

Drinking Water Issues in RMI (Majuro)- USEPA's Perspective

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Introduction – who am I?

- Barry Pollock, P.E. Environmental Engineer, Drinking Water Office, USEPA Region 9
- Registered Professional Civil/ Environmental Engineer and Ca Water Treatment Operator
- 23 years experience working with Public Water Systems in California (Tribal Water Systems), Hawaii, Guam, CNMI, Palau, Pohnpei, Chuuk, Japan (Okinawa)
- Mostly regulatory oversight, compliance and enforcement, water system assessment, technical assistance and training

What is USEPA?

- **United States Environmental Protection Agency**
- **EPA oversees U.S. environmental regulations – Safe Drinking Water Act, Clean Water Act, Clean Air Act, Solid Waste, Hazardous Waste, etc.**
- US Laws and regulations cover the 50 U.S. States and 5 U.S. Territories (Guam, CNMI, American Samoa, Puerto Rico and Virgin Islands) – but do NOT cover the Freely Associated States

What am I doing here in RMI?

- USEPA has no direct regulatory authority in FAS since Independence – we provide “advice and technical assistance” only
- USEPA available to provide technical assistance, training, etc. on an “as requested / as needed/ as funded” basis to the FAS (and some other countries)
- In RMI USEPA staff have done Drinking Water, Hazardous Waste, Oil, solid waste, and other TA – mostly at the invitation of and thru RMIEPA

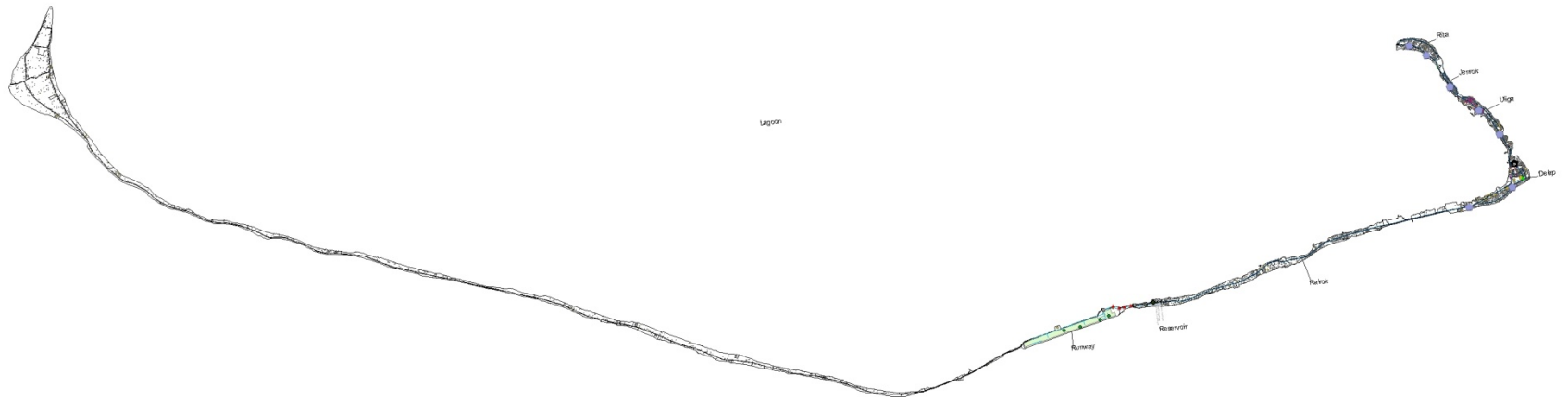
Previous USEPA Drinking Water work in RMI

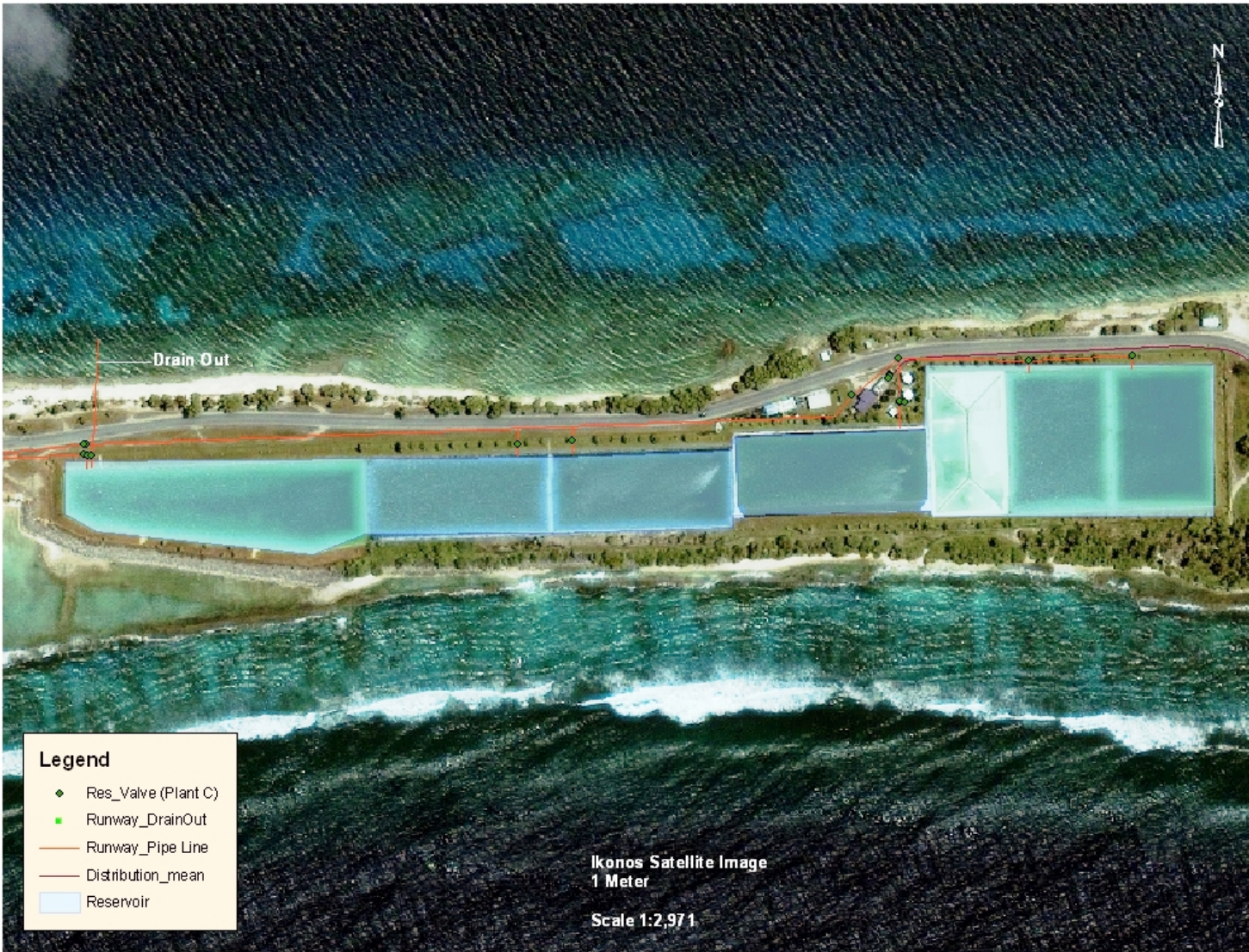
- 2004, 2005 and 2010 – Training to RMIEPA and MWSC on Drinking Water and Water Laboratory Issues
- Included inspections and “big picture” assessment of MWSC water system in 2005 and 2010 (2005 Ebeye also) (not a detailed sanitary survey).
- Water Operator training – September 2010 – together with Angel Marquez, Guam EPA we provided training, and administered the Guam Drinking Water Operator Certification exams to 14 MWSC and RMI EPA employees. There are now 7 certified operators in RMI! 😊

Findings of Assessment of Drinking Water Issues in RMI –Majuro / MWSC

- Water Quality
- Water Quantity
- Water Treatment
- Water Sources
 - Rainwater
 - Groundwater – GW protection (Laura and shallow wells)
- Storage and Distribution of water
- Water Utility (MWSC) – operations, management and finances

Majuro water and sewer company (Distribution Lines)





Water Quality

- Contaminants of Concern
 - #1 – **Microbial contamination** – bacteria, viruses and protozoans. Major health concern- water borne disease
 - Fecal bacteria like E. coli, and other microorganisms, can cause diseases – cholera, hepatitis, salmonellosis, diarrheal and others. Sickness and even mortality
- MWSC water system **continues to have a history of bacteriological contamination in the water system** (including the Hospital water system).
 - For example, from Feb-August 2010, during 5 of the 7 months, fecal contamination was found in the distribution system water

Water Quantity Issues

- **Water Quantity can be as important as Water Quality – insufficient Water Quantity in MWSC system – most of the time the system is not pressurized - no water in the pipes**
 - Basic water needs – public health and hygiene – Need **sufficient** water for drinking, cooking, bathing, other domestic use, fire protection. Also can be important for agriculture, industry
- **Water Quantity can effect Water Quality**
 - Not enough water in pipes – low or no pressure. Can result in contamination of water supply

Water Treatment

- Main treatment for MWSC is chlorination (disinfection) and Sand Filtration
- Water Treatment Issues
 - 1. Chlorination / disinfection is not always done consistently, and chlorine residual is not always adequately maintained in the MWSC distribution system
 - 2. Filtration – Not always done adequately. Can result in high turbidity water in the distribution system, interfering and making less effective the disinfection (chlorination)

WTP C – Chlorination system



WTP C - Filters



TP A



Water Sources

Rainwater Catchment (RWC)

Airport catchment – main source of water

Rooftop catchment – hospital, gov't buildings (note – also lots of individual RWC)

RWC is a good source of water, but can be susceptible to contamination, and quantity varies with the seasons

Groundwater (GW)

Wells – Laura, and shallow wells in DuD

Also a good source, but can have both quality (bacteria, chlorides, pesticides, fertilizers, nitrates, other contaminants) and quantity (decreases during droughts) issues



Water Sources – Quality and Quantity Issues

- Rainwater
 - Good quality source, but can get contaminated - poor maintenance of the source (runway); inadequate treatment; lack of maintenance of the water distribution system; and water storage issues
 - Quantity – Can be highly variable. Rainy season vs. dry season. Droughts. Heavy rains/flooding.
- Groundwater
 - Can be a good quality source, but very susceptible to contamination (bacteriological) from surface activities - especially true in RMI/Majuro, because the GW is very shallow. Laura Wellfield and Delap wells. Also susceptible to salt water intrusion.

Water Storage and Distribution

- Water Storage and Distribution very important.
 - If not enough water storage can run out of water and/or difficult to maintain pressure
 - Both raw water and distribution system storage needed
 - MWSC has large RW storage (36MG), but **no** distribution system storage
 - » Even RW storage not enough to last through dry season
 - » Lack of distribution system storage can effect water quality and quantity – hard to maintain pressure
 - Distribution system – if not well designed, operated and maintained
 - can (and does) result in **water contamination** as well as **excessive water loss**.
 - MWSC estimated up to 50% or more, water loss (leaks, theft, lack of meters, etc.)

Water Utility - MWSC

- **MWSC has many challenges**
 - Difficult system to Operate and maintain, for the following reasons:
 - Old and decaying physical infrastructure
 - Lack of redundancy of equipment
 - Design and/or construction flaws
 - Lack of sufficient resources – funding, spare parts,
 - Difficulty in getting adequate training and technical expertise
 - Funding and rate issues

Side bar - The 8 main components of a water systems physical infrastructure, operations and management

- Sources (including source water storage)
- Treatment
- Distribution System
- Finished Water Storage
- Pumps and pump controls
- Water Quality and Testing – Monitoring and Reporting
- System management and operation
- Operator status and training

Main Findings / issues to consider

- Need for **Improved water treatment – chlorination and filtration**
- **Source water protection** – Laura wells, DUD wells, RWC
- Need for more **Storage** - raw water and distribution system
- Water utility **infrastructure and operations** – need a planning and improvements process
 - More detailed **assessment** of all 8 components of the water system (previous slide)
 - Need to develop (or revise) the short and long term, **Capital Improvements Program (CIP)** infrastructure improvement needs for water supply for Majuro
 - Need to develop more organized **operations and maintenance** program
 - **Process control** – testing water for key parameters for day to day operations
 - **Comprehensive operator training program**
 - **Standard Operating Procedures (SOPs)**
 - Technical and financial issues – **funding, planning, rate structures**, etc.
 - **Asset management program** – taking care of the existing assets and planning for new assets of the water system