



**COLEMAN**  
ENGINEERING



City of Fort Bragg  
Brackish Water Desalination Plant Feasibility

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# Introduction

1. What are optional desalination processes?
  - Thermal
  - Electrical
  - Pressure
2. What is Reverse Osmosis?
  - Reverse osmosis is a pressure method
  - Most economical
  - Most developed technology for a system of the size under consideration

## 6 Considerations during Feasibility Analysis

1. Desalination System Sizing and Design Criteria
2. Regulatory Issues
3. Raw Water Source and Siting Considerations
4. Technical Issues
5. Construction Cost Opinions
6. Operating Cost Opinions

# Desalination System Sizing and Design Criteria

## Conclusion:

- A Brackish RO system to produce 140 gpm of treated water *is feasible*.

## Considerations:

- Location options for the Operations Building
- Discharge options for RO Concentrate
- Feasibility of integrating RO with existing WTP system
- Potential brackish raw water sources

# Regulatory Issues (part 1)

## Conclusions:

- Brackish desal is less risky than ocean desal
- Comingled brine concentrate is preferred
- Important to minimize energy demand
- Site should be as far as practical from the coast
- Locate pipelines in roads
- Facility sizing for current population vs. growth
- Permitting and funding considerations

# Regulatory Issues (part 2)

## Permitting:

- Plan 24-30 months for complete permitting
- Federal ~ 6 agencies & 7 permits
- State ~ 7 agencies & 15 permits
- Local ~ 4 agencies & 8 permits
- **TOTAL ~ 17 Agencies & 30 Permits!**

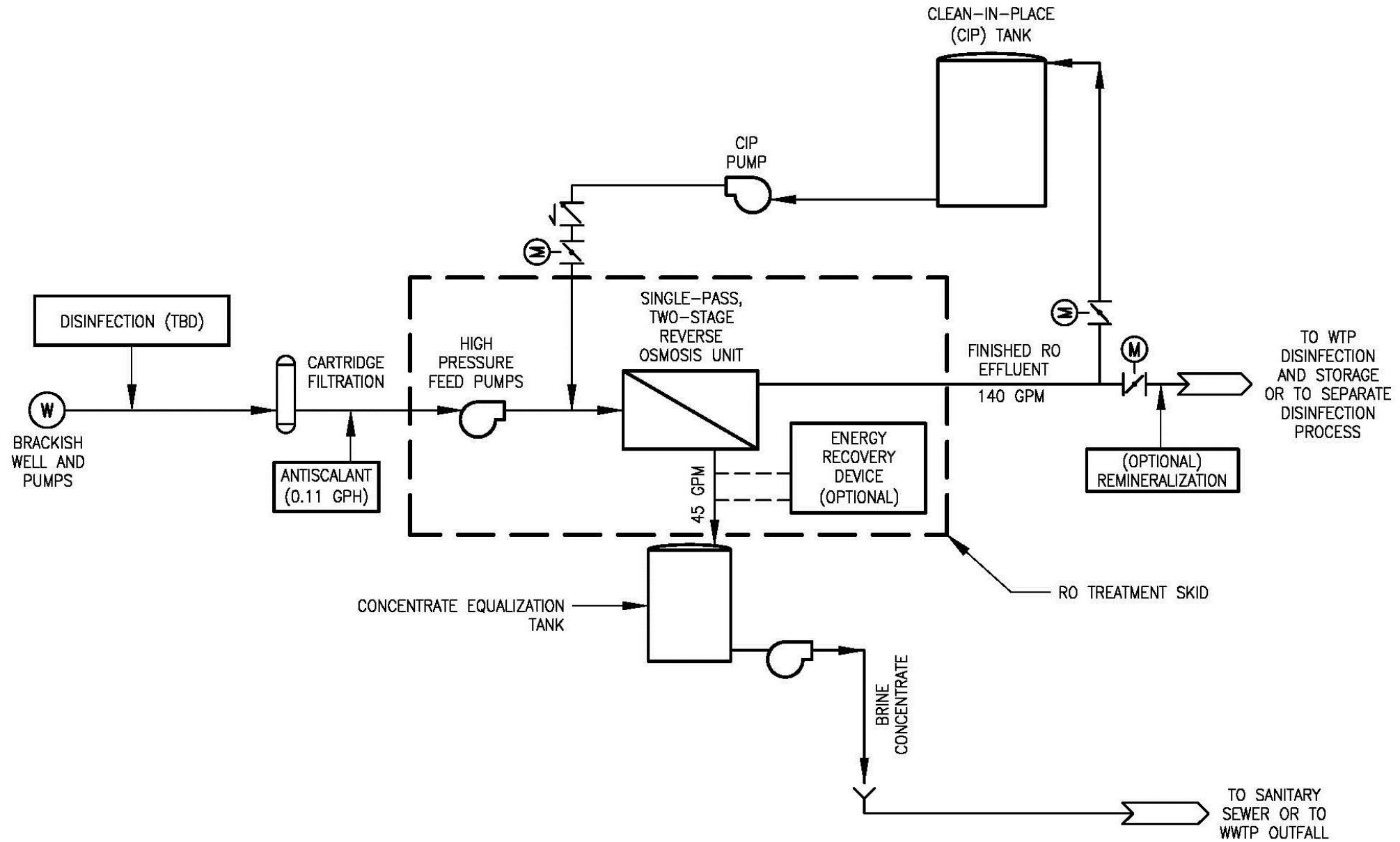
# Raw Water Source and Siting Criteria

## Conclusion:

- Location of multiple components of the brackish treatment system impacts all other components

## Considerations:

- Discharge location for RO concentrate
- Groundwater quality at existing well sites in the area
- Potential Operations Building locations

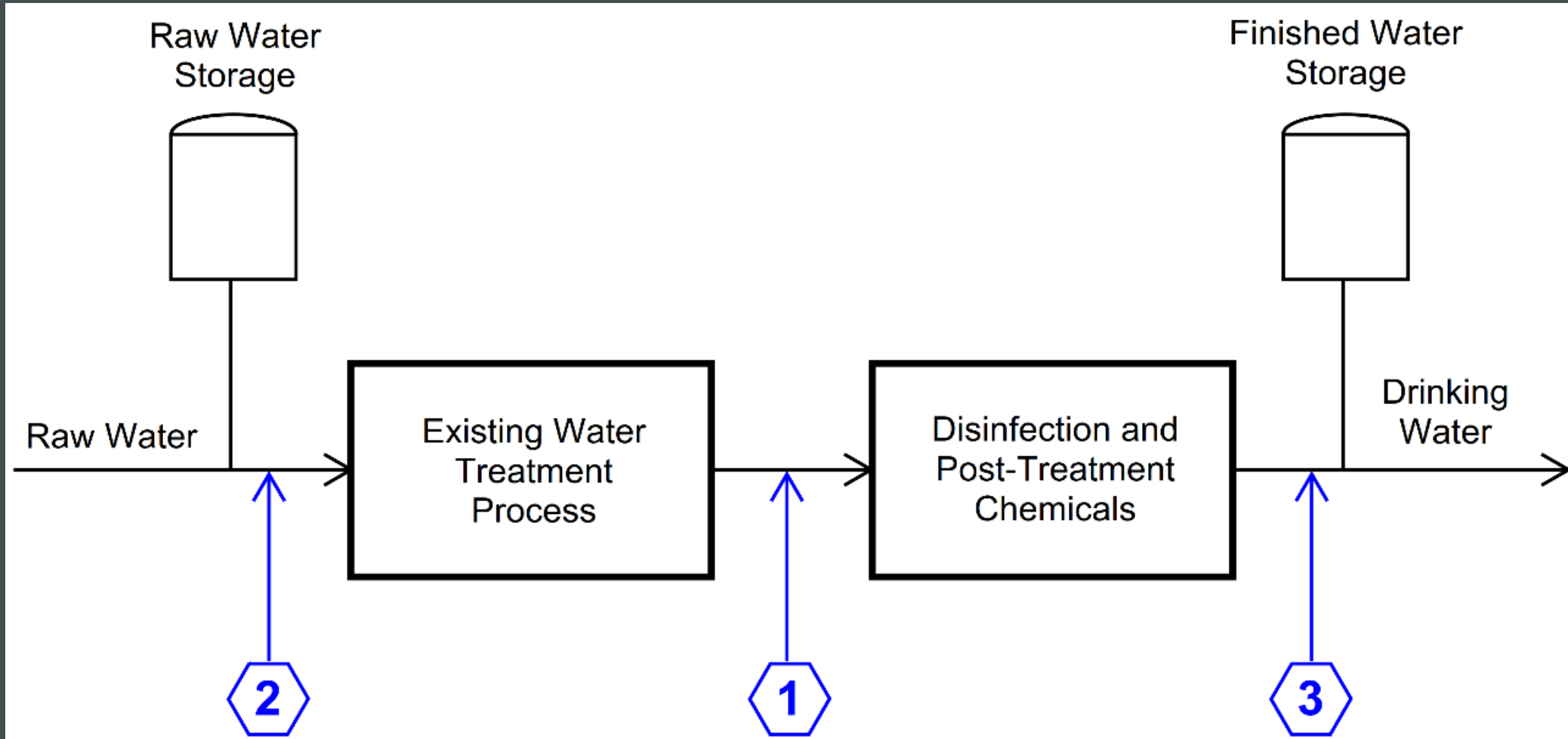




# Technical Issues

- Brackish concentration likely to increase
- Power requirements at well at BWRO plant
- Concentrate discharge to sewer is best.  
Groundwater injection is very unlikely.
- Blending locations in order of preference...

# Technical Issues – Permeate Blending Locations



# Construction Costs

<b>Component</b>	<b>Cost (rounded)</b>	<b>Cost Saving Options</b>
Desalination Operations Facility	\$ 2,460,000	Use of Existing Building
New Well on City Property	\$ 700,000	Locate an Existing Brackish Well
New Brackish Raw Water Conveyance	\$ 850,000	Use of Existing Raw Water Line; Collocation of Well and Operations Facility
Brine Concentrate Disposal	\$ 1,200,000	Disposal into Gravity System
<b>TOTAL =</b>	<b>\$ 5,210,000</b>	

# Operations Costs

Operations Cost Category	Estimated Annual Cost	Notes
Electrical Power to the Reverse Osmosis System	\$21,900	
Electrical Power for a Brackish Raw Water Supply Well	\$30,220	Could be \$17,000 if the Brackish Well is at the existing WTP Site.
Electrical Power for Concentrate Discharge	\$7,400	
Reverse Osmosis Pretreatment Chemicals	\$12,400	
Post Treatment Operations and Chemicals	\$0	Could be \$1,100 if RO plant is not located at the existing plant
Operating Manpower	\$22,500	Could be \$36,000 if the RO plant is not located at the water plant
Maintenance Manpower	\$20,000	
Maintenance Supplies	\$10,000	
<b>ANNUAL TOTAL =</b>	<b>\$124,420</b>	

# Key Considerations for Next Phases

- Brine concentrate disposal method and location
- Raw water quality relative to TSS
- Locate RO plant at WTP site to reduce capital and operating costs
- Facility sizing consistent with UWMP/General Plan
- Portfolio memo to demonstrate need for brackish RO
- Brine discharge consultation with agency stakeholders
- Local/political support for new water supply
- Evaluation of potential opposition/litigation
- Avoiding sensitive resources (wetlands, cultural resources)
- Preparing a MND vs. an EIR (cost/risk tradeoffs)