



CITY OF FORT BRAGG

416 N. FRANKLIN, FORT BRAGG, CA 95437
PHONE 707/961-2823 FAX 707/961-2802

COUNCIL COMMITTEE ITEM SUMMARY REPORT

MEETING DATE: NOVEMBER 19, 2015
TO: PUBLIC WORKS & FACILITIES COMMITTEE
FROM: TOM Z. VARGA, PUBLIC WORKS DIRECTOR
AGENDA ITEM TITLE: RECEIVE REPORT REGARDING ALTERNATE WATER
SUPPLY TECHNOLOGIES

ISSUE:

Receive a report and have a discussion regarding the use of desalinization and related technologies to augment the City's water supply.

SUMMARY:

There are three primary technologies that have been brought to staff's attention: Reverse Osmosis (RO), Solar, and Fog Harvesting. They are discussed in greater detail below:

Reverse Osmosis:

There are several technologies that involve the process of Reverse Osmosis (RO). The basic process involves a solution of water containing unwanted, dissolved constituents (usually a variety of salts) and some sort of mechanism to force the dissolved constituents into a higher concentration solution, (brine), leaving behind drinking water in the original source. In general, the two greatest hurdles involving RO is brine disposal and the energy cost of forcing a solution into a higher concentration.

Zeolitic RO Membranes

A class of minerals, known as zeolites, has unusual physical and chemical properties allowing very specialized chemical reactions to take place. Artificial zeolites can also be created with highly tailored properties. Researchers from UCLA have developed RO membranes that include artificial zeolites and have greatly increased the efficiency of membranes to filter out unwanted dissolved constituents that requires significantly less energy, (and cost), to accomplish this. Staff has been in contact with these researchers to investigate the technology.

A paper by these researchers can be found at:

http://pdclab.seas.ucla.edu/Publications/AZhu/AZhu_ARahardianto_PDChristofides_YCohen_DWT_2010_15_Reverse_Osmosis_Desalination_High_Permeability_Membranes_Cost_Optimization_Research_Needs.pdf

Protein/Peptide Based Chemical Separation – “Molecular Separation Technology”

While not a traditional kind of RO depending on the use of osmotic pressure, this is still a process artificially forcing higher concentrations into a brine. Specially bio-engineered proteins are created to be scaffolds to hold places for chemical reactions that separate unwanted constituents from the source water. The separation works at a molecular level. Mr. Matthew Papa of Santa Rosa is developing this technology under the name of “Molecular Separation Technology”. What is noteworthy about this process is it creates a brine that is so concentrated, that the salts produced by this process are potentially recoverable and could be sold as a way to help defray costs.

Solar:

Solar desalinization takes advantage of the Sun’s power in one of two ways. First is to use solar radiation to power photo-voltaic cells that in turn provide power for a RO process. The other method is to focus the Sun’s rays on to a vessel where heat energy is used to drive a distillation process. Again, the brine produced by either process is difficult to dispose of. Solar power is most efficient and cost effective where there is a great deal of sunshine. The distillation process has been studied as a way to treat brackish water near Firebaugh in Fresno County in response to pollution issues associated with the Kesterson Wildlife Reserve.

Fog Harvesting:

This technology has been extensively studied in northern Chile where precipitation is almost non-existent, but nearby mountains are regularly covered by heavy fogs. It is a relatively simple technology that uses fine mesh nets on which water condenses on to when foggy air passes through them. The water is then collected from the nets for subsequent use. Depending on what may be carried by the fog, water quality can be an issue. A Fort Bragg resident, Mr. John Lovell, is developing a technology that greatly concentrates the surface area of these mesh nets into a smaller volume and increases the efficiency of the process. It has been tested on top of San Bruno Mountain in the Bay Area; analysis of the data is underway. It should be noted that these devices as well as the simpler nets are generally located 1,000 feet or higher to capture the most moisture laden air. Also, water is only collected during foggy conditions. This is typically not the weather pattern during the fall in Fort Bragg when water supplies tend to be at their lowest.

Many of these technologies are scalable making the build-up of treatment capacity over time a possibility. All of these technologies are non-mainstream water purification processes. Consequently, pilot projects to confirm the technology and its suitability for local circumstances would normally be expected. Also, additional infrastructure will be needed before the water produced can be introduced into the City’s water system. Additional storage tanks and associated plumbing will be needed since these treatment facilities will not be operating continuously. Many depend on environmental conditions that are not steady. Many will require at least periodic, additional treatment to remove any remaining contaminants. Most of these technologies produce brine or another similar waste product that need disposal. Even if useable materials (e.g. salts) can be recovered, they will generally have at best a small local market. Transportation costs to markets out of the area can be substantial.

RECOMMENDATION:

After the discussion, provide direction to staff to assist in developing the best way to pursue further investigation of these or other alternate water supply technologies. Staff recommends performing an engineering study at the concept level to vet and prioritize the available technologies as they may apply to the City Fort Bragg and our water supply needs.

ATTACHMENTS:

MST informational flyer

Web Links regarding Desalinization