bypass) Design production (mgd)= 4
- Plant average production (mgd) = 2.5

TREATMENT PROCESS

- Source = groundwater
- Raw water conductivity (µS/cm) = ~400
- Feed pressure (psi) = 82 – 98
- Pretreatment steps = greensand filter, antiscalant, cartridge filter
- TDS of permeate (mg/l) = 25
- Membrane recovery (percent) = 70 – 80
- Age of membrane at last replacement = on original membranes

BLENDING

- Blending = yes
- Blend water source = same source; bypass after greensand filter
- Blend ratio (permeate : other) = 73 : 27
- TDS of blend (mg/l) = < 250

WASTEWATER MANAGEMENT

- Concentrate disposal = surface (discharge to ponds which empty into a creek)
- Fate of cleaning wastewater = same as with concentrate

POST-TREATMENT

- Concentrate treatment = none
- Permeate = pH adjustment (caustic), disinfection, corrosion control, fluoride

# Englehard Hyde County, NC

GENERAL

- Facility name = Englehard WTP
- Facility owner = Hyde County Water Maintenance and Solids Waste Department
- Purpose of facility = drinking water
- Type of desalination technology = reverse osmosis
- Start year of RO operation = 2011
- Reason for RO facility as opposed to conventional treatment =

TREATMENT CAPACITY

- RO Design production (mgd) = 0.432
- RO average production (mgd) =

TREATMENT PROCESS

- Source water = groundwater
- Raw water conductivity (µS/cm) = 973
- Feed pressure to RO (psi) =
- Pretreatment steps = antiscalant
- TDS of permeate (mg/l) = ~25
- Membrane recovery (percent) =
- Age of membrane at last replacement = on original membranes

BLENDING

- Blending = no

WASTE MANAGEMENT

- Concentrate disposal = discharge to surface water (creek)
- Fate of cleaning wastewater =

POST-TREATMENT

- Post-treatment of permeate = acid, lime, phosphate, chlorine
- Post-treatment of concentrate = none

# Skyco, NC

GENERAL

- Facility name = Skyco WTP
- Facility owner = Dare County
- Purpose of facility = drinking water
- Type of desalination technology = nanofiltration
- Start year of NF operation = 2017
- Reason for the NF facility as opposed to a conventional facility = less complicated than the IX facility and found a membrane to remove bromide to address byproduct issue and iron

TREATMENT CAPACITY

- NF Design production (mgd) = 3
- RO average production (mgd) =
- Plant design production (mgd) = 5
- Plant average production (mgd) = 2.5

TREATMENT PROCESS

- Source water = groundwater
- Raw water TDS (mg/l) = 545
- Feed pressure to NF (psi) = 108
- Pretreatment steps = 5 micron cartridge filter, antiscalant
- TDS of permeate (mg/l) = 50
- Membrane recovery (%) = 80
- Age of membrane at last replacement = on original membranes

BLENDING

- Blending = yes
- Blend Water source = product from IX facility; improves hardness
- Blend ratio (permeate : other) = at MAX production = 3 : 2
- Target TDS of blend (mg/l) = 170

WASTE MANAGEMENT

- Concentrate disposal = to surface water
- Fate of cleaning and backwash waste = mixed with concentrate

POST-TREATMENT

- Post -treatment of permeate = caustic, hypochlorite, corrosion inhibitor (zinc ortho phosphate)
- Post-treatment of concentrate = none; concentrate mixed with backwash prior to discharge

# Tyrrell County Prison RO WTP, NC

GENERAL

- Name of facility = Tyrrell County Prison RO WTP
- Facility owner = Tyrrell County Prison
- Purpose of facility = drinking water
- Type of technology = reverse osmosis
- Start year of RO operation = 2010
- Reason for RO facility as opposed to a conventional treatment facility =

TREATMENT CAPACITY

- RO design production (mgd) = 0.432
- RO average production (mgd) =

TREATMENT PROCESS

- Source water =
- Raw water TDS (mg/l) =
- Feed pressure (psi) =
- Pretreatment =
- TDS of permeate (mg/l) =
- Membrane recovery (percent) =
- Age of membrane at last replacement =

BLENDING

- Blending =
- Blending source =
- Blend ratio (permeate : other) =
- TDS of blend (mg/l) =

WASTE MANAGEMENT

- Concentrate disposal = surface
- Fate of cleaning wastewater =

POST-TREATMENT

- Post treatment of permeate =
- Post-treatment of concentrate =

# New Frontier Way NF, NC

GENERAL

- Name of facility = New Frontier Way NF Plant
- Facility owner = City of Jacksonville
- Purpose of facility = drinking water
- Type of technology = nanofiltration
- Start year of NF operation = 2010
- Reason for NF facility as opposed to a conventional facility = softening, organic removal

TREATMENT CAPACITY

- NF Design production (mgd) = 8
- NF Average Production (mgd) = 3.5
- Plant (NF + blend) Design production (mgd) =
- Plant average production (mgd) =

TREATMENT PROCESS

- Source water = groundwater
- Raw water conductivity (µS/cm) = 884
- Pretreatment = antiscalant, cartridge filters; acid added to bypass used for blending
- Feed pressure to NF (psi) = 57
- TDS of permeate (mg/l) = 85
- Membrane recovery (percent) = 75
- Age of membrane at last replacement =

BLENDING

- Blending =yes
- Blend water source = bypass
- Blend ratio (permeate : other) 90 :10
- TDS of blend (mg/l) = 280-320

WASTE MANAGEMENT

- Concentrate disposal = to river
- Fate of cleaning wastewater =

POST-TREATMENT

- Post treatment of permeate = bioscrubbing to remove odor, stabilization, disinfection, pH
- Post-treatment of concentrate = none77

# Valley City WTP, ND

GENERAL

- Name of facility = Valley City WTP
- Facility owner = Valley City
- Purpose of facility = drinking water
- Type of technology = UF/NF
- Start year of NF operation = 2012
- Reason for UF/NF as opposed to conventional treatment = TDS, sulfate; replaced lime softening

TREATMENT CAPACITY

- NF Design production (mgd) = 4.65
- NF Average Production (mgd) =
- Plant (NF + blend) Design production (mgd) =
- Plant average production (mgd) =

TREATMENT PROCESS

- Source waters = ground and surface waters
- Raw water TDS (mg/l) or conductivity (µS/cm) =
- Pretreatment steps = sodium permanganate (for Fe/Mn), coagulant, sulfuric acid; all this before the UF; cartridge filter, antiscalant after the UF
- Feed pressure to NF (psi) = 180
- conductivity of permeate (µS/cm) = 50
- Membrane recovery (percent) = currently 85% on UF (scaling issues; considering antiscalant prior to UF); 85% on NF
- Age of membrane at last replacement = original membranes

BLENDING

- Blending = yes
- Blend water source = raw water treated through the UF step
- Blend ratio (permeate : other) = ~ 50 : 50
- TDS of blend =

WASTE MANAGEMENT

- Concentrate disposal = to surface water unless low receiving water flow; then to lagoon
- Fate of cleaning wastewater = same

POST-TREATMENT

- Post-treatment of permeate = blend, fluoride, caustic, chloramination
- Post-treatment of concentrate = none

# Hillsboro WTP, ND

GENERAL

- Name of facility = City of Hillsboro WTP
- Facility owner = City of Hillsboro
- Purpose of facility = drinking water
- Type of technology = reverse osmosis
- Start year of RO operation = 2012
- Reason for RO facility as opposed to a conventional treatment facility = hardness, SO4, TDS

TREATMENT CAPACITY

- RO design production (mgd) = 0.85
- RO average production (mgd) =

TREATMENT PROCESS

- Source water =
- Raw water TDS (mg/l) =
- Feed pressure (psi) =
- Pretreatment =
- TDS of permeate (mg/l) =
- Membrane recovery (percent) =
- Age of membrane at last replacement =

BLENDING

- Blending =
- Blending source =
- Blend ratio (permeate : other) =
- TDS of blend (mg/l) =

WASTE MANAGEMENT

- Concentrate disposal =
- Fate of cleaning wastewater =

POST-TREATMENT

- Post treatment of permeate =
- Post-treatment of concentrate =

# Emmons County WTP, ND

GENERAL

- Name of facility = Emmons County WTP
- Facility Owner = South Central Regional Water District
- Purpose of facility = drinking water
- Type of technology = UF/RO
- Start year of RO operation = 2012
- Reason why UF/RO as opposed to a conventional WTP = hardness

TREATMENT CAPACITY

- RO design production (mgd) = 1.2
- RO average Production (mgd) = 0.4
- Plant (RO + blend) design production (mgd) = 2.0
- Plant average production (mgd) = 0.7

TREATMENT PROCESS

- Source = Lake Oahe
- Raw water TDS (mg/l) = 500
- Feed pressure (psi) = 120
- Pretreatment steps = ozone(oxidation), coagulation/sedimentation, ultrafiltration, antiscalant
- TDS of permeate (mg/l) = 30
- Membrane recovery (percent) = 80
- Age of membrane at last replacement = 6 years

BLENDING

- Blending = yes
- Blend water source = bypass
- Blend ratio (permeate : other) = 60 : 40
- TDS of blend (mg/l) = 250

WASTE MANAGEMENT

- Concentrate disposal = surface (discharge to lake)
- Fate of cleaning wastewater = with concentrate

POST-TREATMENT

- Post-treatment of concentrate = none
- Post-treatment of permeate = blend, ozone, chlorine

# Bowling Green, OH

**GENERAL**

- Name of facility = Bowling Green WTP
- Facility owner = City of Bowling Green
- Purpose of facility = drinking water plant
- Type of technology = reverse osmosis
- Start year of RO operation = 2012
- Reason for RO treatment = THMs, TOC

TREATMENT CAPACITY

- RO Design production (mgd) = 3
- RO Average Production (mgd) = 1
- Plant (RO + blend) Design production (mgd) = 14
- Plant average production (mgd) = 4.8

TREATMENT PROCESS

- Source water = surface water (Maumee River)
- Raw water conductivity (µS/cm) = 650 µS/cm
- Pre-treatment steps = antiscalant, cartridge filters, microfiltration
- Feed pressure (psi) = 75
- Conductivity of permeate (µS/cm) 16
- Membrane recovery (percent) = 78
- Age of membrane at last replacement = on original membranes

BLENDING

- Blending = Yes
- Blend water source = with lime softened/GAC treated water
- Blend ration (permeate : other) = 25 : 75
- TDS of blend =

WASTE MANAGEMENT

- Concentrate disposal = to lagoon and then river
- Fate of cleaning wastewater = same: lagoon and river

POST-TREATMENT

- Post treatment of permeate = blend, pH adjustment, chlorination
- Post-treatment of concentrate = none

# City of Delaware WTP, OH

**GENERAL**

- Name of facility = City of Delaware WTP
- Facility owner = City of Delaware
- Purpose of facility = drinking water plant
- Type of technology = UF/NF and NF (separate NF lines)
- Start year of RO operation =
- Reason for RO treatment = Fe, Mn

TREATMENT CAPACITY

- NF Design production (mgd) = 6
- NF Average Production (mgd) = 3.8

TREATMENT PROCESS

- Source water = surface water and GW
- Raw water conductivity (µS/cm) =
- Pre-treatment steps = on surface water = coagulation, UF; on GW = filters to remove Fe, Mn
- Feed pressure (psi) =
- Target conductivity of permeate (µS/cm) =
- Membrane recovery (percent) =
- Age of membrane at last replacement =

BLENDING

- Blending = no

WASTE MANAGEMENT

- Concentrate disposal = surface water
- Fate of cleaning wastewater =

POST-TREATMENT

- Post treatment of permeate = chlorine, corrosion inhibitor, fluoride
- Post-treatment of concentrate =

# Spencerville, OH

GENERAL

- Name of facility = Spencerville WTP
- Facility owner = City of Spencerville
- Purpose of facility = drinking water
- Type of technology = nanofiltration
- Start year of NF operation = 2014
- Reason for the NF facility as opposed to a conventional facility = better water quality, capability of meeting future concerns, present concerns with TDS increases from ion exchange systems

TREATMENT CAPACITY

- NF Design production (mgd) = 0.49
- NF Average Production (mgd) =
- Plant (NF + blend) Design capacity (mgd) =
- Plant average production (mgd) =

TREATMENT PROCESS

- Source water = ground water
- Raw water conductivity (µS/cm) = 1095 – 1518
- Pretreatment = aeration, chlorination, sand filters, dechlorination, antiscalant
- Feed pressure to NF (psi) = 122
- TDS of permeate (mg/l) = 74
- Membrane recovery (percent) = 70%
- Age of membrane at last replacement = still have original membranes

BLENDING

- Blending = yes
- Blend water source = sand-filtered raw water
- Blend ratio (permeate : other) = 90 : 10
- TDS of blend =

WASTEWATER MANAGEMENT

- Concentrate disposal = to sewer
- Fate of cleaning wastewater =

POST TREATMENT

- Post-treatment of permeate = disinfections, pH adjustment
- Post-treatment of concentrate = add acid to lower pH

# Pigeon Forge STP, TN

GENERAL

- Name of facility = Pigeon Forge STP
- Facility owner = City of Pigeon Forge (or Veolia?)
- Type of facility = WWTP
- Type of technology = nanofiltration
- Purpose = to thicken digester content for next digester
- Start year of NF operation = 2015

TREATMENT CAPACITY

- NF Design production (mgd) = 0.4
- NF average production (mgd) =

TREATMENT PROCESS

- Feed pressure to NF (psi) =
- TDS of permeate (mg/l) =
- Membrane recovery (percent) =
- Age of membrane at last replacement = on original membranes

BLENDING

- Blending = no

WASTE MANAGEMENT

- Concentrate disposal = passed on to next digester
- Fate of effluent = discharge to river

POST-TREATMENT

- Post-treatment of permeate = disk filter, chlorinated, dechlorinated (bisulfite); later this year will recycle to front of process due to high phosphorus content

# 14TH And C RO WTP, TX

GENERAL

- Name of facility = 14th and C RO WTP
- Facility owner = BW Primoris
- Purpose of facility = drinking water
- Type of technology = reverse osmosis
- Start year of RO operation = 2016
- Reason for RO facility as opposed to a conventional treatment facility = TDS, arsenic

TREATMENT CAPACITY

- RO Design production (mgd) = 0.65
- RO average production (mgd) = 0.5 – 0.65
- Plant Design production (mgd) =
- Plant Average Production (mgd) =

TREATMENT PROCESS

- Source water = groundwater
- Raw water TDS (mg/l) = summer ~ 2500; rest of year ~ 1100
- Feed pressure (psi) = 225-250
- Pretreatment = antiscalant, cartridge filters, sulfuric acid
- TDS of permeate (mg/l) = 40-50
- Membrane recovery (percent) = 65-70%
- Age of membrane at last replacement = on original membranes

BLENDING

- Blending = yes
- Blend water source = raw water bypass
- Blend ratio (permeate : other) = 2 : 1
- TDS of blend = 740

WASTE MANAGEMENT

- Concentrate disposal = to gulch, percolations into ground
- Fate of cleaning wastewater = send membranes off site

POST-TREATMENT

- Post treatment of permeate = blend, chlorine, caustic
- Post-treatment of concentrate = none

# 25th and Avenue G RO WTP, TX

GENERAL

- Name of facility = 25TH and Avenue G RO WTP
- Facility owner = BW Primoris
- Purpose of facility = drinking water
- Type of technology = reverse osmosis
- Start year of RO operation = 2016
- Reason for RO facility as opposed to a conventional treatment facility = TDS, arsenic
- Present status = offline since start; replaced by coagulation process just for As

TREATMENT CAPACITY

- RO Design production (mgd) = 1.15
- RO average production (mgd) =
- Plant Design production (mgd) =
- Plant Average Production (mgd) =

TREATMENT PROCESS

- Source water = groundwater
- Raw water TDS (mg/l) =
- Feed pressure (psi) =
- Pretreatment =
- TDS of permeate (mg/l) =
- Membrane recovery (percent) =
- Age of membrane at last replacement =

BLENDING

- Blending =
- Blend water source =
- Blend ratio (permeate : other) =
- TDS of blend =

WASTE MANAGEMENT

- Concentrate disposal = to gulch, percolations into ground
- Fate of cleaning wastewater =

POST-TREATMENT

- Post treatment of permeate =
- Post-treatment of concentrate =

# Aransas Bay Utilities WTP, TX

GENERAL

- Name of facility = Aransas Bay Utilities WTP
- Facility owner = Aransas Bay Utilities
- Purpose of facility = drinking water
- Type of technology = reverse osmosis
- Start year of RO operation = 2011
- Reason for RO facility as opposed to a conventional treatment facility =

TREATMENT CAPACITY

- RO design production (mgd) = 0.20
- RO average production (mgd) =
- Plant (RO + blend) design production (mgd) =
- Plant Average Production (mgd) =

TREATMENT PROCESS

- Source water = groundwater
- Raw water TDS (mg/l) =
- Feed pressure (psi)?
- Pretreatment = antiscalant, cartridge filters, sulfuric acid,
- TDS of permeate (mg/l) =
- Membrane recovery (percent) =
- Age of membrane at last replacement =

BLENDING

- Blending =
- Blend water source =
- Blend ratio (permeate : other) =
- TDS of blend =

WASTE MANAGEMENT

- Concentrate disposal = surface
- Fate of cleaning wastewater =

POST-TREATMENT

- Post treatment of permeate =
- Post-treatment of concentrate =

# Big Spring Water Advanced Treatment Plant, TX

GENERAL

- Name of facility = Big Spring Advanced Treatment Plant
- Facility owner = Colorado River Municipal Water District
- Purpose of facility = drinking water supply
- Type of technology = MF/reverse osmosis
- Start year of RO operation = 2013
- Reason for RO facility as opposed to a conventional treatment facility = draught dried up a source water lake; new drinking water source needed

TREATMENT CAPACITY

- RO Design production (mgd) = 2.38
- RO average production (mgd) = 1.2

TREATMENT PROCESS

- Source water = reservoir water which received water from WWTP
- Raw water TDS (mg/l) = 1845
- Feed pressure (psi) = 150
- Pretreatment = MF, disinfection (chemical and UV), pH adjustment, antiscalant
- TDS of permeate (mg/l) =
- Membrane recovery (percent) = 75%
- Age of membrane at last replacement =

BLENDING

- Blending = no

WASTE MANAGEMENT

- Concentrate disposal = surface water
- Fate of cleaning wastewater =
- Fate of backwash waste =

POST-TREATMENT

- Post treatment of permeate = UV oxidation; 5-20% is blended with surface water from one of the reservoirs and then treated again at the Big Springs WTP; the rest of the permeate goes to meet an industry need
- Post-treatment of concentrate = none

# Bob Elder WTP, TX

GENERAL

- Name of facility = Bob Elder WTP
- Facility owner = City of Milsap
- Purpose of facility = drinking water
- Type of technology = MF/reverse osmosis
- Start year of RO operation = 2014
- Reason for RO facility as opposed to a conventional treatment facility =

TREATMENT CAPACITY

- RO Design production (mgd) =
- RO average production (mgd) =

TREATMENT PROCESS

- Source water = surface water
- Raw water TDS (mg/l) = 1255
- Feed pressure (psi) = 148
- Pretreatment = MF, cartridge filter, dichlorination, antiscalant
- TDS of permeate (mg/l) =
- Membrane recovery (percent) = 70%
- Age of membrane at last replacement =

BLENDING

- Blending = yes
- Blending source =
- Blend ratio (permeate : other) =
- TDS of blend (mg/l) =

WASTE MANAGEMENT

- Concentrate disposal = surface water
- Fate of cleaning wastewater =
- Fate of backwash waste =

POST-TREATMENT

- Post treatment of permeate = blending, pH adjustment, disinfection
- Post-treatment of concentrate = none

# City of Benjamin RO WTP, TX

GENERAL

- Name of facility = City of Benjamin RO WTP
- Facility owner = City of Benjamin
- Purpose of facility = drinking water
- Type of technology = reverse osmosis
- Start year of RO operation = 2012
- Reason for RO facility as opposed to a conventional treatment facility =

TREATMENT CAPACITY

- RO Design production (mgd) = 0.072
- RO average production (mgd) = 0.0576

TREATMENT PROCESS

- Source water = groundwater
- Raw water TDS (mg/l) =
- Feed pressure (psi) = 165
- Pretreatment = cartridge filter
- TDS of permeate (mg/l) =
- Membrane recovery (percent) = 71
- Age of membrane at last replacement =

BLENDING

- Blending = yes
- Bending source =
- Blend ratio (permeate : other) =
- TDS of blend (mg/l) =

WASTE MANAGEMENT

- Concentrate disposal = evaporation pond
- Fate of cleaning wastewater =

POST-TREATMENT

- Post treatment of permeate = pH adjustment, disinfection
- Post-treatment of concentrate =

# City of Evant RO WTP, TX

GENERAL

- Name of facility = City of Evant RO WTP
- Facility owner = City of Evant
- Purpose of facility = drinking water
- Type of technology = reverse osmosis
- Start year of RO operation = 2010
- Reason for RO facility as opposed to a conventional treatment facility =

TREATMENT CAPACITY

- RO Design production (mgd) = 0.08
- RO average production (mgd) = 0.065

TREATMENT PROCESS

- Source water = groundwater
- Raw water TDS (mg/l) = 1100
- Feed pressure (psi) = 190
- Pretreatment = cartridge filter, media filter, antiscalant
- TDS of permeate (mg/l) = 800
- Membrane recovery (percent) = 80
- Age of membrane at last replacement =

BLENDING

- Blending = no

WASTE MANAGEMENT

- Concentrate disposal = sanitary sewer
- Fate of cleaning wastewater =

POST-TREATMENT

- Post treatment of permeate = disinfection
- Post-treatment of concentrate = none

# City of Granbury, TX

GENERAL

- Name of facility = City of Granbury WTP
- Facility owner = City of Granbury
- Facility type = drinking water
- Type of technology = reverse osmosis
- Start year of RO operation = 2017
- Reason for RO treatment = high bromide

TREATMENT CAPACITY

- RO Design production (mgd) = 2.5
- RO Average Production (mgd) = 0.7
- Plant Design production (mgd)= 2.5
- Plant average production (mgd) = 0.875

TREATMENT PROCESS

- Source water = surface (lake)
- Raw water conductivity (µS/cm) = 1330
- Feed pressure to RO (psi) = 115-120
- Pretreatment steps in front of RO = MF, cartridge filter, antiscalant
- TDS of permeate (mg/l) = 30
- Membrane recovery (percent) = 75
- Age of membrane at last replacement = on original membranes (start-up was November 2017)

BLENDING

- Blending = yes
- Blend water source = bypass, MF treated
- Blend ratio (permeate:other) = 75 : 25
- TDS of blend (mg/l) = 250

WASTE MANAGEMENT

- Concentrate disposal = surface (discharge to lake)
- Fate of cleaning waste = mixed with concentrate

POST-TREATMENT

- Post-treatment of permeate = pH adjustment, chloramination
- Concentrate treatment = none

# City of Roscoe WTP, TX

GENERAL

- Facility name = City of Roscoe WTP
- Facility owner = City of Roscoe
- Purpose of facility = drinking water
- Type of desalination technology = reverse osmosis
- Start year of RO operation = 2013
- Reason for RO facility as opposed to conventional treatment = nitrate, hardness,

TREATMENT CAPACITY

- RO design production (mgd) = 0.36
- RO average production (mgd) =
- Plant design production (mgd) =
- Plant average production (mgd) =

TREATMENT PROCESS

- Source water = groundwater
- Raw water conductivity (µS/cm) =
- Pretreatment steps =
- Feed pressure to RO (psi) =
- TDS of permeate (mg/l) =
- Membrane recovery (percent) =
- Age of membrane at last replacement =

BLENDING

- Blending =
- Blend Water source =
- Blend ratio (permeate : other) =
- TDS of blend =

WASTE MANAGEMENT

- Concentrate disposal = sewer
- Fate of cleaning wastewater = sewer

POST-TREATMENT

- Post-treatment of permeate =
- Post-treatment of concentrate = none

# City of Rule, WTP TX

GENERAL

- Name of facility = City of Rule WTP
- Facility owner = City of Rule
- Purpose of facility = drinking water
- Type of technology = reverse osmosis
- Start year of RO operation = 2015
- Reason for RO facility as opposed to a conventional treatment facility =

TREATMENT CAPACITY

- RO Design production (mgd) = 0.0854
- RO average production (mgd) = 0.04

TREATMENT PROCESS

- Source water = groundwater
- Raw water TDS (mg/l) =
- Feed pressure (psi) = 120
- Pretreatment = cartridge filter, antiscalant
- TDS of permeate (mg/l) =
- Membrane recovery (percent) = 68%
- Age of membrane at last replacement =

BLENDING

- Blending = no

WASTE MANAGEMENT

- Concentrate disposal = sewer
- Fate of cleaning wastewater =
- Fate of backwash waste =

POST-TREATMENT

- Post treatment of permeate = disinfection
- Post-treatment of concentrate = none

# City of Wheeler, TX

GENERAL

- Name of facility = City of Wheeler TP
- Facility owner = City of Wheeler
- Purpose of facility = drinking water
- Type of technology = reverse osmosis
- Start year of RO operation = 2016
- Reason for RO treatment as opposed to conventional treatment = nitrates

TREATMENT CAPACITY

- RO Design production (mgd) = 0.5
- RO Average Production (mgd) =
- Plant (RO + blend) design production (mgd) =
- Plant average production (mgd) =

TREATMENT PROCESS

- Source water = groundwater
- Raw water conductivity (µS/cm) = depends on wells used; 750-900
- Pre-treatment steps = antiscalant, cartridge filters
- Feed pressure to RO (psi) = 127-140
- Conductivity of permeate (µC/cm) = 15
- Membrane recovery (percent) = 75
- Age of membrane at last replacement = on original membranes

BLENDING

- Blending = yes
- Blend water source = bypass
- Blend ratio (permeate : other) = ~ 300 : 150
- TDS of blend = target is based on nitrate rather than conductivity

WASTE MANAGEMENT

- Concentrate disposal = to water job locations and roads
- Fate of cleaning wastewater = same as concentrate

POST-TREATMENT

- Post-treatment of permeate = chlorine
- Post-treatment of concentrate = none

# Fort Hancock RO Plant 1, TX

GENERAL

- Name of facility = Fort Hancock RO Plant 1
- Facility owner = Fort Hancock Water Control & Improvement District
- Purpose of facility = drinking water
- Type of technology = reverse osmosis
- Start year of RO operation = 2012
- Reason for RO facility as opposed to a conventional treatment facility =

TREATMENT CAPACITY

- RO Design production (mgd) = 0.43
- RO average production (mgd) = 0.04

TREATMENT PROCESS

- Source water = groundwater
- Raw water TDS (mg/l) =
- Feed pressure (psi) = 180
- Pretreatment = cartridge filter
- TDS of permeate (mg/l) =
- Membrane recovery (percent) = 78%
- Age of membrane at last replacement =

BLENDING

- Blending = yes
- Blending source =
- Blend ratio (permeate : other) =
- TDS of blend (mg/l) =

WASTE MANAGEMENT

- Concentrate disposal = evaporation pond
- Fate of cleaning wastewater =

POST-TREATMENT

- Post treatment of permeate = pH adjustment, disinfection
- Post-treatment of concentrate = none

# Hamby-Abilene WWTP, TX

GENERAL

- Facility name = Hamby-Abilene WWTP
- Facility owner = City of Abilene
- Purpose of facility = originally additional source water during draught (up to 7 mgd of highly treated water goes to lake for clean water supply); now main purpose is for reuse (landscaping, irrigation)
- Type of desalination technology = MBR/ozone/reverse osmosis; up to 22 mgd goes through MBR; a portion (up to 2.8 mgd) of MBR effluent goes to ozone treatment, portion (up to 4.2 mgd) goes to RO; these 2 streams eventually combined and discharged to water supply lake; water treated only by MBR provided for reuse and eventually it is discharged to a Creek and to different lake.
- Start year of RO operation = 2015
- Plant status = was shut down for 1.5 years after rains came; started up again about 3 months ago; currently down due to cartridge filter problem

TREATMENT CAPACITY

- RO design production (mgd) = 4.2
- RO average production (mgd) =
- Plant (RO + blend) design production (mgd) = 7 (RO = 4.2; Ozone = 2.8)
- Plant average production (mgd) =

TREATMENT PROCESS

- Source water = WWTP influent
- Raw water conductivity (µS/cm) = 3200
- Feed pressure to RO (psi) = 127
- Pretreatment steps before RO = MBR, ozone, cartridge filter, antiscalant
- Conductivity of permeate (µS/cm) =131
- Membrane recovery (percent) = 82%
- Age of membrane at last replacement = on original membranes

BLENDING

- Blending of permeate = yes
- Blend Water source = same source water, treated by MBR then ozone
- Blend ratio (permeate : other) = ~ 4.2 : 2.8
- TDS of blend =

WASTE MANAGEMENT

- Concentrate disposal = evaporation pond
- Fate of cleaning waste = neutralization tank, then to front end of process

POST-TREATMENT

- Post-treatment of concentrate = none
- Post-treatment of permeate = blend, chlorination, aeration, dechlorination

# Joines Road WTP, TX

GENERAL

- Facility name = Joines Road WTP
- Facility owner = Military Highway Water Supply Corporations
- Purpose of facility = drinking water
- Type of desalination technology = microfiltration/reverse osmosis
- Start year of RO operation = 2014
- Reason for RO facility as opposed to conventional treatment =

TREATMENT CAPACITY

- RO Design production (mgd) = 1.44
- RO average production (mgd) =
- Plant design production (mgd) =
- Plant average production (mgd) =

TREATMENT PROCESS

- Source water = groundwater
- Pretreatment steps =
- Raw water conductivity (µS/cm) =
- Feed pressure to RO (psi) =
- Membrane recovery (percent) =
- TDS of permeate (mg/l) =
- Age of membrane at last replacement =

BLENDING

- Blending =
- Blend Water source =
- Blend ratio (permeate : other) =
- TDS of blend =

WASTE MANAGEMENT

- Concentrate disposal = to surface water via drainage ditch
- Fate of cleaning wastewater =

POST-TREATMENT

- Post-treatment of permeate =
- Post-treatment of concentrate =

# La Rusias WTP, TX

GENERAL

- Facility name = La Rusias WTP
- Facility owner = Military Highway Water Supply Corporations
- Purpose of facility = drinking water
- Type of desalination technology = microfiltration/reverse osmosis
- Start year of RO operation = 2017
- Reason for RO facility as opposed to conventional treatment =

TREATMENT CAPACITY

- RO Design production (mgd) = 1.44
- RO average production (mgd) =
- Plant (RO + blend) design production (mgd) =
- Plant average production (mgd) =

TREATMENT PROCESS

- Source water = groundwater
- Pretreatment steps =
- Raw water conductivity (µS/cm) =
- Feed pressure to RO (psi) =
- Membrane recovery (percent) =
- TDS of permeate (mg/l) =
- Age of membrane at last replacement =

BLENDING

- Blending =
- Blend Water source =
- Blend ratio (permeate : other) =
- TDS of blend =

WASTE MANAGEMENT

- Concentrate disposal = to surface water via drainage ditch
- Fate of cleaning wastewater =

POST-TREATMENT

- Post-treatment of permeate =
- Post-treatment of concentrate =

# La Tierra RO WTP, TX

GENERAL

- Name of facility = La Tierra RO WTP
- Facility owner = BW Primoris
- Purpose of facility = drinking water
- Type of technology = reverse osmosis
- Start year of RO operation = 2016
- Reason for RO facility as opposed to a conventional treatment facility = TDS, arsenic

TREATMENT CAPACITY

- RO Design production (mgd) = 0.65
- RO average production (mgd) = 0.5 – 0.65
- Plant Design production (mgd) =
- Plant Average Production (mgd) =

TREATMENT PROCESS

- Source water = groundwater
- Raw water TDS (mg/l) = 1000 - 1200
- Feed pressure (psi) = 220-250
- Pretreatment = antiscalant, cartridge filters, sulfuric acid
- TDS of permeate (mg/l) = 40-50
- Membrane recovery (percent) = 65-72%
- Age of membrane at last replacement = on original membranes

BLENDING

- Blending = yes
- Blend water source = raw water bypass
- Blend ratio (permeate : other) = 2 : 1
- TDS of blend = 250

WASTE MANAGEMENT

- Concentrate disposal = to gulch, percolations into ground
- Fate of cleaning wastewater = send membranes off site

POST-TREATMENT

- Post treatment of permeate = blend, chlorine, caustic
- Post-treatment of concentrate = none

# Mitchell County Desalination Plant, TX

GENERAL

- Name of facility = Mitchell County Desalination Plant
- Facility owner = Mitchell County
- Facility type = drinking water
- Type of technology = reverse osmosis
- Start year of RO operation = 2017
- Reason for RO treatment =

TREATMENT CAPACITY

- RO Design production (mgd) = 0.25
- RO Average Production (mgd) =
- Plant Design production (mgd)=
- Plant average production (mgd) =

TREATMENT PROCESS

- Source water =
- Raw water conductivity (µS/cm) =
- Feed pressure to RO (psi) =
- Pretreatment steps in front of RO =
- Target TDS of permeate (mg/l) =
- Membrane recovery (percent) =
- Age of membrane at last replacement =

BLENDING

- Blending =
- Blend water source =
- Blend ratio (permeate:other) =
- Target TDS of blend (mg/l) =

WASTE MANAGEMENT

- Concentrate disposal =
- Fate of cleaning waste =

POST-TREATMENT

- Post-treatment of permeate =
- Concentrate treatment =

# Progresso WTP, TX

GENERAL

- Facility name = Progresso WTP
- Facility owner = Military Highway Water Supply Corporations
- Purpose of facility = drinking water
- Type of desalination technology = microfiltration/reverse osmosis
- Start year of RO operation = 2011
- Reason for RO facility as opposed to conventional treatment =

TREATMENT CAPACITY

- RO Design production (mgd) = 0.52
- RO average production (mgd) =
- Plant (RO + blend) design production (mgd) =
- Plant average production (mgd) =

TREATMENT PROCESS

- Source water = groundwater
- Pretreatment steps =
- Raw water TDS (mg/l) or conductivity (µS/cm) =
- Feed pressure to RO (psi) =
- Membrane recovery (percent) =
- TDS of permeate (mg/l) =
- Age of membrane at last replacement =

BLENDING

- Blending =
- Blend Water source =
- Blend ratio (permeate : other) =
- TDS of blend =

WASTE MANAGEMENT

- Concentrate disposal = to surface water via drainage ditch
- Fate of cleaning wastewater =

POST-TREATMENT

- Post-treatment of permeate =
- Post-treatment of concentrate =

# San Antonia, TX

GENERAL

- Name of facility = H2OAKS Center Brackish Groundwater Desalination Plant
- Facility owner = City of San Antonio
- Purpose of facility = drinking water
- Type of technology = reverse osmosis
- Start year of RO operation = 2016
- Reason for RO facility as opposed to a conventional treatment facility =

TREATMENT CAPACITY

- RO Design production (mgd) = 10
- RO average production (mgd) = 7.22
- Plant Design production (mgd) = 12
- Plant Average Production (mgd) =

TREATMENT PROCESS

- Source water = groundwater
- Raw water TDS (mg/l) = 1300
- Feed pressure (psi) =
- Pretreatment = antiscalant, cartridge filters, sulfuric acid,
- TDS of permeate (mg/l) = 30-50
- Membrane recovery (percent) = 90%
- Age of membrane at last replacement =

BLENDING

- Blending = yes
- Blend water source = bypass
- Blend ratio (permeate:other) = 10 : 2
- TDS of blend = <320

WASTE MANAGEMENT

- Concentrate disposal = deep well injection
- Fate of cleaning wastewater =

POST-TREATMENT

- Post treatment of permeate = calcite contactor (for Ca), sulfuric acid, degasification, stabilization (NaOH), disinfection (chlorine)
- Post-treatment of concentrate = none

# Stephens Regional Special Utility District, TX

GENERAL

- Name of facility = Stephens Regional SUD WTP
- Facility owner = Stephens Regional Special Utility District
- Purpose of facility = drinking water
- Type of technology = reverse osmosis
- Start year of RO operation = 2013
- Reason for RO facility as opposed to a conventional treatment facility =

TREATMENT CAPACITY

- RO design production (mgd) = 0.4
- RO average production (mgd) =

TREATMENT PROCESS

- Source water = surface water (lake)
- Raw water TDS (mg/l) =
- Feed pressure (psi) =
- Pretreatment =
- TDS of permeate (mg/l) =
- Membrane recovery (percent) =
- Age of membrane at last replacement =

BLENDING

- Blending =
- Blending source =
- Blend ratio (permeate : other) =
- TDS of blend (mg/l) =

WASTE MANAGEMENT

- Concentrate disposal = evaporation ponds
- Fate of cleaning wastewater =

POST-TREATMENT

- Post treatment of permeate =
- Post-treatment of concentrate =

# Victoria Road RO Plant, TX

GENERAL

- Name of facility = Victoria Road RO Plant
- Facility owner = North Alamo Supply Corporation
- Purpose of facility = drinking water
- Type of technology = reverse osmosis
- Start year of RO operation = 2012
- Reason for RO facility as opposed to a conventional treatment facility =

TREATMENT CAPACITY

- RO Design production (mgd) = 2.25
- RO average production (mgd) = 2.25

TREATMENT PROCESS

- Source water = groundwater
- Raw water TDS (mg/l) = 4000
- Feed pressure (psi) = 150
- Pretreatment = cartridge filter
- Target TDS of permeate (mg/l) = 150
- Membrane recovery (percent) = 75%
- Age of membrane at last replacement =

BLENDING

- Blending = no

WASTE MANAGEMENT

- Concentrate disposal =
- Fate of cleaning wastewater =

POST-TREATMENT

- Post treatment of permeate = gas removal, pH adjustment, corrosion control, disinfection
- Post-treatment of concentrate =

# Southwest GW TP, UT

GENERAL

- Name of facility = Southwest Groundwater Treatment Plant
- Facility owner = Jordan Valley Water Conservation District
- Purpose of facility = drinking water
- Type of technology = reverse osmosis
- Start year of RO operation = 2012
- Reason for RO treatment as opposed to conventional treatment = TDS, sulfate

TREATMENT CAPACITY

- RO Design production (mgd) = 8.25 installed – but currently limited to 5.5
- RO Average Production (mgd) = 4
- Plant (RO + blend) Design production (mgd) = ~ 7.5
- Plant average production (mgd) = 5.5

TREATMENT PROCESS

- Source = groundwater
- Raw water TDS (mg/l) = 800
- Feed pressure (psi) = 130-190
- Pre-treatment steps = cartridge filter, antiscalant
- TDS of permeate (mg/l) =
- Membrane recovery (percent) = 80
- Age of membrane at last replacement = lead elements replaced after ~ 5 years

BLENDING

- Blending = yes
- Blend water source = raw water bypass after 1µ cartridge filter
- Blend ratio (permeate : other) = 4 : 1.5
- TDS of blend = 225

WASTE MANAGEMENT

- Concentrate disposal = 26-mile pipeline to Great Salt Lake
- Fate of cleaning wastewater = sewer

POST-TREATMENT

- Post-treatment of permeate = caustic, disinfection
- Treatment of concentrate = none