

DESALINATION POOP SHEET #1 – FREQUENTLY ASKED QUESTIONS

By Ford Greene, San Anselmo Town Councilman
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Q. What is reverse osmosis desalination?

Reverse osmosis desalination is in effect a type of screening and sifting. It uses water pressure at a very high volume to force baywater through a very fine membrane screen. The desalination reverse osmosis process requires roughly two gallons of fluid for every gallon of desalinated “product” produced which will be mixed in three 2 million gallon tanks with our rain-fed reservoir water.

MMWD’s 5-15 million gallon per day desalination plant will produce from 5-15 millions gallons of waste per day.

Q. What is desalination waste?

The desalination process generates a lethal by-product of concentrated brine mixed with the chemicals and heavy metals used in the production of freshwater to prevent salt corrosion and clean and maintain the reverse osmosis membranes. Such chemical waste includes manganese, lead, iodine, chlorine, sulfuric acid and other biocides, ferric chloride, copper, and dead marine life - such as plankton, eggs, larva and fish - killed by the suck pipe and outflow pipe. The industry calls such fluid waste “brine.”

Q. Where is the location of the desalination plant and its intake/outflow pipes?

Marin’s reverse osmosis desalination plant will be located along the shore of San Rafael Bay, just north of the Richmond-San Rafael Bridge, in the same area where the San Quentin Dump used to be. It was an open pit, unregulated dump along the western edge of San Rafael Bay, generally where Home Depot is now located. For decades people dumped everything there without inspection or restriction.

The desalination intake pipe will extend 2000 feet over the Marin Rod and Gun Club Pier, located at the base of the Richmond-San Rafael Bridge.

Extending roughly one mile beyond the business end of the desalination intake pipe is the business end of the Central Marin Sewage Agency’s treated sewage outflow pipe. It dumps 11 million gallons of treated sewage into San Rafael Bay every day.

The brine from the desalination process will be mixed with the CMSA’s sewage, and, via CMSA’s outflow pipe, dumped back into San Rafael Bay

Q. What is the water source for the desalination process?

San Rafael Bay will be the source of the desalinated product. San Rafael Bay is both shallow and devoid of currents. This means it is relatively both warm and stagnant. San Rafael Bay will be loaded with between 16 to 26 million gallons of brine/sewage discharge every day. Thus, this bay will provide MMWD water in a recirculating loop - in the desalination pipe and out the sewage discharge pipe and back in the desalination pipe.

Q. Isn’t San Rafael Bay poisonous?

Yes. In addition to the CSSA’s outflow pipe in which we have seen that the brine will be mixed and discharged, the Bay’s waters are quite toxic.

The history of the contamination of the S.F. Bay begins with the hydraulic gold mining runoff in the mid 19th century, followed by the location of industries and industrial agriculture located along the tributaries feeding into the delta, and on the shores of the Bay itself.

Shipping, particularly oil spills, and nuclear powered ships are additional major factors.

The illegal dumping of toxic chemicals, storm road runoff, dredging, inadequately designed sewage plant discharges, runoff from solid, and toxic landfills, and discharges from power plants, oil refineries, chemical/plastic plants, high tech industries, construction, commercial paints, port facilities, shipyards, military facilities, households, commercial real estate, chemicals from PG&E’s telephone poles, and hospitals are other important sources of Bay sediment/water pollution.

With improvements in chemical analytical technology the following are the major pollutants that have been well documented in the Bay water/sediment and that have been found in the many life forms that have existed in the S.F. Bay. They have bio-accumulated, and bio-magnified and have resulted in a tragic diminution of fish, Bay marine life (eg bivalves, crab, and other invertebrates), and migratory birds. The

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pollutants are widespread, if uneven, and contaminate all of the Bay's waters and sediments. They are:

- heavy metals (particularly mercury, lead, cadmium, chromium),
- dioxins,
- dibenzofurans,
- PCBs,
- polyaromatic hydrocarbons (PAHs),
- PBDEs (polybrominated diphenyl ethers),
- toxic pharmaceuticals (particularly hormone disruptors),
- personal care product chemicals,
- pesticides, fertilizer nitrates, and nitrites,
- solvents,
- detergents,
- plasticizers (eg bisphenyl A, and phthalates),
- plastic monomers.

Many chemical molecules breakdown into forms that often are more toxic than the original compound.

When catastrophic events occur, e.g. the Costco Buscan oil spill, the levels of these toxic compounds suddenly overwhelm all Bay life systems. In that case highly toxic bunker oil was distributed along all of the Bay shores. Such spills have, and will continue to happen periodically.

Q. Are there any other poisons in the Bay?

Yes. In addition to the Central Marin Sanitary Agency's 11-million gallon per day sewage outflow pipe located near the desalination intake pipe, there are six major sewage disposal plants which dump processed sewer water into the southern Bay waters a few miles south of the desalination intake pipe.

These aging plants frequently malfunction as the stench of these events often wafts over the Marin County air as hydrogen sulfide (a toxic rotten eggs stench) causing people downwind to quickly close their windows. Raw sewage spills from six sewage disposal plants frequently accompany these toxic gas emissions as millions of raw sewage gallons are dumped into the southern Bay waters annually. In 2008 alone, 6,723 million gallons of partially treated, or totally untreated sewage spills occurred in Southern Marin.

Treated sewage can contain biological contaminants such as bacteria, viruses and protozoa, critters borne of human feces.

They include giardia and other parasites such as:

- cryptosporidiosis - parasites of the bowels;
- trypanosomiasis - infection of uterus ;
- amebiasis - infected cysts.

Inherent in this Bay contamination source (the toilet) is a unique public health hazard aside from the pharmaceuticals, endocrine disruptors, heavy metals, and toxic organics referenced above.

Drug-resistant, highly virulent "superbug" microorganisms are produced in the mix that is coming from residents, hospitals, clinics, laboratories, and biotechnology. These are antibiotic resistant pathogens which are DNA-coded for antibiotic resistance. They have been contributing to the spread and virulence of these "superbugs" to the human community.

MRSA, or Methicillin-resistant Staphylococcus aureus, is a type of bacteria that is resistant to certain antibiotics. These antibiotics include methicillin and other more common antibiotics such as oxacillin, penicillin and amoxicillin.

Health care providers are well aware of the increasing incidence of MSRA and other new antibiotic resistant devastating infections. The genetic material is exchanged and antibiotic/chlorine resistance occurs in the mix of sewer plants. Microorganism pathogenicity, antibiotic resistance, and virulence is nurtured.

The shallow, calm and warm San Rafael Bay will become a living crucible of multiple toxic microorganisms bioaccumulating in an environment that will encourage synergistic interaction.

Q. Can't reverse osmosis filter out everything?

No. It can't. The water fed into a desalination system may introduce biological and chemical contaminants that are hazardous to human health. Biological contaminants include viruses, protozoa and bacteria. Chemical contaminants include regulated and unregulated chemicals, xenobiotics (including pharmaceuticals, endocrine disruptors and personal care products); and algal toxins such as paralytic shellfish poisoning.

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These DNA and viral sized particles will pass through the reverse osmosis filters and will inevitably enter Marin's potable water supply by means of reverse osmosis desalination.

Boron, arsenic, small petroleum molecules can also pass through the reverse osmosis membranes.

Q. Does reverse osmosis technology break down?

Yes. Desalination is neither magic nor perfect, and, like everything else, is subject to mechanical breakdown and human error.

Various causes of operational failures of existing worldwide desalination plants have been documented in peer reviewed engineering articles. Pipes, pumps, ejectors, valves, and, most importantly, the reverse osmosis membranes all have failed due to a variety of physical, and biological causes.

By a method of scientific analysis called "environmental scanning electron microscopy," science has established that the process of membrane fouling causes frequent and unpredictable failures of the reverse osmosis membrane-screens that constitute the heart of the operating system of the desalination plant.

Such membrane fouling is acute where sharp particles are pressed into the membrane's micro-ridges which causes the integrity of the membranes to tear. This type of breakdown is common.

Q. What will happen to us when there is desalination plant breakdown?

Each breakdown will have very serious implications for leaks of highly toxic chemical/heavy metal molecules as well as bacterial, viral/recombinant DNA microscopic particles.

When there is a tearing or other breakdown of the membranes, sewage-saturated, biologically and chemically contaminated bay water will blast directly into and be mixed with our reservoir-stored rainwater. The potential contamination of the desalinated product that will be supplied to the Marin users is a real concern. It has not been adequately studied. MMWD's Environmental Impact Report is inadequate.

Q. What are the health implications?

We do not want to trade our pure reservoir water for poisonous stuff growing in the waters of San Rafael Bay.

There are at present over 85, 000 chemicals in commercial use in the U.S. 10 to 15% of these are in "high volume" use. The vast majority of these have not been tested, but were grandfathered-in when the Toxic Substances Control Act was implemented in the 1970's.

The toxicologic testing that was done was only animal testing for acute effects. There was little or no testing for chronic or hormone disrupting multigenerational toxic effects.

None of the toxicological testing was done on the combinations of the multiplicity of chemicals that members of the public have adsorbed, and accumulated and which are present in the San Rafael Bay.

Testing for the major categories: carcinogens, mutagens, reproductive hazards (CMRs) are just now being adequately checked in Europe.

Recent scientific discoveries by chemical hormone disruptor researchers have pushed the EPA into finally considering a chemical hormone disruptor screening program that will begin over the next 10 years. These hormone disrupting effects occur with water exposures in ultra dilute concentrations (below parts per trillion) particularly putting embryos, fetuses, newborns, infants, and young children at developmental risk.

Certain diseases are increasing implicated as leading causes of disability and death. They are:

- a variety of cancers (breast, lung, leukemia, brain, lymphoma, prostate, pancreas, testicular, brain, melanoma, etc.);
- immune system dysfunction (decreased resistance to infectious diseases, autoimmune diseases);
- central nervous system dysfunction (Alzheimer's, Parkinson's, multiple sclerosis, learning dysfunction, memory loss);
- reproductive system dysfunction (infertility, birth defects, spontaneous abortions, premature

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births, defective sperm counts, developmental disabilities;

- dysfunctional sexual development, autism, low birth weight, birth defects), and
- epigenetic multigenerational effects.

Q. What can I do?

- Educate yourself and network with people who share your concerns.
- Join the Marin Water Coalition and volunteer your participation in the on-going activities aimed at stopping desalination in Marin.
- Make your voice heard. Write letters to the newspapers and to the MMWD board, go to MMWD public meetings and object during “Open Time,” and talk to your neighbors, businesses and friends.
- Donate money to support the lawsuit which challenges the adequacy of the Environmental Impact Report.

Send checks to:

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On the memo line put:

Marin Desalination Lawsuit

E.W.F. de Roever et al; Microscopy as a tool for analysis of membrane failure and fouling. Desalination 207 (2007) 35-44

J.N. Willard; Identification of surface chemical functional groups correlated to failure of reverse osmosis polymeric membranes. Microscopic Microanalysis 13(Suppl 2), (2007).

Field Manual of Wildlife Diseases, Chap. 36, Algal Toxins
http://www.nwhc.usgs.gov/publications/field_manual/chapter_36.pdf

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Cooley, Gleick & Wolff (Pacific Institute, 2006)
“Desalination, With a Grain of Salt”