

Meeting Summary

DATE: March 24, 2009

FROM: Jerry M. Salsano, P.E.

TO: Coquina Coast Representatives (via email only)

CC: Staff and Interested Parties (via email only)

SUBJ: Coquina Coast Seawater Desalination Alternative Water Supply Project Business Meeting Summary, March 11, 2009 **Revision 1**
(Revisions are shown in red underline and ~~striketrough~~)

Purpose

Conduct business as required to accomplish the Coquina Coast Seawater Desalination Alternative Water Supply Project PDR. The meeting agenda is at attachment 2.

Action Items

Person/Agency	ACTION ITEM(s)	Due/Status
Garland/Salsano	Update SJRWMD-maintained Coquina Coast webpage as necessary but no less than quarterly until the Pirnie-maintained website is active	Ongoing
Pirnie	For both Suppliers and Ex Officio Members collect required data and generate all cost data so that all Parties can determine whether to participate in Phase 2.	Ongoing
Salsano	Following each applicable business meeting send Outlook Calendar invitation for upcoming review cycle(s) to appointed Party representatives and core Consultant team.	Ongoing
Pirnie/Salsano	When distributing TM files for review, avoid attaching and simply send link to ftp file location. Use the email notifying of the TM availability/review cycle and only identify the files and provide the link.	Ongoing
Adams/Salsano	Allowance Task Proposals contain two typographical errors in the Consultant Contract. Specifically: <ul style="list-style-type: none">3.2 states \$10,979 in the contract, but \$10,711 in the fee estimate.3.3 states \$10,324 in the contract, but \$10,979 in the fee estimate. Following the business meeting, this was discussed by Taurant and Pirnie. The errors lie in the contract text, not the fee spreadsheet. They need not be fixed immediately, but held until there is another reason for a contract amendment.	TBD
Suppliers/Pirnie	Discuss expected participation and required venue for planned 9/23/09 Public meeting and secure adequate venue.	TBD
Flagler Beach	Provide demand data to Pirnie	Complete
Pirnie	Draft a short statement on the process and type of people who should attend, including how many subgroups there will be and what the public role and limits, if any, will be.	Complete
Salsano	Secure adequate venue for planned 9/23/09 Public meeting.	TBD

Note: The author prepared this work product from notes taken during the meeting or teleconference. The work product is not intended to be verbatim text of the conversations, but a summary of the important points covered. If an addressee finds that an error in fact was made please contact the author and corrections will be made with a revised version circulated.

Person/Agency	ACTION ITEM(s)	Due/Status
Pirnie/Salsano District	Advertise on website and by email to the interested party list the TM review schedule.	ASAP
Pirnie/Dialogue	Prepare draft proposal for composition of public outreach list for review by the Chair, Taurant and the District prior to review and approval by Suppliers.	ASAP
Adams	Provide to Pirnie a letter formalizing the 2/11/09 business meeting consensus authorization of the allowance tasks as outlined in the meeting summary	ASAP
Utilities	Revisit submitted demand numbers and assure the demands reflect actual desal demands for those years represented, not total demands.	ASAP
Pirnie	Malcolm Pirnie will utilize average day demand plus a 5% safety factor rounded up to the nearest 5 MGD increment for determining preliminary treatment capacity.	ASAP
Pirnie	It was suggested that the workshop be renamed to avoid misperception about what will take place.	ASAP
Salsano/District	Coordinate EarthWater Global presentation at April 8, 2009 Business Meeting. Have appropriate District technical staff attend to comment on content.	ASAP
Utilities	Complete review of draft TM's— <u>Water Quantity and Quality</u> and <u>Raw Water Quality</u> TM's— <u>Water Quantity and Quality</u> and <u>Raw Water Quality</u> and provide comments to Pirnie.	3/13/09
Pirnie	Provide agenda to Salsano for 3/25 Sustainability Workshop	3/17/09
Salsano	Distribute agenda and Sunshine notice for March meeting	3/18/09
Salsano	Distribute agenda and meeting notice approximately one week prior to the meeting.	3/18/09
Pirnie	Complete and distribute for final review by Parties final TM's— <u>Water Quantity and Quality</u> and <u>Raw Water Quality</u>	3/20/09
Pirnie/Salsano	Complete and distribute for review and approval Final Version of Technology Providers Response Form <u>Include modification that relaxes restrictions on 5-year and 20 MGD requirement</u>	4/3/09
Pirnie/Dialogue	Draft key messages and distribute to Parties for consideration at 4/8/09 meeting.	4/3/09

Welcome and Introductions

The business meeting started at 9:10 a.m. The Chairman, Richard Adams, Palm Coast, welcomed attendees who introduced themselves. He introduced Lisa Henthorne, representing Water Standard, for the next presentation.

Water Standard Presentation (Business Model discussion)

Lisa is consulting with Water Standard and was asked by them to present today. Jerry Salsano asked Lisa to focus on any changes to the business model that might affect their participation in this project. Her slides are available at attachment 3.

She noted that the technology is not new, just the application on ship for municipal supply. Their first ship under construction has a 14-17 MGD production capacity with a 21 megawatt power supply, which includes 50% standby capacity. The vessel is the H₂OCEAN Christina—48,000 dry weight tons, 182 meters long x 32 meters wide x 18 meters deep.

Water Standard has determined their costs more accurately during this first construction effort. Their sense is that the most likely users would be those that need water quickly or those with protracted permitting schedules-not able to obtain permits. They are finding that it may be hard for the vessel to provide water on a long term basis at costs that are competitive with a land-

based plant. Over the long life of a desalination plant, it may be more cost-effective to operate a land-based desalination facility while the ship-based supply may be preferred for short-term or emergency supply. Based on the extensive engineering and procurement analysis which has been done over the recent months, the vessel is expected to cost more than originally presented to the Coquina Coast suppliers in 2007. But as there are so many unknowns relative to the project, it is necessary to conduct a project-specific cost evaluation to make this determination. estimated.

Another aspect Water Standard is exploring is doing the same thing on a barge. A barge is not as flexible as ship-based but is much cheaper. This is not generally appropriate for open ocean use.

Lisa went on to describe some of the factors associated with ship-based treatment. They included intake and discharge issues, power redundancy, mooring and the complexities associated with sea depth requirements to withstand weather and accommodate delivery pipelines. In summary she covered some of the advantages associated with Water Standard's product. These advantages can be seen on pages 17 and 18 of attachment 3.

Jerry asked Lisa to summarize how their business model might have changed now that they have a better understanding of the costs. He stated that he understood that Water Standard now had a customer for their first vessel.

Lisa noted they do not yet have a customer for their first vessel. They have invested much (approximately \$25M on generators alone). If given the opportunity they will present the Coquina Coast group with the best price possible based on their recently-gained knowledge of capital and operating costs.

New technology providers response form

Chris Hill presented the form for consideration by the Suppliers. One suggested edit was made during the meeting. Keith Riger, DeLand, asked that we establish a time frame beyond which new proposals were no longer accepted. There was some discussion and a decision not to impose such a restriction. Pirnie will post the next draft on the ftp site with a review cycle before the final draft will be generated. **ACTION ITEM.**

Update/preview of GIS database

Chris displayed several slides, shown at attachment 4, and also provided hard copy printout, noting that the printouts were to illustrate what was available and recognizing the legibility problem with the hard copy. He noted that the PDF file is dynamic and useable with Adobe Reader 9.0 or later. Using Reader the user can turn layers on and off and can zoom extensively. The file distributed and posted to the ftp site is preliminary and does not have all the GIS data planned. It is provided to illustrate the concept.

Richard asked if there would be a specific GIS workshop and Pirnie responded that there would not. Comments are always welcome and the GIS work product will be used extensively for the siting work. This and other pertinent files from the 3/11 meeting are posted on the ftp site in a March business meeting folder.

Ray Sharp, Leesburg, recommended contacting Lake County GIS for their base data if the consultant does not already have those data. Pirnie was asked and responded that they are including "pathogen data, such as red tide.

Jerry Salsano recommended that the Suppliers consider using ship-based treatment for a Phase 1 followed by land-base for Phase 2, but with full capacity to eliminate the need for the ship. This could be accomplished by using the fresh water delivery line from Phase 1 as a concentrate discharge line for Phase 2 thereby avoiding wasted capital costs.

Water Quantity & Treated Water Quality TM Workshop (including demand data review)

Chris started by showing the demand data. Richard asked if anyone had a problem with accessing the files on the ftp site. They had not. After some discussion the SUPPLIERS agreed by consensus that in the future the email notifying of the TM availability/review cycle need only identify the files and provide the link. Agreed by consensus. **ACTION ITEM.**

Richard noted Flagler Beach was omitted from the demand data table. Flagler Beach did have their data and will provide today and by email before Friday, March 13, 2009. **ACTION ITEM.**

There was discussion about phasing and how that might affect capital costs for each utility relative to when they need flow. Jerry discussed again the potential for the ship-based treated water line to be later used for concentrate discharge by the land-based plant and how that might affect phasing considerations. Scott noted that the phasing numbers are a first cut for illustration only and don't represent what the phasing recommendation will be. He did stress that each utility's demand numbers should reflect how much they think they will need from the facilities in those years. It is important that the each Supplier revisit their numbers and assure the demands reflect their actual desal demands for those years represented. **ACTION ITEM.**

Keith challenged the concept of using maximum day calculations as it relates to cost. The issue of consumptive use permitting and plant sizing was discussed. Richard noted that the SUPPLIERS must provide the data to Pirnie and it is not Pirnie's responsibility to vet those data with the District.

Jerry recommended that the consultant and the SUPPLIERS rely on conjunctive use for peak demands considerations but also cautioned that that may also require reductions in their existing average daily withdrawals under their existing groundwater permits in order to provide that conjunctive use flexibility.

There was some discussion on whether the SUPPLIERS had considered conjunctive use in preparing their projections. There was no real determination on that matter. Following considerable discussion Pirnie suggested a 5% peaking capacity at the plant rounded up to the nearest 5 MGD increment, subject to normal FDEP redundancy requirements and recognizing that max day will have to be met with groundwater through conjunctive use. **ACTION ITEM.**

Pirnie then provided the following summary (next page) of the finished water quality data provide by the SUPPLIERS. Everyone is on free chlorine except for St. Johns County and Palm Coast.

SUPPLIERS' Finished Water Quality Data

	pH	Alkalinity (mg/L as CaCO ₃)	Disinfection	Other
Bunnell	--	--	--	--
Dunes CDD	7.8 – 8.0 – 8.5	12 – 14 – 18	Free Cl ₂	Ortho-poly-P
Flagler County ¹	7.7 – 8.8 – 9.1	5 – 20 – 35	NH ₂ Cl	Ortho-poly-P
Leesburg	7.5	--	Free Cl ₂	--
Mt. Dora	6.5 – 7.5 – 8.5	100 – 120 – 140 ²	Free Cl ₂	Ortho-poly-P
Palm Coast	7.7 – 8.8 – 9.1	5 – 20 – 35	NH ₂ Cl	Ortho-poly-P
St. Johns County	8.6 – 8.8	30	NH ₂ Cl	--
Flagler Beach	--	--	--	--
Deland	7.2 – 7.5 – 7.8	--	Free Cl ₂	Ortho-poly-P, Fluoride
Marion County	7.7 – 7.9	108 - 112 ²	Free Cl ₂	--
WAV	7.2 – 8.0 – 9.4	30 – 105 – 140	Both	Mixed

They also showed some additional water quality considerations.

- Mineral Deficiencies
 - Low Ca, Mg, SO₄ can impact agricultural/irrigation
- Boron
 - More of an agricultural concern than public health concern
 - EU and CDPH goal 1.0 mg/L , WHO raising from 0.5 to 2.4 mg/L
- Bromide
 - Bromamines formation in chloraminated systems
 - Brominated DBPs
- Chloride and Sodium
 - Potential wastewater discharge impacts
- Algal toxins
 - Pretreatment to address “red tide”
 - Toxins effectively removed by RO process

Raw Water Quality Workshop

Chris showed the primary sources of raw water data that they are using:

- National Data Buoy Center
 - 6 Locations from St. Augustine to Molasses Reef, FL
 - Limited usefulness – surficial data
- Marineland
 - Ocean, infiltration gallery, and vertical well,
 - Data from Sept. 2003 to Feb. 2004
- Water Research Foundation
 - General seawater quality

- o Good correlation with National Data Buoy Center (NDBC) data

Chris then showed this summary of raw water quality data and those values that will be used for the project.

Raw Water Quality Data

Parameter	NDBC	Marineland	WRF	Project
pH	6.1 – 7.7 – 13.9	8.1	8.3	8
Temperature (°C)	10 – 26 – 42	--	--	10 – 42
Conductivity (mS/cm)	0.2 – 50 – 65	--	--	50
TDS (mg/L)	134 – 33,800 – 44,000	--	34,500	34,000
Salinity (ppt)	0.2 – 34 – 62	34	--	34
Chloride (mg/L)	112 – 18,600 – 34,000	20,200	19,000	20,000
Bromide (mg/L)	--	67	65	70
Calcium (mg/L)	--	312	400	400
Magnesium (mg/L)	--	1,320	1,300	1,300
Sodium (mg/L)	--	10,650	10,600	10,600
Silica (mg/L)	--	0.6	<10	5
Strontium (mg/L)	--	5.9	13	10
Boron (mg/L)	--	--	4.6	4.5

Asked about silt density index (SDI), Chris noted that the pretreatment will be designed to target an SDI less than 3. Testing will be done at the site when it is appropriate.

He asked for comments on the TM. **ACTION ITEM.**

Project Fact Sheets and Media Relations

Michelle Robinson, Dialogue, presented on this topic. Her slides are included at attachment 4.

Keith noted the editorial criticism from the Sentinel on the regional transmission in particular and AWS in general with the prevailing thought that we can and should conserve our way out of the need for AWS. Todd Petrie, Marion County, echoed his concern that the prevailing sentiment is that conservation is the silver bullet. Ray Sharp also agreed with that same prevailing thought existing in Lake County. Todd also made a plea that the WMD help educate the public about the water pie, where the water currently comes from and how the need exists to move beyond groundwater to prevent unacceptable impacts. Jerry recommended that growth be discussed in the same forums as the conservation issue; they cannot be separated. We must convey that, to the extent that slower growth and conservation can delay this and other projects of its type, we welcome those delays. Keith noted that we are trying to maintain a standard of living. In terms of economic development, we don't want to evaluate each opportunity on resource availability but on its own merit.

Regarding fact sheets, the major content shall be:

- Purpose of the project
- What is being studied
- Timeline
- Cost
- Partners

To this draft list, the Suppliers added:

- What's been done so far.

The first fact sheet is due in May. Consultant will prepare a draft of key messages for consideration at the April 8 Business Meeting. Key messages shall be the foundation of the first fact sheet. **ACTION ITEM.**

Update on Sustainability discussion and meeting plan

Chris noted that at the last meeting we discussed a sustainability workshop. He confirmed that the date for that workshop is March 25, 2009, 9:00 a.m. to 4:00 p.m. at the Palm Coast Recreation Center. Details of the workshop are as follows:

- Facilitators
 - Doug Owen, Malcolm Pirnie Chief Technology Officer
 - Bruce Abernathy, SKM Former Chief Sustainability Officer
- Participants
 - Alan Davie, SKM
 - Mike Kuhn and/or Larry Jessup, Veolia
 - Others
- Partner Attendees
 - To be determined

Planned Agenda

- Introductions and Objectives
- Overview of Sustainability Elements
- Project Components and Sustainability
- System Mapping (Group Exercise)
- LUNCH (On your own)
- "Close the Loop" on System Mapping
- Future Casting and Scenario Planning
- Framework for Decision-Making
- ADJOURN

Chris discussed the planned presenters and facilitators and, using the draft agenda, asked Suppliers to consider other invitees. After a suggestion by Richard, Pirnie agreed to draft a short statement on the process and type of people who should attend, including how many subgroups there will be and what the public role and limits, if any, will be. Michelle suggested renaming the workshop to avoid misperception about what will take place. **ACTION ITEM.**

Scott Shannon, Pirnie, reviewed the meeting and deliverable schedule that had been previously sent electronically, passing out hard copies to the PARTIES. The schedule is at attachment 5.

Next meeting Sustainability Workshop—March 25, 2009--see agenda, above.

Next regular business meeting—April 8, 2009

- The next Coquina Coast Business Meeting will be held on Wednesday, April 8, 2009, 9:00 a.m., at the Palm Coast Community Center. An agenda and meeting notice will be distributed approximately one week prior to the meeting. **ACTION ITEM**
- Regular Business Meetings are conducted every 2nd Wednesday at the above venue.
- Additional meetings for a workshops and a public meeting are tentatively scheduled for April 22, 2009, September 23, 2009 and December 16, 2009. Times and venues have not been set.

Major AGENDA Items for April 8, 2009, Business Meeting

- Project status update (15 minutes)
- Key messages review (30 minutes)
- Technology memo/checklist review (10 minutes)
- Review of final versions of first two TM's (30 minutes)
- Follow up discussion on Sustainability workshop (approx 45 minutes)

Public Comments

John Mampe, Hammock CCC, asked that 5 years and 20 MGD be reconsidered—might constrain you to 20-year old technology. Richard complimented. And Pirnie agreed to make changes. **ACTION ITEM**

Member Comments

Robert Smith, Flagler Beach asked if Ex Officio Member dues are one time at \$10,000 or assessed annually? There was discussion on this matter with the following outcome.

There was consensus by SUPPLIERS that the Ex Officio Member payment was a one-time payment for Phase 1 and that XO members will only receive one invoice for \$10,000.

Jerry asked if and when the Suppliers would like EarthWater Global to give a presentation on their technology and their business model. EarthWater Global had advised Jerry that they could have a contract quickly and have an answer about what they could provide by the time Phase 1 is complete.


There was discussion among the Parties that if EarthWater Global is invited, Parties should invite their administrators and tech staff to attend. Also, they requested that SJRWMD include tech staff to provide input to the Parties. They agreed to schedule the presentation for the April 8, 2009 meeting. **ACTION ITEM**

Adjourn—meeting adjourned at 12:50 p.m.

Attachments

1. Full attendance list and Appointee attendance history
2. Agenda
3. Water Standard Slides (included in PDF version of this summary only)
4. Malcolm Pirnie Slides (included in PDF version of this summary only)
5. Phase 1 Meetings and Deliverable Review Schedule (included in PDF version of this summary only)

Business Meeting Attendance List			
Name	Affiliation	Name	Affiliation
Richard Adams	Palm Coast	Todd Petrie	Marion County
James Ailes	DeLand	Greg Peugh	Palm Coast (CPH)
Tom Bartol	SJRWMD	Jack Pitman	Utility Advisory Comm.
Mick Cuthbertson	Bunnell	Kermit Prime	PBS&J
John Fitzgerald	SJRWMD	Junos Reed	Volusia County
Ed Garland	SJRWMD	Keith Rice	AECOM Water
Gary Hammond	Mount Dora	Keith Riger	DeLand
Lisa Henthorne	Water Standard	Lindsay Roberts	Water Auth of Volusia
Chris Hill	Malcolm Pirnie	Michelle Robinson	Malcolm Pirnie-Dialogue
Lawrence Jessup	Veolia Water	Cheryl Robitzsch	Haskell
Ying Lee	Palm Coast (CPH)	Jerry Salsano	SJRWMD (Taurant)
John Mampe	Hammock CCC	Scott Shannon	Malcolm Pirnie
Brian Matthews	Palm Coast	Ray Sharp	Leesburg
Amy McClure Skinner	Bunnell	Tim Sheahan	Dunes CDD
Frank Meeker	SJRWMD	Robert Smith	Flagler Beach
Heidi Petito	Flagler County	Mike Sulayman	St. Johns County

COQUINA COAST SEAWATER DESALINATION ALTERNATIVE WATER SUPPLY PROJECT																		
Business Meeting Appointee Attendance																		
	14-Jan-09	11-Feb-09	11-Mar-09	25-Mar-09	8-Apr-09	22-Apr-09	13-May-09	27-May-09	10-Jun-09	8-Jul-09	12-Aug-09	9-Sep-09	23-Sep-09	14-Oct-09	11-Nov-09	9-Dec-09	16-Dec-09	13-Jan-10
Suppliers																		
City of Bunnell,	X	X	X															
Dunes Community Development District	X	X	X															
Flagler County		X	X															
City of Leesburg	X	X	X															
City of Mt. Dora	X		X															
City of Palm Coast	X	X	X															
St. Johns County	X	X	X															
Ex Officio Members																		
City of DeLand	X	X	X															
City of Flagler Beach			X															
Marion County	X	X	X															
Water Authority of Volusia	X	X	X															
 Denotes appointed members not present																		

Coquina Coast Seawater Desalination Project Business Meeting Agenda

Wednesday, March 11, 2009, 9:00 a.m. - 1:00 p.m.

City of Palm Coast Community Center
305 Palm Coast Parkway NE, Palm Coast, FL 32135

Directions: Exit I-95 at Palm Coast Parkway (Exit 289). Drive east through two stop lights to Club House Drive. Turn left – the entrance to the Community Center is immediately off Club House Drive.

<u>ITEM</u>	<u>WHO</u>	<u>START</u>
• Welcome/Introductions	Chair	9:00
• Water Standard Presentation (Business Model discussion)	Water Standard	9:05
• New technology providers response form	Pirnie	9:20
• Update/preview of GIS database	Pirnie	9:40
• Water Quantity and Treated Water Quality TM Workshop (including 45 minutes for review of demand data)	Pirnie	9:50
• Break	All	11:20
• Raw Water Quality Workshop	Pirnie	11:30
• Project Fact Sheets and Media Relations Contact List Discussion (30 minutes)	Dialogue	12:00
• Update on Sustainability discussion and meeting plan	Pirnie	12:30
• Confirm agenda for next business meeting	Chair	12:40
○ Next regular business meeting – April 8, 2009		
• Public Comments	Chair	12:50
• Member Comments	Chair	12:55
• Adjourn.....	Chair	1:00



WATER STANDARD™

A global water solution in partnership with natureSM



H2OCEAN
A product line of WATER STANDARD

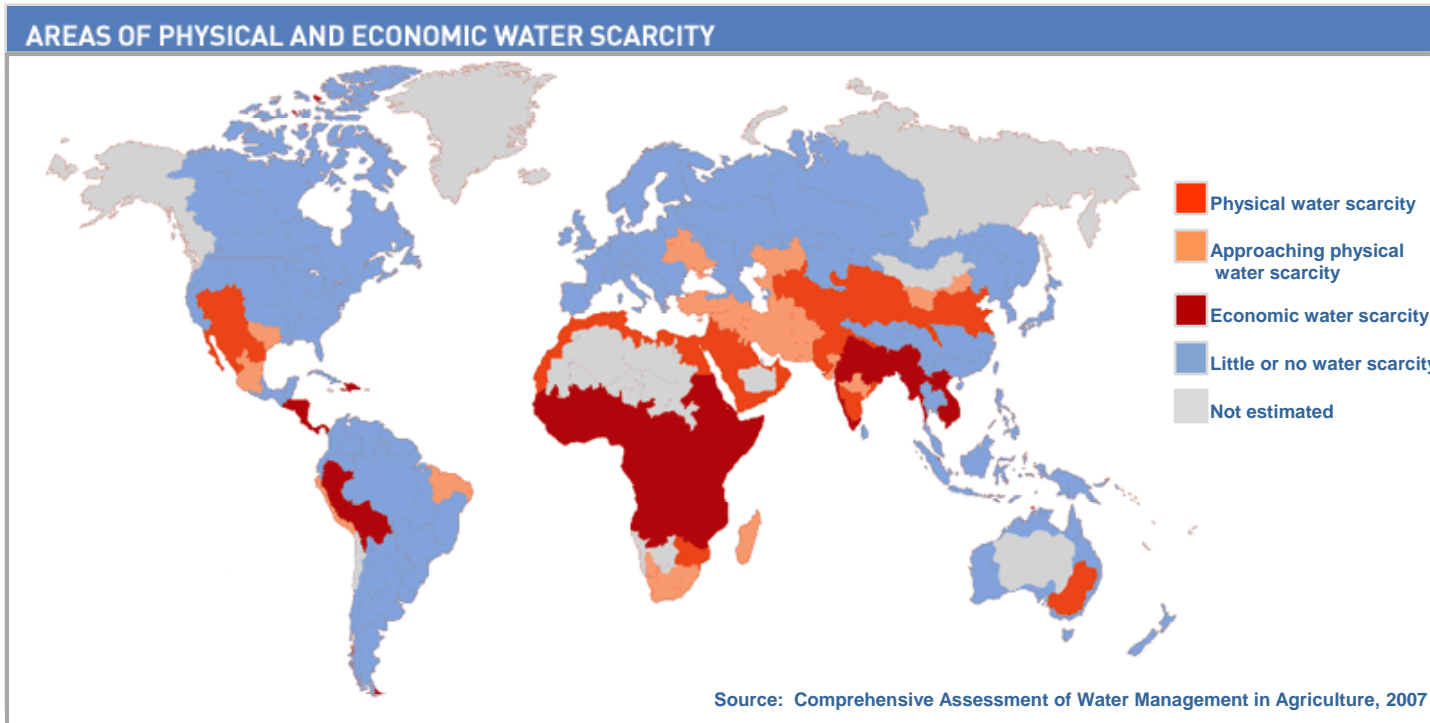
Right for the Ocean Right for the Environment Right for the World



- The Global Water Crisis
- Why Desalination: The Wave of the Future
- An Introduction to **WATER STANDARD** and **H₂OCEAN**
- Technology on the Seawater Desalination Vessel (SDV)
- Purchase of first vessel - *H₂OCEAN Cristina* and the addition of Lisa Henthorne to the WATER STANDARD Team
- Design Highlights
- Vessel Mooring
- Transfer of Product Water to Customer
- Why **WS/H₂OCEAN** is a Better Alternative
- Intellectual Property Advantages
- Conclusions
- Environmental Support
- Contact Information



The Global Water Crisis



“For more than **one billion people** on our planet, clean water is out of reach. And some 2.6 billion people have no access to proper sanitation. The consequences are devastating.”

- Kofi Annan

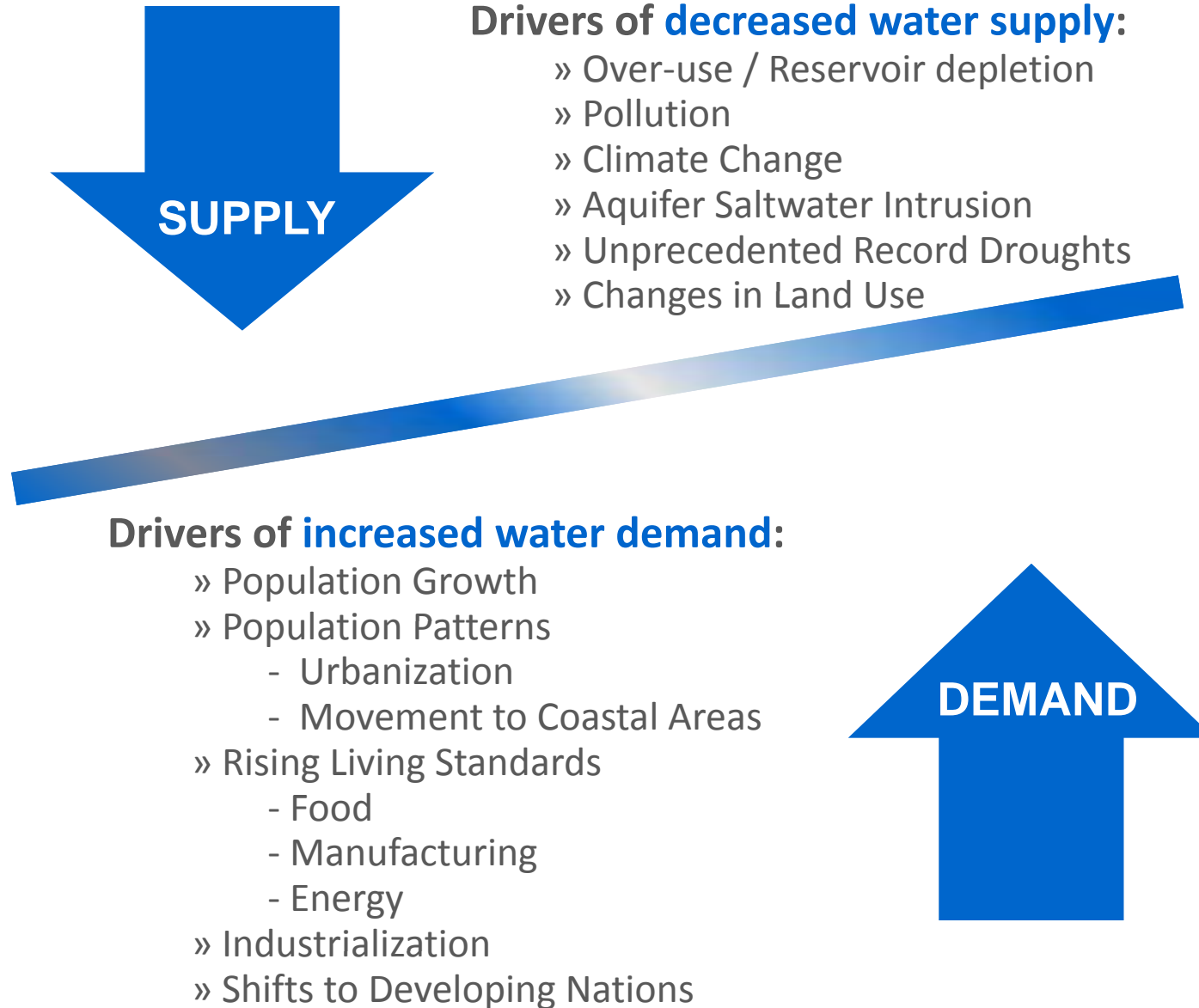
“The twin challenges of water quantity and water quality represent an *inexorable planetary crisis*—and one that will ultimately overshadow shorter-term geopolitical, financial, and even energy crises that typically attract far more attention.”

-The Environmental Benchmarker & Strategist
 -The State of the Water Industry 2008



Unquenchable Thirst

Drivers of Water Supply-Demand Imbalance





Why Desalination Now?

Options for New Water Supply

Additional water supply for increasing demand can only be obtained through four (4) basic sources:

Finding additional traditional sources of supply: rainwater catchment, aquifers, rivers and lakes/dams

Environmental drivers and regulations are moving markets away from dams and traditional sources of supply, which have also been significantly impacted by climate change.

Conservation

Consumption elasticity limits the supply potential that can be realized from this option.

Reuse (wastewater retreatment)

Political price and infrastructure cost related to adding reuse as an option beyond direct point of use is prohibitive.

Consumer reluctance to consume treated wastewater also hinders this option.

Desalination

Desalination is the only viable, cost-effective source of new water that:

- is drought proof
- is a predictable and scalable source that can be quickly increased to meet demand
- has not been previously allocated to a prior use; no conflicts with agriculture
- is sourced from an inexhaustible supply

Desalination is not the only alternative but is now expected to be one of the primary, long-term solutions needed to meet increasing global water needs.



Desalination

The Wave of the Future

Top 10 desal countries

1)	Saudi Arabia	10,759,693 m ³ /d	17%
2)	UAE	8,428,456 m ³ /d	13%
3)	USA	8,133,415 m ³ /d	13%
4)	Spain	5,249,536 m ³ /d	8%
5)	Kuwait	2,876,625 m ³ /d	5%
6)	Algeria	2,675,958 m ³ /d	4%
7)	China	2,259,741 m ³ /d	4%
8)	Qatar	1,712,886 m ³ /d	3%
9)	Japan	1,493,158 m ³ /d	2%
10)	Australia	1,184,812 m ³ /d	2%

Source: GWI DesalData/IDA

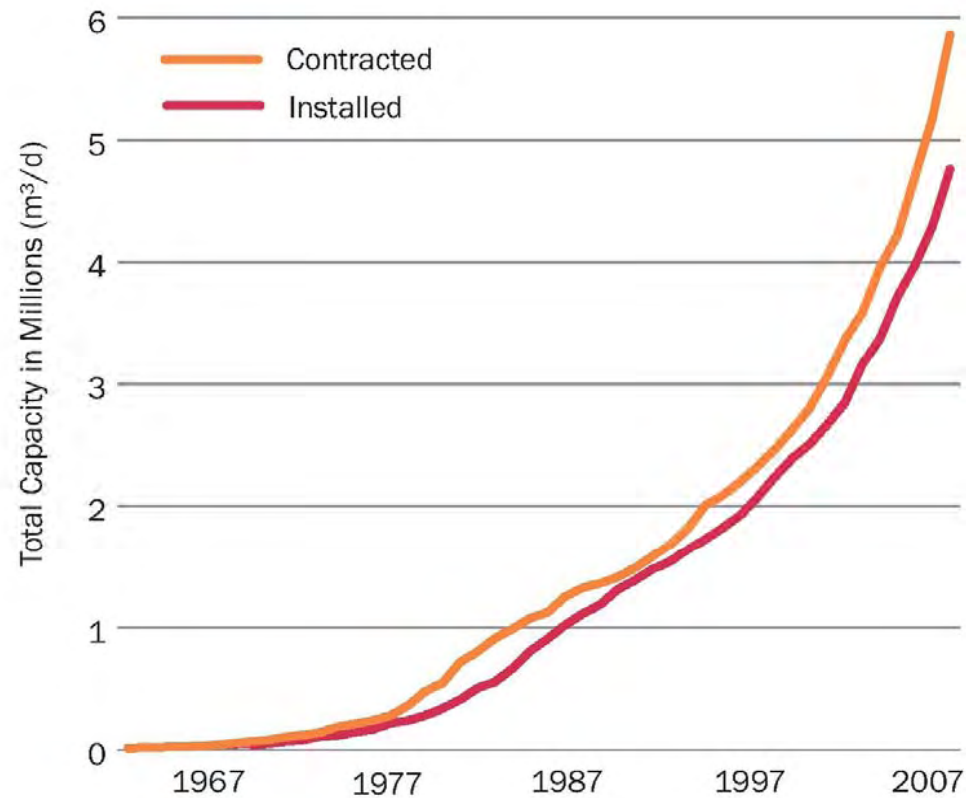
Source: GWI DesalData/IDA

+17.0%

The compound annual growth rate of new contracted capacity since 1990

There was a 43.3% increase in the amount of new capacity contracted in 2007 compared to 2006.

Cumulative desalination capacity growth



Source: GWI DesalData/IDA



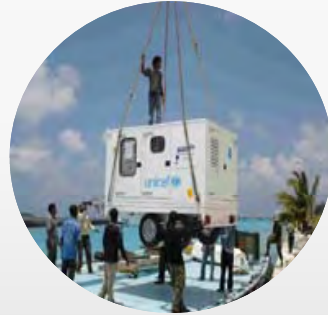
Where Vessel-Based Desalination Fits in the Range of Alternatives

Vessel-based plants can provide advantages in terms of contract length, speed to market, capacity and cost.



Importing Water via Tanker

- Ideal for very short-term emergency use
- Fastest to market if tankers are available and water can be purchased
- High risk of contamination
- Most expensive alternative
 - Cyprus tankered water for \$8.40/m³
 - Barcelona for \$11.20/m³
- Also used as a solution by the Greek Islands and Northern Emirates



Containerized Units

- Option for short timeframes up to 2 ½ years
- Subject to logistical issues due to sizing limitations of units
- Units produce 250, 500, or 1,000 m³/day (75, 150, 300 ac-ft/yr)
- Additional arrangements to provide power, pretreatment, and intake and discharge systems are required; additional consideration for added environmental issues may be required
- Economies of scale are essentially lost with small units: limited redeployment possibilities
- Requires added maintenance and labor
- Estimated prices range from \$3.00/m³ to \$5.00/m³



Vessel-Based Plants

- For emergency, long or short term solutions
- Power independence from land grid
- Production capacity can range from 20,000 to 200,000 m³/day (6,000 to 60,000 ac-ft/yr)
- Speed to market is longer than containerized units but shorter than land based plants
- Permits required are usually more limited
- Off-shore location and vessel design minimizes effects on the environment
- Can easily redeploy or provide multi-point delivery capability and a regional solution
- Prices depend on length of contract and size of output and can range with power costs from \$1.35/m³ to \$2.50/m³.



Land-Based Plants

- Subject to location issues – including:
 - Limited availability of land
 - Expensive coastal land
 - Construction disruption to communities
 - Permitting complexities
- Extended construction periods
- Large environmental footprint
- Long-term contract solution; 15-20 years to be economically viable.
- Typically requires substantial termination fees to end early (Example: Santa Barbara)
- Limited salvage value
- Requires a local power source
- Prices globally vary depending on subsidies from an estimated \$0.90/m³ to \$1.75/m³
- 3-5 years until delivery of first water



An Introduction to WATER STANDARD and H₂OCEAN

WATER STANDARD (WS), with its H₂OCEAN division and product line, is a global water treatment company providing innovative solutions for the world's growing water needs by building and operating vessels that deliver treated water solutions to off takers on shore or provide water treatment solutions to the offshore energy industry.

WS/H₂OCEAN is well positioned to penetrate the rapidly expanding desalination and waste water treatment/reuse markets, and is also committed to an aggressive design approach that has been recognized by environmentalists globally as providing a preferred option to land-based desalination alternatives.

WS/H₂OCEAN uses proven reverse osmosis membrane technology and proprietary water intake and concentrate discharge systems in its designs and self-generates power onboard for its production systems. In this way WATER STANDARD is able to provide water solutions in a cost effective manner under customized contractual arrangements to a variety of industries and off takers in diverse environments.

In the production of desalinated or treated water, WS/H₂OCEAN provides the following competitive advantages:

- Mobile, with contract flexibility; short or long term contracts matching term of need
- Independent self-generation of power, with full emissions controls
- Provides differentiated water specifications as needed
- Provides water treatment options on an independent platform
no location restrictions
- Scalable and flexible options ranging from 5 million gallons per day (MGD) to 50 MGD
(approx. 20,000 to 200,000 m³/day)
- Proven technology and faster to production
- Cost competitive with ability to provide a customer off-balance-sheet solutions
- Recognized as safe for marine life and environmentally responsible

Right for the Ocean

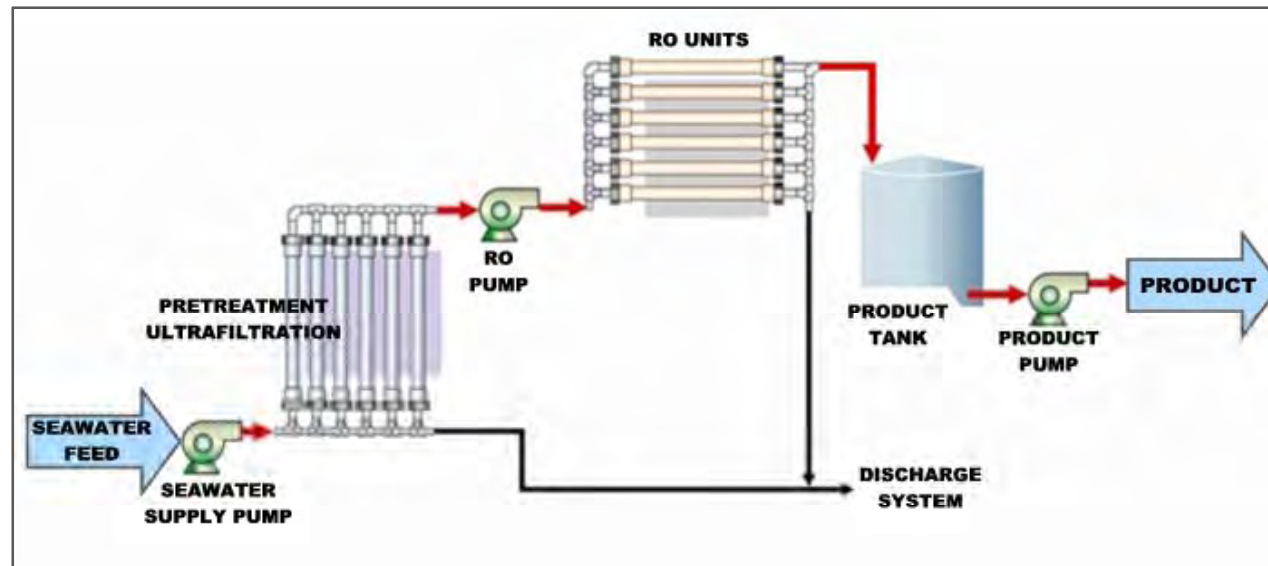
Right for the Environment

Right for the World



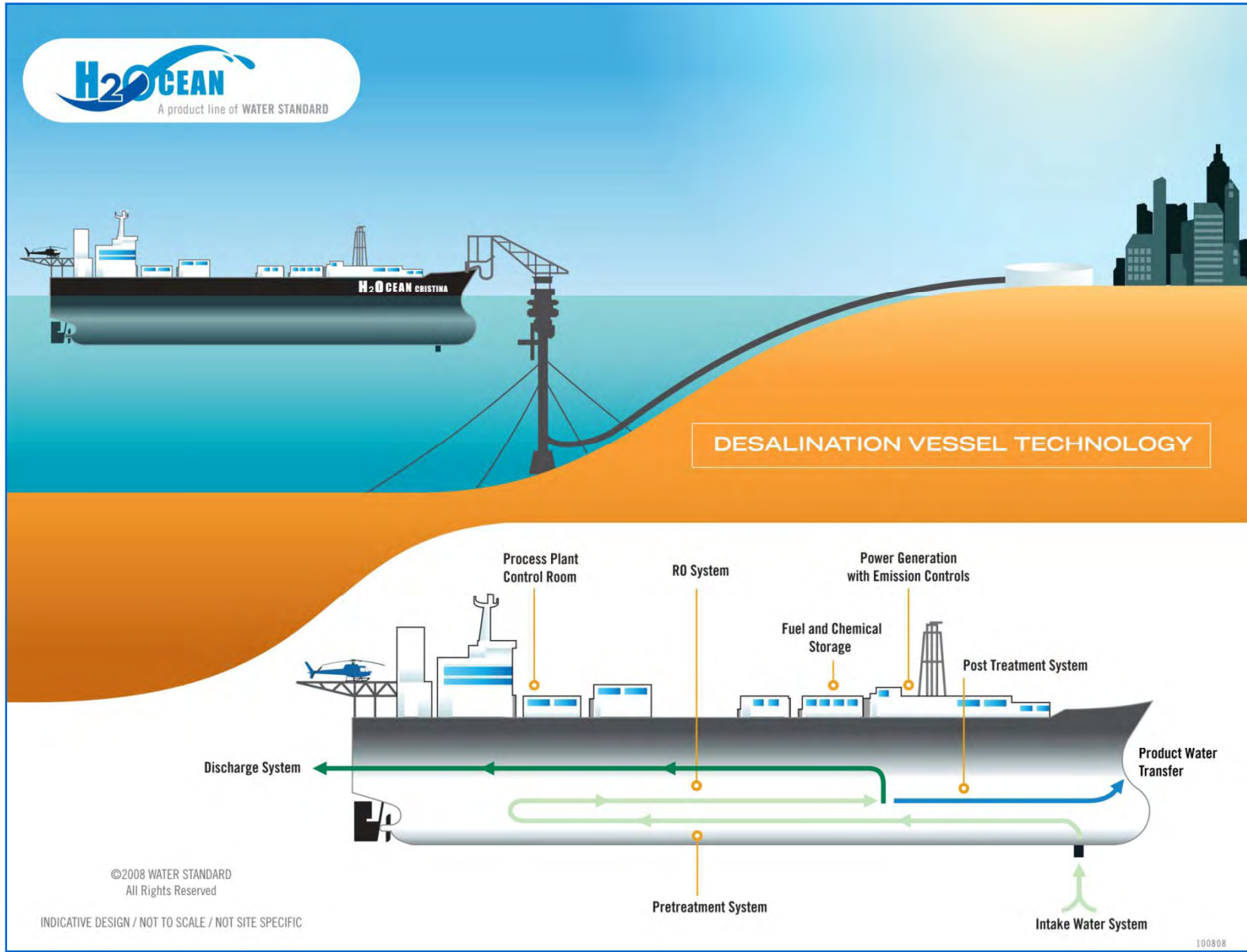
Proven Technology on the Seawater Desalination Vessel (SDV)

- **WS/H₂OCEAN** designs purpose built vessels or purchases and converts previously utilized vessels into mobile floating desalination plants, called Seawater Desalination Vessels (SDV).
- An SDV can be designed and located on any floating water platform, including ships or barges. Vessel sizes depend on output volumes needed by a customer and can range from a 10,000 deadweight tonnes (DWT) barge to a 100,000 DWT Aframax Tanker.
- **WS/H₂OCEAN** uses pre-treatment and reverse osmosis membrane systems, coupled with an onboard power source; all equipment utilized is proven and demonstrated to be cost competitive and reliable in marine environments. **WS/H₂OCEAN** also uses energy recovery devices and emissions control equipment to provide better energy efficiencies.
- To mitigate effects on the environment, a low velocity intake system with a passive screen is used and concentrate produced in the desalination process is discharged through a proprietary dispersion system.





The SDV and Its Technology





WATER STANDARD

SHIPYARD BOUND 2009

WATER STANDARD has entered into contract to purchase our first vessel

- Will be named: *H₂OCEAN Cristina*.
- Designed for minimum water production of 50,000 m₃/d
- Can operate in a minimum water depth of 15 meters
- Long lead items are being contracted.
- New generation diesel generators, compliant with emission regulations are already committed.
- Expected to be producing water by early 2010.
- HAZOP (Hazard and Operability Analysis) was successfully completed December 2008.
- Preliminary environmental impact assessment (EIA) studies of the SDV are being completed by CH2M Hill.
- DNV, the Classification Society of the vessel, has confirmed a class notation which will allow for bottom in water surveys (BIS) to be carried out in water, with no required dry-docking, for as long as the vessel remains moored at one location (up to 20 years).
- The *H₂OCEAN Cristina* team consists of a strategic group of vendors, designers and contractors including VEOLIA, Wärtsilä, Siemens, Babcock International, WATEK, DOW, ERI, Norit and V.Ships.



48,000 DWT tanker; 182 meters long by 32 meters wide by 18 meters deep



Design Highlights

Hazardous Operations (HAZOP) Review Complete

- HAZOP was successfully completed early December, 2008, providing confirmation for the design and model. Veolia, WS and John Tonner of Water Consultants International, conducted the HAZOP and identified no impediments to design and execution.

EIA

- Preliminary environmental impact assessment studies of the SDV are being completed by CH2M Hill. The studies are designed to cover the range of environmental issues likely to be encountered under various global project development scenarios.

Marine

- WS designs new or converts existing vessels or other floating platforms.
- Design can apply to any floating water platform, including ships or barges, and can vary from a 10,000 DWT to a 150,000+ DWT vessel.
- Mooring options and transmission systems to deliver water to shore are available and cost-effective.
- Marine classification societies will provide a new notation for a floating desalination platform and will allow all maintenance inspections performed in place without requirement for intermediate dry dock surveys.
- Vessel costs and conversion costs in shipyards are decreasing rapidly as a result of the global slowdown.
- Goal of WS is to move toward new build market for vessels as costs and shipyard lead times decrease.

Power Island

- Use onboard power sources from large-scale new generation diesel generators or turbines (Wärsiltä, Siemens).
- Utilize latest technology energy recovery devices and emissions controls equipment.
- For power efficiency, the use of waste energy is an essential component of design. Waste energy is captured and utilized from the generators and circuits reducing the carbon footprint.

Desalination

- WS uses standard pre-treatment (Norit) and reverse osmosis membrane technologies (Dow) and is working with first tier EPC providers and operators such as Veolia.

All Equipment Utilized is Proven Technology

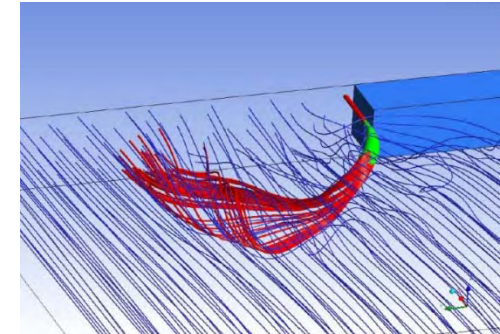
- Demonstrated to be cost competitive and reliable in marine environments.
- Analogous to well-established FPSO applications.
- Use of proven applications will facilitate debt financing available when markets stabilize.



Environmental Designs & Assessment

Environmental Designs

- WATER STANDARD's intake and outfall designs are tested and modeled by **Deltares (formerly WL | Delft Hydraulics)** of the Netherlands, who have carried out more than 60 studies in the last decade on intake and outfall systems for various types of plants all over the world.
- The hydraulic studies carried out by Deltares serve to create an optimal balance between safety and efficiency of operation of the plant, as well as sustainability of the environment at the site area.
- The intake is designed to minimize impingement and entrainment of marine organisms.
- The outfall is designed to comply with the most stringent environmental regulations, based where the SDV is likely to operate.
- ***Deltares has concluded that the specific design to be utilized "is sufficient to ensure that the environmental salinity regulations will be satisfied in all current conditions (direction and velocity) given the discharge rate and excess salinity".***



A graphic taken from a Deltares study completed for WS. CFX velocity streamlines of effluent (red) and ambient (blue) current. The upstream half of the ship is shown here, with the green zone indicating the region of excess salinity above the environmental threshold value.

Environmental Assessment

- Preliminary environmental impact assessment (PEIA) studies of the SDV are being completed by **CH2M HILL**. The studies are designed to cover a range of environmental issues likely to be encountered under various global project scenarios.
- The PEIA addresses key environmental issues throughout all phases of the project, including construction, commissioning, operation, maintenance and decommissioning of the plant. The PEIA also provides a description of mitigation strategies and measures to address environmental impacts identified in this preliminary environmental document.

Preliminary work has indicated that: "The comparison of potential SDV operational effects with those that might be generated by operation of a comparably-scaled land-based seawater desalination plant suggests that the SDV approach may cause fewer operational impacts than the land-based system alternative."



Power on the SDV

The SDV self-generates power using efficient, reliable and environmentally compliant marine power generation technology.

By self-generating power:

- There is no need to be connected to a power grid or additional land-based capacity;
- Independence from land-based power increases reliability factors in areas where power is constrained;
- Environmental efficiencies can be gained.

For power efficiency, the use of waste energy is an essential component of design. Waste energy is captured and utilized from the generators and circuits.

A reliable power supply is a key component of the SDV design.

- We have designed a robust power system with appropriate redundancy and reliability levels.
- **H₂OCEAN's** design has focused on achieving:
 - Acceptable emissions standards;
 - Reliability and low maintenance costs;
 - Integrated monitoring and control systems;
 - Minimized consumables and spare parts.

WATER STANDARD recognizes that power efficiency and reliability are fundamental requirements for the cost effective delivery of desalinated water.



Vessel Mooring

WATER STANDARD/H₂OCEAN, working with global partners, has flexibility in choosing how to moor/anchor the vessel offshore.

When a project is designed to produce water in one location, or is connected to a delivery system, a mooring system is required.

- Considerations When Selecting Mooring Method:
 - Vessel Size
 - Weather Conditions
 - Water Depth
 - Seabed Conditions
 - Delivery Requirements
 - Contract Type (e.g., long-term, multi-point delivery)

- Methods of Vessel Mooring Systems Which Can be Considered:
 - Spread Anchor System
 - Single Anchor Leg Mooring (SALM)
 - Catenary Anchor Leg Mooring (CALM)
 - Conventional Buoy Mooring System
 - Turret Systems (Internal, External, Disconnectable)

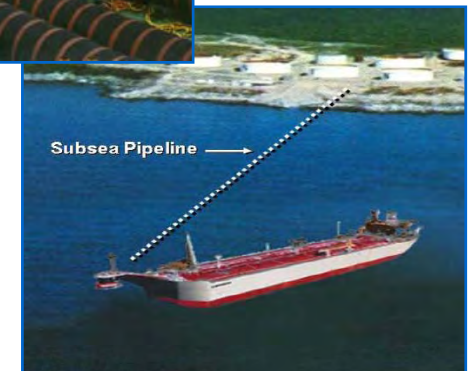
- If weather conditions are not an issue, simple mooring systems may be utilized.





Transfer of Product Water to Customer

- **WS/H₂OCEAN** can deliver water on a short-term basis to a single location, move continuously between locations making deliveries, or in certain circumstances, remain in place for up to 20 years without having to return to dry dock; maintenance is performed during normal operations offshore.
- Product water flows through hoses or pipelines from the vessel, either directly to shore or through a mooring system, into a fixed water pipeline system. **WS/H₂OCEAN** can also utilize shuttle ships for delivery and storage.
- **WS/H₂OCEAN** can re-mineralize and stabilize product water onboard for a customer's specific needs and transport straight to their distribution system or reservoir for immediate delivery or storage.
- Methods of Water Transportation Include:
 - Permanent Seabed Pipelines
 - Transfer Flex Hoses or Flexpipe
 - Shuttle Ships
- Considerations When Selecting Transportation Method:
 - Distance to Shore
 - Contract Type (e.g., long-term, merchant)
 - Available Storage and if delivering to more than one location
 - Environmental
 - Regulatory/Permitting Restrictions
 - Weather Conditions





Why WATER STANDARD/H₂OCEAN is a Better Alternative

In many cases, vessel-based desalination systems have distinct advantages over land-based systems:

Environment	<ul style="list-style-type: none"> • WS/H₂OCEAN significantly mitigates the environmental impact on marine life and coastlines. • Our processes were developed specifically to mitigate the impacts associated with seawater intake and concentrate discharge. • Fewer permits are typically required.
Location	<ul style="list-style-type: none"> • We can locate flexibly off the coast. We typically model 1 to 3 km offshore, but can adjust based on local conditions of depth and quality of intake water. • No need for expensive coastal land or limitations associated with availability of land sites. • The need for expensive intake and outfall systems has been eliminated.
Contract Flexibility	<ul style="list-style-type: none"> • Mobility gives WATER STANDARD the option of offering long-term, short-term or regionally based contracts in a variety of ownership and financing structures.
Scalability	<ul style="list-style-type: none"> • Output on vessels can be scaled from 20,000 to 200,000m³/d (6,000 to 60,000 ac-ft/yr). Smaller and larger vessels are utilized depending on the output required.
Development Time	<ul style="list-style-type: none"> • Timelines to production are significantly shorter than land-based alternatives.
Labor	<ul style="list-style-type: none"> • All skill sets are available in a shipyard during construction, so WS is not dependent on local labor availability, constraints or weather limitations.
Seawater Source	<ul style="list-style-type: none"> • With the SDV Located 1 to 3 km offshore, seawater is typically a better quality when compared to water found close to shore that often contains higher suspended solids, pollutants and organic content. This reduces pre-treatment costs; less chemical usage, reduced waste disposal costs; and minimal sludge production.



Why WATER STANDARD/H₂OCEAN is a Better Alternative

Power	<ul style="list-style-type: none"> • The SDV can self-generate power if needed, using reliable, environmentally compliant marine diesel generation technology. • There is no need to be connected to a power grid or for additional land-based capacity. • NO NEW LAND-BASED POWER SOURCES are required. • WS/H₂OCEAN can also generate excess power and deliver water and power to shore. • If less expensive land-based power is readily available, WS/H₂OCEAN can take power from land.
Fuel Costs	<ul style="list-style-type: none"> • We can use multiple grades of oil fuel for self-generation dependent on location and environmental considerations. • Fuel Costs can be hedged for price predictability.
Construction Advantages	<ul style="list-style-type: none"> • Because the ship is converted in a shipyard, there are none of the disruptions typically associated with land-based site construction, such as habitat changes, environmental issues, noise pollution, increased traffic, and other community issues.
Emergency Supply	<ul style="list-style-type: none"> • Because we are mobile and we self-generate power, our vessels have a distinct advantage over land-based systems and can be used to provide an emergency supply in response to natural disasters, drought or unexpected requirements or security challenges. • WS/H₂OCEAN is not affected by most power interruptions or earthquakes.
OPEX & CAPEX	<ul style="list-style-type: none"> • We are a cost competitive alternative. • Land-based intake and outfall pipelines are replaced by a single pipeline to shore or a delivery reel hose system.
Water Trading	<ul style="list-style-type: none"> • WS can play a vital role in the redistribution of existing sources between regions. We present a regional solution and can play a pivotal role in delivery mechanisms.
Risk Management	<ul style="list-style-type: none"> • Vessels can be moved, protecting the capital investment – a better credit risk. • No coastal impact on investment as a result of climate change. • Able to produce continuously even in severe weather (with the exception of cyclonic type conditions). • Easier decommissioning at the end of the project.



Basic Pricing Assumptions

WS/H₂OCEAN is competitive in its pricing. It can joint venture, participate in a public/private partnership or fund a vessel and deliver water to a customer for a unit cost price.

Primary Variables Affecting Price:

- Size of desalination plant
- Salinity and quality of source water
- Single pass or double pass, depending on quality of finished water (100 TDS vs. 500 TDS)
- Power requirements, power generation, fuel type
- Weather conditions affecting mooring systems
- Location and number of deliveries
- Delivery to shore mechanism
- Storage requirements
- Length of contract term

All of these variables need to be clearly defined as they have an impact on price, both from a capital and operating expenditure perspective.



Intellectual Property Portfolio

Competitive Advantages

- **WS/H₂OCEAN**'s competitive advantages as a developer of vessel-based desalination are supported by its numerous issued patents (6 U.S. and 7 International) as well as 5 U.S. and 64 International current patent applications.
- First patent applications were filed in 2002 and the first patent was issued in 2006.
- \$2 million+ has been spent to date developing and protecting the current patent portfolio, continuing to develop new technology that make operations more efficient while maintaining environmental standards.
- **WS/H₂OCEAN**'s patent portfolio covers technologies including:
 - Environmentally responsible systems and methods of desalination on vessels
 - Adjustable Intake Water System
 - Multi-Port Diffusion System
 - Pre-dilution of concentrate
 - Delivery methods of desalinated water to land
 - Excess power production transferable to land
 - Packaging desalinated water
- **WS/H₂OCEAN**'s patents and applications are filed globally including North America, South America, Australia, Asia, Europe, Africa, and the Middle East.
- **WS/H₂OCEAN** has also created a significant trademark portfolio including the trademarks filed globally of :



The performance of WS/H₂OCEAN's discharge system has been independently verified by DELTARES of the Netherlands.



Conclusions

- Many parts of the world are facing challenges in all sectors relating to water and energy and have to find solutions to a growing need, while balancing competing interests for such limited resources.
- **WS/H₂OCEAN** is able to competitively provide potable and process water and excess energy to shore, while protecting the environment.
- **WS/H₂OCEAN's** contract flexibility, pricing regimes, mobility and environmental advantages over land-based systems can play a significant role in identifying regional solutions for shortages.
- Our processes eliminate the need for expensive intake and outfall systems.
- We have the advantage of being power independent and able to locate closer to where the water is needed, reducing pipeline distances and related pumping costs.
- **WS/H₂OCEAN's** can mobilize very quickly and is well funded. We are prepared to look at short and long term opportunities and utilize our own balance sheet while global debt markets are refocusing.

**WS/H₂OCEAN is actively seeking
Regional Partners.**



Market Recognition and Validation

WHAT THEY ARE SAYING

THE SDV “promises to help solve a major human problem—providing pure water to communities in great need of this resource-without inflicting damage on the marine environment.”

*Dr. George Somero
Director of the Stanford University Hopkins Marine Institute*

The SDV is “an important new direction in the evolution of the desalination industry.”

*Judges in the 2007 Global Water Awards
recognizing WATER STANDARD and the SDV Innovation*

“A country where the populations is concentrated around the coast line is ideally suited to the benefits offered by WATER STANDARD’s Seawater Desalination Vessel.”

Global Water Intelligence (in reference to Australia)

“The environmental impact mitigation measure the company has taken [include] a proprietary intake arrangement to reduce impingement and entrainment and a concentrate outfall that virtually eliminates the discharge plume.”

Water Desalination Report

“With a technology such as the (SDV), desalination soon may leave the realm of wishful thinking and become one of the world's primary means to augment clean, environmentally responsible, reliable global water supplies.”

Journal of the American Water Works Association

“We consider WATER STANDARD to be one of the most exciting stories in the global water sector.”

Goldman, Sachs & Co.



Environmental Support

“I view this technology as an exceptionally innovative and environmentally sound approach to providing essential fresh water supplies to many areas of the world where shortages in water availability either now exist or will exist in the near future...In terms of environmental impact, then, the shipboard system is a much better solution to the desalination problem than a shore-based system. **Suffice it to say [the SDV] promises to help solve a major human problem-providing pure water to communities in great need of this resource – without inflicting damage on the marine environment.**”

- Dr. George N. Somero

David and Lucile Packard Professor of Marine Science
 Director, Hopkins Marine Station, Stanford University

The Hopkins Marine Station is the oldest marine laboratory on the US West Coast. Dr. Somero has studied the effects of environmental factors on marine organisms for over four decades and, in recognition of his discoveries, has been elected to the United States National Academy of Sciences.



The **Sundance Channel** featured WATER STANDARD in a segment on *Big Ideas for A Small Planet*, a documentary series addressing some of the most important issues facing humanity.

Clips from the “Water” Episode, are now available at:

<http://www.sundancechannel.com/thegreen/#/homePage>



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For more information and the latest
WATER STANDARD and **H₂OCEAN**
related and Industry news, please visit our website at:
www.waterstandard.com



Technology Response Form

Coquina Coast Seawater Desalination Alternative Water Supply Project



GIS Update

Coquina Coast Seawater Desalination Alternative Water Supply Project



Review of Projected Water Needs

Coquina Coast Seawater Desalination Alternative Water Supply Project

Projected AAD Demand



UTILITY		Demand (MGD)								
		2010	2015	2020	2025	2030	2035	2040	2045	2050
Suppliers	Bunnell	0.00	0.00	0.05	0.37	0.63	0.93	1.23	1.52	1.81
	Dunes	0.00	0.00	0.00	0.00	0.25	0.25	0.25	0.25	0.25
	Flagler County	0.00	0.08	0.08	0.08	0.09	0.09	0.10	0.10	0.11
	Leesburg	0.00	0.00	0.00	5.00	5.00	5.00	5.00	5.00	5.00
	Mt. Dora	0.17	0.30	0.56	0.77	1.47	2.12	2.96	3.97	5.13
	Palm Coast	0.00	0.00	4.00	7.00	10.00	13.00	16.00	19.00	22.00
	St. Johns	0.00	0.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
	Total	0.17	0.38	8.69	17.22	21.44	25.39	29.54	33.84	38.29
Ex-Officio	Flagler Beach	--	--	--	--	--	--	--	--	--
	Deland	0.50	4.10	6.00	7.20	7.80	8.30	8.67	8.97	9.22
	Marion County	3.10	8.30	13.40	17.90	20.30	25.80	30.20	34.60	39.00
	Water Authority of Volusia	4.50	5.90	9.00	12.80	17.20	21.70	26.33	31.03	35.78
	Total	8.10	18.30	28.40	37.90	45.30	55.80	65.20	74.60	84.00
Suppliers + Ex-Officio		8.27	18.68	37.09	55.12	66.74	81.19	94.74	108.44	122.29



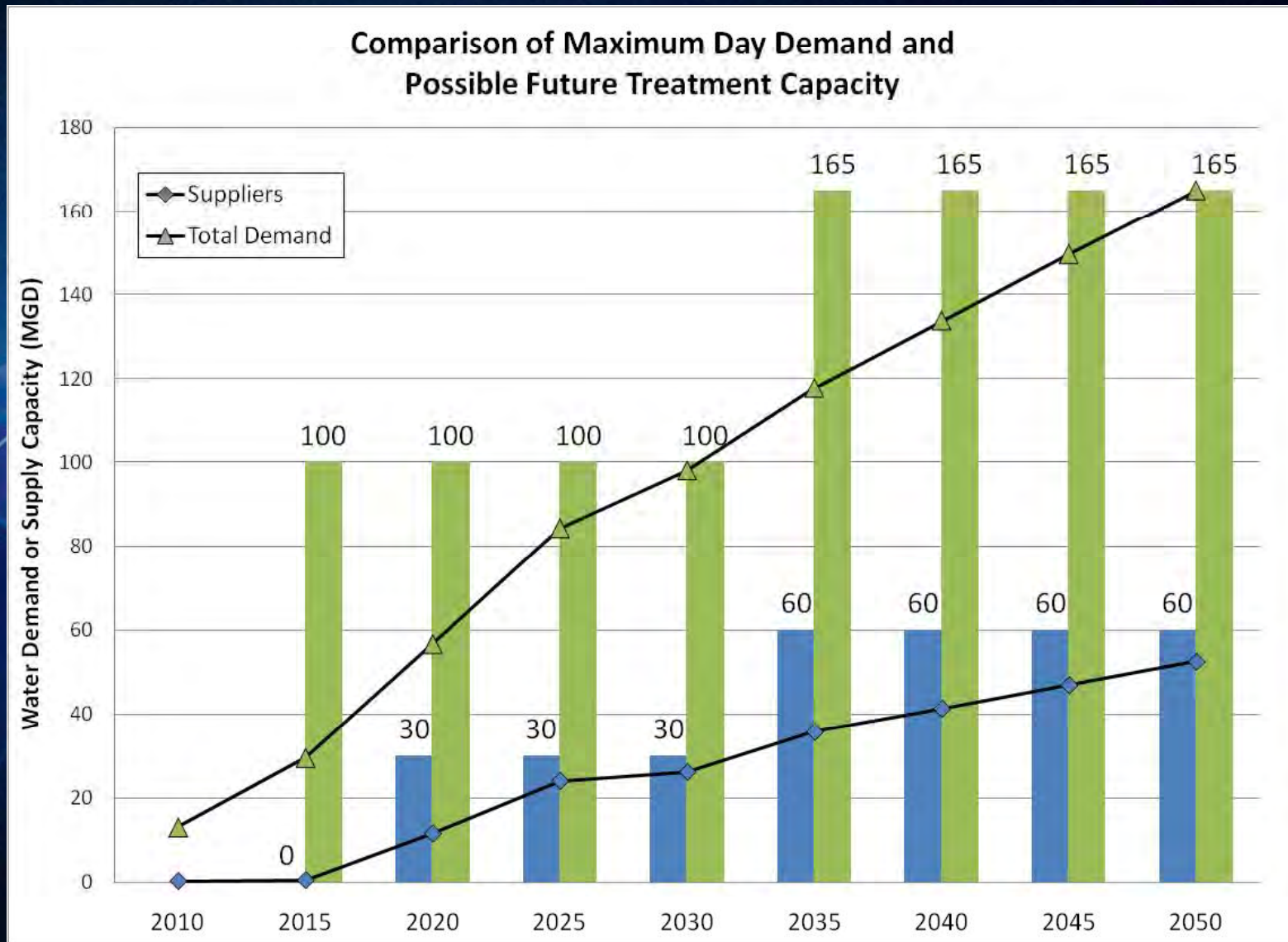
Projected Maximum Day Demand



UTILITY		Demand (MGD)								
		2010	2015	2020	2025	2030	2035	2040	2045	2050
Suppliers	Bunnell	0.00	0.00	0.08	0.59	1.01	1.49	1.96	2.43	2.90
	Dunes	0.00	0.00	0.00	0.00	0.45	0.45	0.45	0.45	0.45
	Flagler County	0.09	0.09	0.10	0.10	0.11	0.11	0.12	0.13	0.13
	Leesburg	0.00	0.00	0.00	7.50	7.50	7.50	7.50	7.50	7.50
	Mt. Dora	0.26	0.45	0.84	1.15	2.21	3.06	3.99	4.92	5.84
	Palm Coast	0.00	0.00	5.60	9.80	10.00	18.20	22.40	26.60	30.80
	St. Johns	0.00	0.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
	Total	0.34	0.55	11.62	24.14	26.27	35.81	41.42	47.02	52.62
Ex-Officio	Flagler Beach	--	--	--	--	--	--	--	--	--
	Deland	0.80	6.56	9.60	11.52	12.48	13.28	13.87	14.35	14.76
	Marion County	4.96	13.28	21.44	28.64	32.48	34.73	37.43	39.76	41.82
	Water Authority of Volusia	7.02	9.20	14.04	19.97	26.83	33.85	41.08	48.41	55.81
	Total	12.78	29.04	45.08	60.13	71.79	81.87	92.37	102.52	112.38
Suppliers + Ex-Officio		13.12	29.59	56.70	84.27	98.06	117.68	133.79	149.54	165.01

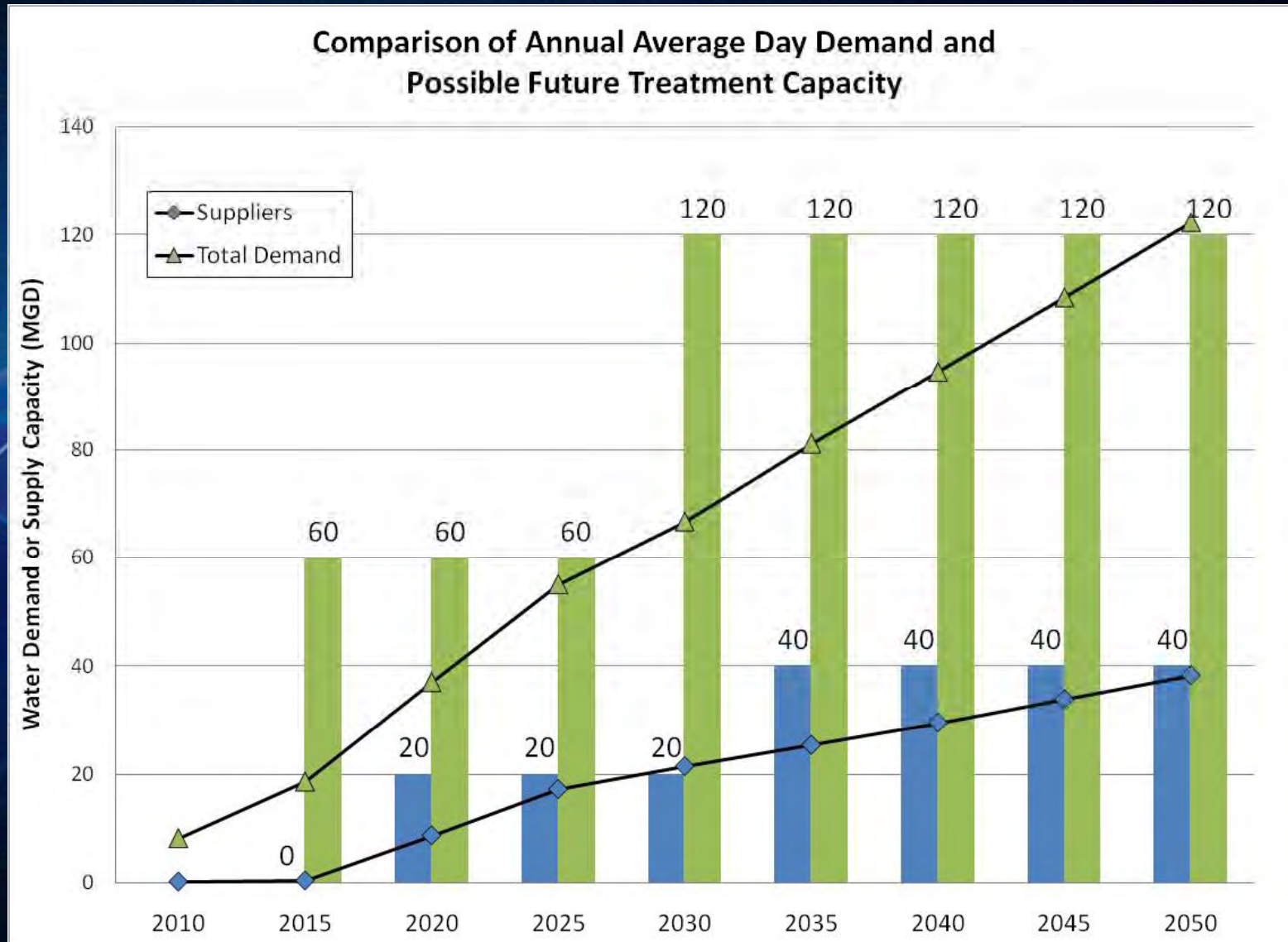


Future Treatment Capacity vs. Maximum Day





Future Treatment Capacity vs. AAD





Review of Finished Water Quality Objectives

Coquina Coast Seawater Desalination Alternative Water Supply Project

Summary of Current Finished Water Quality



	pH	Alkalinity (mg/L as CaCO ₃)	Disinfection	Other
Bunnell	--	--	--	--
Dunes CDD	7.8 – 8.0 – 8.5	12 – 14 – 18	Free Cl ₂	Ortho-poly-P
Flagler County ¹	7.7 – 8.8 – 9.1	5 – 20 – 35	NH ₂ Cl	Ortho-poly-P
Leesburg	7.5	--	Free Cl ₂	--
Mt. Dora	6.5 – 7.5 – 8.5	100 – 120 – 140 ²	Free Cl ₂	Ortho-poly-P
Palm Coast	7.7 – 8.8 – 9.1	5 – 20 – 35	NH ₂ Cl	Ortho-poly-P
St. Johns County	8.6 – 8.8	30	NH ₂ Cl	--
Flagler Beach	--	--	--	--
Deland	7.2 – 7.5 – 7.8	--	Free Cl ₂	Ortho-poly-P, Fluoride
Marion County	7.7 – 7.9	108 - 112 ²	Free Cl ₂	--
WAV	7.2 – 8.0 – 9.4	30 – 105 – 140	Both	Mixed

1. Receive water through POC with Palm Coast

2. Hardness



Additional Water Quality Considerations



Mineral Deficiencies

- Low Ca, Mg, SO_4 can impact agricultural/irrigation

Boron

- More of an agricultural concern than public health concern
- EU and CDPH goal 1.0 mg/L , WHO raising from 0.5 to 2.4 mg/L

Bromide

- Bromamines formation in chloraminated systems
- Brominated DBPs

Chloride and Sodium

- Potential wastewater discharge impacts

Algal toxins

- Pretreatment to address "red tide"
- Toxins effectively removed by RO process



Proposed Water Quality Goals



Parameter	Treated Water Quality Goal	Comments
pH	7.5 – 7.8	
Secondary Disinfection	Free Cl ₂	
CCPP	4 – 10	
LSI	> 0.0	
TTHM/HAA5	40/30 ug/L	50% of MCL
Chlorite	0.80 mg/L	80% of MCL
Bromate	0.008 mg/L	80% of MCL
Pathogens	--	LT2ESWTR/SWTR
Turbidity*	0.3 NTU/0.15 NTU	IESWTR/LT2ESWTR
Inorganic contaminants	--	FDEP MCLs
Organic contaminants	--	FDEP MCLs
Radionuclides	--	FDEP MCLs
Secondary standards	--	FDEP MCLs
Boron	1.0 mg/L	CDPH and EU goal

CCPP – Calcium Carbonate Precipitation Potential

LSI – Langlier Saturation Index

* Values are for pretreatment/RO permeate



Supplier and Ex Officio Water Quality Modifications



	Blending	Booster Disinfection	Corrosion Inhibitor	Other
Bunnell	X	X		
Dunes CDD	X	X	X	
Flagler County	Purchase through POC with Palm Coast			
Leesburg	X	X		
Mt. Dora	X	X	X	
Palm Coast	X	X*	X	pH
St. Johns County	X	X*		pH
Flagler Beach	X	X		
Deland	X	X	X	Fluoride
Marion County	X	X		
Water Authority of Volusia	X	X	X	X

* Booster chloramination





Review of Raw Water Quality Data

Coquina Coast Seawater Desalination Alternative Water Supply Project

Raw Water Quality Investigations



National Data Buoy Center

- 6 Locations from St. Augustine to Molasses Reef, FL
- Limited usefulness – surficial data



Marineland

- Ocean, infiltration gallery, and vertical well,
- Data from Sept. 2003 to Feb. 2004

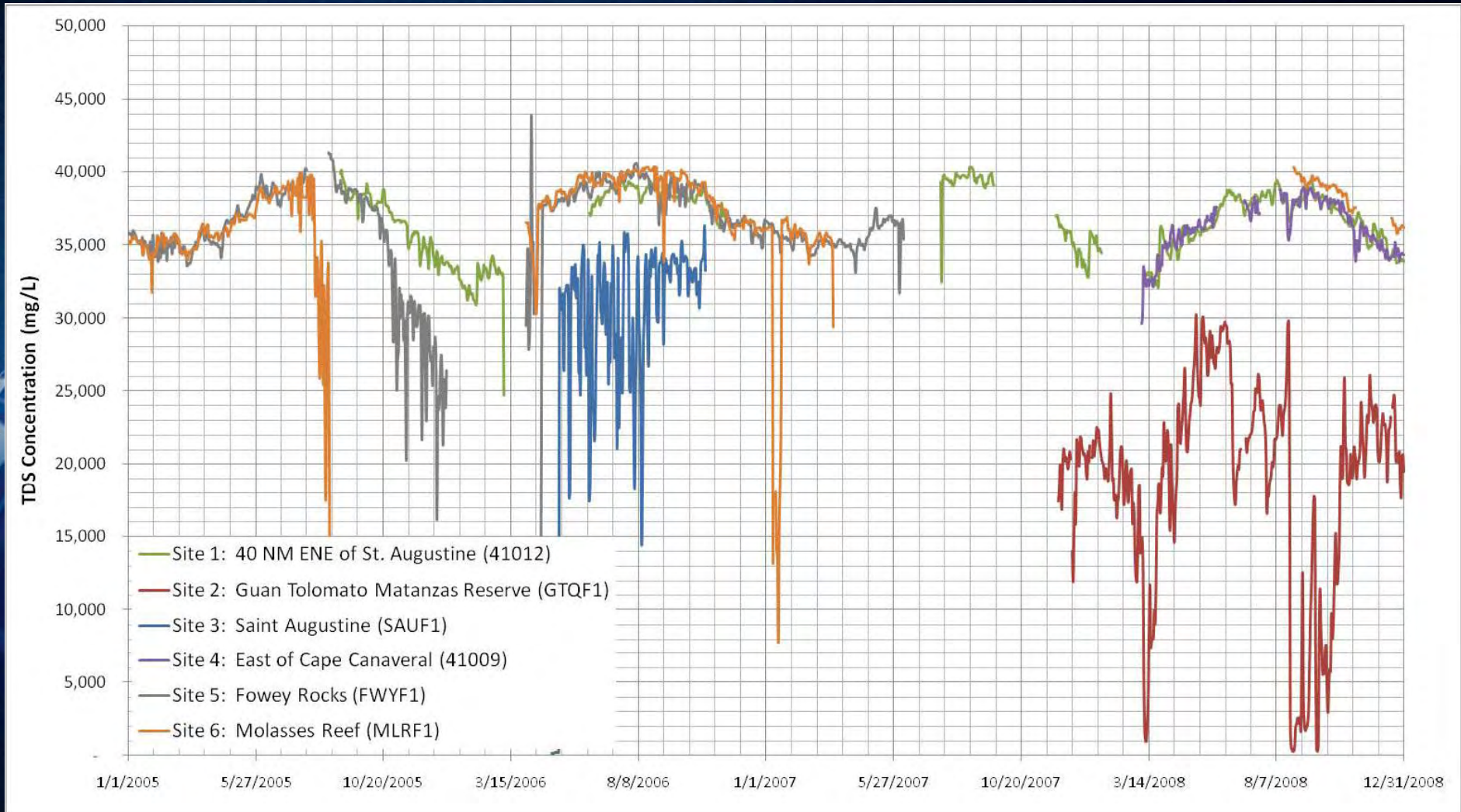


Water Research Foundation

- General seawater quality
- Good correlation with NDBC data



Water Quality Variability - TDS



Summary Raw Water Quality for Phase 1



Parameter	NDBC	Marineland	WRF	Project
pH	6.1 – 7.7 – 13.9	8.1	8.3	8
Temperature (°C)	10 – 26 – 42	--	--	10 – 42
Conductivity (mS/cm)	0.2 – 50 – 65	--	--	50
TDS (mg/L)	134 – 33,800 – 44,000	--	34,500	34,000
Salinity (ppt)	0.2 – 34 – 62	34	--	34
Chloride (mg/L)	112 – 18,600 – 34,000	20,200	19,000	20,000
Bromide (mg/L)	--	67	65	70
Calcium (mg/L)	--	312	400	400
Magnesium (mg/L)	--	1,320	1,300	1,300
Sodium (mg/L)	--	10,650	10,600	10,600
Silica (mg/L)	--	0.6	<10	5
Strontium (mg/L)	--	5.9	13	10
Boron (mg/L)	--	--	4.6	4.5





Project Fact Sheets and Media Relations

Coquina Coast Seawater Desalination Alternative Water Supply Project

Public Involvement



Key Messages

- Basis of all project communications
- Ensure consistency



Key Messages



Example:

Seawater desalination produces some of the highest quality drinking water in the world.

Suggested Topics:

- Purpose of the project
- Project components
- Alternative sources
- Desalination
 - Benefits, water quality, environmental considerations, etc.





Public Involvement



Overall Project Fact Sheet

- Purpose of the project
- What is being studied
- Timeline
- Cost
- Partners

Project Fact Sheets





Update on Sustainability Planning

Coquina Coast Seawater Desalination Alternative Water Supply Project

Sustainability Workshop Planning



- Wednesday, March 25
 - 9:00 AM to 4:00 PM
- Facilitators
 - Doug Owen, MPI Chief Technology Officer
 - Bruce Abernathy, SKM Former Chief Sustainability Officer
- Participants
 - Alan Davie, SKM
 - Mike Kuhn and/or Larry Jessup, Veolia
 - Others
- Partner Attendees



Sustainability Workshop Tentative Agenda



- Introductions and Objectives
- Overview of Sustainability Elements
- Project Components and Sustainability
- System Mapping (Group Exercise)
- LUNCH
- “Close the Loop” on System Mapping
- Future Casting and Scenario Planning
- Framework for Decision-Making
- ADJOURN



Deliverable Review Schedule for Coquina Coast Seawater Desalination Project Phase 1

Revision 1.0
March 11, 2009

Phase 1 Deliverable Review Schedule for Coquina Coast Project

January 2009

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
				1	2	3
4	5	6	7	8	9	10
11	12	13	14 Business Meeting: Project Kickoff	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31

Responsibility: Parties (Suppliers, Ex Officios, SJRWMD) Malcolm Pirnie All

Phase 1 Deliverable Review Schedule for Coquina Coast Project

February 2009

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
1	2	3	4	5	6	7
8	9	10	11 Business Meeting	12	13	14
15	16	17	18 Respond to Initial Data Request	19	20	21
22	23	24	25	26	27	28

Responsibility: Parties (Suppliers, Ex Officios, SJRWMD) Malcolm Pirnie All

Phase 1 Deliverable Review Schedule for Coquina Coast Project

March 2009

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
1	2	3	4	5	6 Review draft Water Quantity/Quality TM Review draft Raw Water Quality TM	7
8 Review draft Water Quantity/Quality TM Review draft Raw Water Quality TM	9	10	11 Business Meeting: WORKSHOPS Water Quantity/ Quality TM Raw Water Quality TM	12 Submit comments Submit comments	13	14
15	16	17	18	19	20	21
22	23	24	25 WORKSHOP Sustainability Considerations	26	27 Issue Final Water Quantity/ Quality TM Raw Water Quality TM	28
29	30	31				

Responsibility: Parties (Suppliers, Ex Officios, SJRWMD) Malcolm Pirnie All

Phase 1 Deliverable Review Schedule for Coquina Coast Project

April 2009

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
			1	2	3	4
5	6	7	8 Business Meeting	9	10	11
12	13	14	15	16	17	18
19	20	21	22 WORKSHOP Project Evaluation Criteria Identification	23	24	25
26	27	28	29	30		

Responsibility: Parties (Suppliers, Ex Officios, SJRWMD) Malcolm Pirnie All

Phase 1 Deliverable Review Schedule for Coquina Coast Project

May 2009

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
					1	2
3	4	5	6	7	8 Review draft Transmission System TM	9
10 Review draft Transmission System TM	11	12	13 Business Meeting: WORKSHOP Transmission System TM	14 Submit comments	15	16
17	18	19	20	21	22	23
24 31	25	26	27 WORKSHOP Project Evaluation Criteria Weighting	28	29 Issue Final Transmission System TM	30

Responsibility: Parties (Suppliers, Ex Officios, SJRWMD) Malcolm Pirnie All

Phase 1 Deliverable Review Schedule for Coquina Coast Project

June 2009

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
	1	2	3	4	5 Review draft Treatment Process Reqs. TM Review draft Project Evaluation Criteria TM	6
7 Review draft Treatment Process Reqs. TM Review draft Project Evaluation Criteria TM	8	9	10 Business Meeting WORKSHOPS Treatment Process Requirements TM Project Evaluation Criteria TM	11 Submit comments Submit comments	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26 Issue Final Treatment Process Requirements TM Project Evaluation Criteria TM	27
28	29	30				

Responsibility: Parties (Suppliers, Ex Officios, SJRWMD) Malcolm Pirnie All

Phase 1 Deliverable Review Schedule for Coquina Coast Project

July 2009

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
			1	2	3 Review draft Intake/Pretreat/Discharge TM	4
5 Review draft Intake/Pretreat/Discharge TM	6	7	8 Business Meeting WORKSHOP Intake, Pretreatment, Discharge TM	9 Submit comments	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24 Issue Final Intake, Pretreatment, Discharge TM	25
26	27	28	29	30	31	

Responsibility: Parties (Suppliers, Ex Officios, SJRWMD) Malcolm Pirnie All

Phase 1 Deliverable Review Schedule for Coquina Coast Project

August 2009

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
						1
2	3	4	5	6	7	8
					Review 1 st draft Land-Based Treatment TM	
					Review 1 st draft Ship-Based Treatment TM	
9	10	11	12	13	14	15
Review 1 st draft Land-Based Treatment TM			Business Meeting WORKSHOPS Land-Based Treatment TM Ship-Based Treatment TM		Submit comments	
Review 1 st draft Ship-Based Treatment TM					Submit comments	
16	17	18	19	20	21	22
23 30	24 31	25	26	27	28	29

Responsibility: Parties (Suppliers, Ex Officios, SJRWMD) Malcolm Pirnie All

Phase 1 Deliverable Review Schedule for Coquina Coast Project

September 2009

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
		1	2	3	4 Review 2 nd draft Land-Based Treatment TM Review 2 nd draft Ship-Based Treatment TM	5
6 Review 2 nd draft Land-Based Treatment TM Review 2 nd draft Ship-Based Treatment TM	7	8	9 Business Meeting WORKSHOPS Land-Based Treatment TM Ship-Based Treatment TM	10 Submit comments Submit comments	11	12
13	14	15	16	17	18	19
20	21	22	23 PUBLIC MEETING	24	25 Issue Final Land-Based Treatment TM Ship-Based Treatment TM	26
27	28	29	30			

Responsibility: Parties (Suppliers, Ex Officios, SJRWMD) Malcolm Pirnie All

Phase 1 Deliverable Review Schedule for Coquina Coast Project

October 2009

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
				1	2	3
4	5	6	7	8	9	10
11	12	13	14 Business Meeting	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31

Responsibility: Parties (Suppliers, Ex Officios, SJRWMD)

Malcolm Pirnie

All

Phase 1 Deliverable Review Schedule for Coquina Coast Project

November 2009

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
1	2	3	4	5	6	7
8	9	10	11 Business Meeting	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30					

Responsibility: Parties (Suppliers, Ex Officios, SJRWMD) Malcolm Pirnie All

Phase 1 Deliverable Review Schedule for Coquina Coast Project

December 2009

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
		1	2	3	4	5
6	7	8	9 Business Meeting	10	11	12
	Review 1 st draft Recommended Projects Report					
13	14	15	16 WORKSHOP Recommended Projects Report 1 st Draft	17	18	19
	Review 1 st draft Recommended Projects Report, continued					
20	21	22	23	24	25	26
	Submit comments					
27	28	29	30	31		

Responsibility: Parties (Suppliers, Ex Officios, SJRWMD) Malcolm Pirnie All

Phase 1 Deliverable Review Schedule for Coquina Coast Project

January 2010

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
					1	2
3	4	5	6	7	8	9
					Review 2 nd draft Recommended Projects Report	
10	11	12	13	14	15	16
Review 2 nd draft Recommended Projects Report			Business Meeting: WORKSHOP Recommended Projects Report 2 nd Draft	Submit comments		
17	18	19		20	21	22
					Issue Final Recommended Projects Report END OF PHASE 1	
24	25	26	27	28	29	30
31						

Responsibility: Parties (Suppliers, Ex Officios, SJRWMD) Malcolm Pirnie All

**Deliverable Review Schedule and Other Key Dates
Coquina Coast Seawater Desalination Project, Phase 1**

DATE	RESPONSIBILITY	EVENT OR MILESTONE
2009:		
January 14	All	Monthly Business Meeting - Project Kickoff
February 11	All	Monthly Business Meeting
February 18	Parties	Respond to Initial Data Request
March 6	Parties	Begin review of draft Water Quantity and Quality Technical Memorandum (TM) Begin review of draft Raw Water Quality TM
March 11	All	Monthly Business Meeting - WORKSHOP: Water Quantity and Quality TM Review - WORKSHOP: Raw Water Quality TM Review
March 13	Parties	Provide Water Quantity and Quality TM comments to Pirnie Provide Raw Water Quality TM comments to Pirnie
March 25	All	WORKSHOP: Sustainability Considerations
March 27	Pirnie	Issue final Water Quantity and Quality TM Issue final Raw Water Quality TM
April 8	All	Monthly Business Meeting
April 22	All	WORKSHOP: Project Evaluation Criteria Identification
May 8	Parties	Begin review of draft Transmission System Planning TM
May 13	All	Monthly Business Meeting - WORKSHOP: Transmission System Planning TM Review
May 15	Parties	Provide Transmission System Planning TM comments to Pirnie
May 27	All	WORKSHOP: Project Evaluation Criteria Weighting
May 29	Pirnie	Issues final Transmission System Planning TM
June 5	Parties	Begin review of draft Treatment Process Requirements TM Begin review of draft Project Evaluation Criteria TM
June 10	All	Monthly Business Meeting - WORKSHOP: Treatment Process Requirements TM Review - WORKSHOP: Project Evaluation Criteria TM Review
June 12	Parties	Provide Treatment Process Requirements TM comments to Pirnie Provide Project Evaluation Criteria TM comments to Pirnie
June 26	Pirnie	Issue final Treatment Process Requirements TM Issue final Project Evaluation Criteria TM
July 3	Parties	Begin review of draft Intake, Pretreatment, and Discharge TM
July 8	All	Monthly Business Meeting - WORKSHOP: Intake, Pretreatment, and Discharge TM Review
July 10	Parties	Provide Intake, Pretreatment, and Discharge TM comments to Pirnie
July 24	Pirnie	Issue final Intake, Pretreatment, and Discharge TM
August 7	Parties	Begin review of first draft Land-Based Treatment Concept TM Begin review of first draft Ship-Based Treatment Concept TM
August 12	All	Monthly Business Meeting - WORKSHOP: Land-Based Treatment Concept TM (first draft) Review - WORKSHOP: Ship-Based Treatment Concept TM (first draft) Review
August 14	Parties	Provide Land-Based Treatment Concept TM (first draft) comments to Pirnie Provide Ship-Based Treatment Concept TM (first draft) comments to Pirnie
September 4	Parties	Begin review of second draft Land-Based Treatment Concept TM Begin review of second draft Ship-Based Treatment Concept TM
September 9	All	Monthly Business Meeting - WORKSHOP: Land-Based Treatment Concept TM (second draft) Review - WORKSHOP: Ship-Based Treatment Concept TM (second draft) Review
September 11	Parties	Provide Land-Based Treatment Concept TM (second draft) comments to Pirnie Provide Ship-Based Treatment Concept TM (second draft) comments to Pirnie
September 23	All	PUBLIC MEETING
September 25	Pirnie	Issue final Land-Based Treatment Concept TM Issue final Ship-Based Treatment Concept TM
October 14	All	Monthly Business Meeting

**Deliverable Review Schedule and Other Key Dates
Coquina Coast Seawater Desalination Project, Phase 1**

November 11	All	Monthly Business Meeting
December 7	Parties	Begin review of first draft Recommended Projects Report
December 9	All	Monthly Business Meeting
December 16	All	WORKSHOP: Recommended Projects Report (first draft) Review
December 21	Parties	Provide Recommended Projects Report (first draft) comments to Pirnie
2010:		
January 8	Parties	Begin review of second draft Recommended Projects Report
January 13	All	Monthly Business Meeting - WORKSHOP: Recommended Projects Report (second draft) Review
January 15	Parties	Provide Recommended Projects Report (second draft) comments to Pirnie
January 22	Pirnie	Issue final Recommended Projects Report

RESPONSIBILITY KEY:

Parties: Suppliers, Ex Officio Members, and SJRWMD

Pirnie: Malcolm Pirnie and Subconsultant Team Members

All: Parties and Pirnie