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March 3, 2011

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Re: Proposed "Aquifer Storage and Recovery (ASR) wells for City of Cocoa Beach  
DEP Draft Permit No. 05-0224301-002-UC  
**Environmental Impact Statement (EIS) Required – Legal Liability**

Dear Ladies and Gentlemen:

This comment letter is in response to the notice of public meeting and comment for the draft permit referenced above for the City of Cocoa Beach ("city"), beginning at 10:00 AM, March 3, 2011 in the city commission room in Cocoa Beach, Florida. More than five years ago when I initially expressed my concerns to Mr. Watroba regarding aquifer injections, including so-called "aquifer storage and recovery" (ASR), he indicated that the public comment meetings appeared to be a waste of time because the public did not attend or provide comments. In my opinion that was the result of inadequate and inaccurate information provided to the public and municipalities by the agencies regulating and promoting aquifer injections in Florida and the consultants receiving substantial financial benefits from aquifer injections.

**Inadequate and Inaccurate Information**

1. **Response to inadequate and inaccurate information** - As a result of my concerns over the information and disinformation provided to the public and municipalities regarding aquifer injections in Florida I authored a peer-reviewed book for the purpose of providing more detailed, accurate and accessible information to the public regarding "ASR" (and other aquifer injections) in Florida. Please refer to **Attachment A**, which I am incorporating into my comments by reference. Hopefully this has facilitated an increased response from the public at these public comment events.

2. **Leaky “confining” layers** - In my opinion, the greatest disinformation may be the continuing implications (in both narratives and graphics) that the aquifer system has impenetrable “confining” layers and that groundwater flow does not occur. Neither is true, as described in **Attachment A**. See also the U.S. Environmental Protection Agency’s (USEPA, 2003) publication titled, “Relative Risk Assessment of Management Options for Treated Wastewater in South Florida.” This publication is incorporated by reference as **Attachment B** and includes the following statement:

The presence of the separating confining units (intermediate and middle), combined with the considerable depth to the deep-well injection zones, was considered to provide a sufficient level of protection to the water-bearing strata that supply public water. However, the relative safety of this disposal option is now in question because injected water is known to have migrated up to and, in some cases, into the USDWs (Underground Source of Drinking Waters).

3. **Hydrologic connections** - Additionally the USEPA’s risk assessment included aquifer discharges to marine waters because of “the hydrologic connections between groundwater and coastal embayments and estuaries” and the “strong interconnection of groundwater and surface waters.”

4. **Unintended fluid movement** - Although the USEPA concluded that 18 of the 93 facilities with deep injection wells in South Florida (including Brevard County) were “identified as having unintended movement of fluid out of the injection zone,” in my opinion the agencies’ methods of monitoring groundwater flow associated with the injection wells is grossly inadequate. I am confident that if dye-tracer studies were initiated for all existing injection wells that discharges to surface waters would be confirmed in all cases. Despite the gross inadequacies in monitoring, the report confirms that federal and state regulations have failed to prevent “migration” of injected waters beyond the “storage” zone.

5. **Arsenic** - In addition to the specific problems with aquifer injections described in **Attachment A**, including the negligible true “recovery” and the problems describe in the USEPA (2003) publication, additional serious problems with **arsenic** have been documented with “ASR” wells in that vicinity of the state. Attempts to develop functional “ASR” wells have failed in many areas because of arsenic contamination. The St. John’s River Water Management District (SJRWMD) has reported that arsenic leaching is problematic in approximately one-third to one-half of ASR test wells (City of Deland 2010a). Arsenic concentrations were so high in many cases that the “reclaimed” water couldn’t be used and may meet the definition of a hazardous waste subject to federal and state storage, treatment, and disposal regulations. The SJRWMD had to drill three “ASR” test wells in Deland, Florida because the first two failed. At the third ASR test well, high arsenic concentrations caused the SJRWMD to install an oxygen removal system to prevent (in theory) the flushing of arsenic into the recovery water. The annual cost to the City of Deland was \$16,558 for chemicals used in the pre-treatment of waters injected into the well (City of Deland 2010a; 2010b). The Peace River “ASR” (largest in the eastern U.S.) had arsenic levels exceeding the 10 ppb standard. Both the Kissimmee River ASR pilot well and Hillsboro ASR pilot wells also had arsenic levels exceeding the 10 ppb standard in their first cycle of testing (SFWMD, 2010, **Attachment C**). Cycle 1 testing of the Markham WTP ASR resulted in arsenic levels as high as 58 ppb, which were lowered only to still-excessive levels of 32 ppb using a Carbonair Arsenic Removal System.

6. **Stressors considered by USEPA** - Stressors included in the USEPA’s risk analysis remaining after secondary treatment included metals (which tend to bioaccumulate in the food chain, reaching toxic levels), nutrients (nitrogen, phosphorus, iron), volatile and synthetic organic compounds, bacteria and viruses, pathogenic protozoans, trihalomethanes (toxic to both humans and marine organisms), surfactants, and endocrine disruptors (known to cause reactions at extremely low concentrations).

7. **Stressors NOT considered by USEPA** - The USEPA’s risk assessment did **NOT** include the impacts of fluoride compounds, such as those that are added to municipal water in the “fluoridation” process. Not only did that risk assessment not consider the risk of consumption of and exposure to daily discharges of fluoride-contaminated water as a single contaminant for marine, aquatic and terrestrial organisms to, the risk assessment did not consider the combined or cumulative impacts of fluoride with other contaminants such as pesticides. The USEPA currently is being sued regarding its failure to consider the effects of pesticides on federally endangered and threatened animals and plants

(Center for Biological Diversity and Pesticide Action Network North America v. Environmental Protection Agency). The 2008 Drinking Water Quality Report for the Claude H. Dyal Water Treatment Plant, incorporated herein as **Attachment D**, confirms that Fluoride is being added to the municipal water. This report lists Fluoride under “INORGANIC CONTAMINANTS” and that the “Level Detected” in the municipal water in 2008 was 0.73 (ppm). This level exceeds the USEPA’s most recent recommendation for fluoride in municipal water. Ironically, instead of providing the precise source of this inorganic contaminant that is being added to the municipal water supply, the water quality report provides the following information for the Fluoride additive under “Likely Source of Contamination” section of this report:

Erosion of natural deposits; discharge from fertilizer and aluminum factories. Water additive which promotes strong teeth when at optimum levels between 0.7 and 1.3 ppm.

8. **Adverse impacts of fluoride** - Despite my repeated requests from agencies promoting fluoridation of municipal water as a dental amenity, none have produced a single scientific clinical study published in a peer-reviewed journal supporting such claims. Conversely, the adverse effects from exposure to and consumption of Fluoride are well documented. The most readily available source of fluoride used for fluoridation of municipal water is Hydrofluosilicic Acid – a hazardous waste product of the phosphate mining industry. A copy of that Material Safety Data Sheet (MSDS) from Mosiac (phosphate mining and fertilizer company currently attempting to expand mining in Florida) is incorporated herein as **Attachment E**. Health Hazards listed under Section II of that MSDS include:

Hydrofluosilicic acid is corrosive to the skin, eyes, and mucous membranes through direct contact, inhalation and ingestion. Large doses can cause nausea, vomiting, diarrhea, abdominal burning, and cramp-like pains. Circulatory, respiratory, nervous complaints, and skin rashes may occur. Liquid or vapor also causes severe irritation and burns, which may not be immediately apparent. It also causes severe irritation to the lungs, nose and throat. If swallowed, it can cause severe damage to throat and stomach.

This same section of Mosaic’s MSDS states, “No data available for this material” regarding its adverse effects on organs and developmental conditions. The “POTENTIAL ENVIRONMENTAL EFFECTS” line of the MSDS is blank. Under “SECTION XI – TOXICOLOGICAL INFORMATION” the “Mutagenesis,” “Target Organ,” “Developmental Toxicity,” and “Carcinogenicity” categories all state, “**No data available.**” Under “SECTION XII – ECOLOGICAL INFORMATION” the “ECOTOXICOLOGY” category also states, “**No data available.**”

9. **Adverse human effects from fluoride consumption and/or exposure** – Considering the chilling information provided in Mosaic’s MSDS, its ironic that the 2008 Drinking Water Quality Report (**Attachment D**) includes a photo of a smiling infant sitting in a tub of water. This irony is emphasized by the recent warnings issued by the Center for Disease Control and Prevention that fluoridated water should **NOT** be consumed by infants. Yet fluoride is a highly reactive contaminant that is absorbed readily through the skin and can be lethal if consumed by cows and horses. Results of published studies on adverse effects of fluoride on humans can be found at [www.FluorideAlert.org](http://www.FluorideAlert.org). See also the book “The Case Against Fluoride: How Hazardous Waste Ended Up in Our Drinking Water and the Bad Science and Powerful Politics that Keep it There” by Connett et al. In January 2011, the USEPA announced that additional research was required to evaluate the skeletal fluorosis caused by exposure to fluoride. Symptoms of early skeletal fluorosis include:

- \* **Pains in your bones and joints**
- \* **Burning, prickling, and tingling in your limbs**
- \* **Muscle weakness and Chronic fatigue**
- \* **Gastrointestinal disorders**

Examples of numerous other health problems associated with the accumulation of fluoride in your body include:

- \* **Hyperactivity and/or lethargy**
- \* **Arthritis**
- \* **Dental fluorosis (staining and pitting of teeth)**
- \* **Lowered thyroid function**
- \* **Lowered IQ, and dementia**
- \* **Disrupted immune system**

10. **Adverse effects on hydroperiod** - Production of the water that would be injected under the proposed permit includes a maximum of 60 millions of gallons per day (MGD) from groundwater wells in east Orange County in addition to extracting surface water from the Taylor Creek reservoir and 10 aquifer injection (“ASR”) wells. I have observed significant environmental damage from alterations in the natural hydroperiod from the production and injections of that water, including to habitat critical for the survival and recovery of federally endangered and threatened species such as the wood storks. None of those adverse effects were addressed in the proposed permit referenced above.

### **Environmental Impact Statement (EIS) Required**

11. **Discharge to the Indian River Lagoon and other navigable surface waters** - Although this draft permit is based on the premise that partially treated sewage effluent or other fluids injected into the aquifer system will remain where it is injected, the published scientific literature confirms that injected fluids flow rapidly away from the injection site. The rapid flow to unidentified locations also can mobilize and transport other underground pollutants, leading to widespread contamination of the aquifer system, supply wells, the Indian River Lagoon and other navigable surface waters, such as the Atlantic Ocean and canals. The Indian River Lagoon is an Estuary of National Significance and part of the Everglades Restoration effort.

12. **Adverse interaction with hydrologic or geologic features** - The injection of partially treated sewage also may interact negatively with hydrologic or geologic features in such a way as to release significant levels of arsenic or create additional new contaminants. As you are probably aware, investigations have been completed, are underway or are being considered in Florida regarding environmental and human health problems related to contaminated groundwater. A study recently completed by the U.S. Geological Survey has found widespread feminizing of black bass due to residual hormones from birth control pills and other hormone treatments that are seeping into waterways.

13. **Direct, indirect, secondary and cumulative impacts to marine species** - Aquifer injections create groundwater changes that can result in direct, indirect, secondary and cumulative impacts to marine species. For example, a large-scale fish kill occurred in the Florida Bay portion of Everglades National Park in July 2009. Florida Bay is adjacent to the Florida Keys, where similar partially treated sewage is injected into approximately 1,000 shallow wells located throughout the Florida Keys. Those injections are similar to the injections proposed by the Port. No comprehensive scientific study has been conducted to assess the direct, indirect, secondary and cumulative impacts of those and other aquifer injections in the Florida Keys, including impacts on marine species.

14. **Physical, chemical and biological change** - Changes to the groundwater caused by aquifer injections, such as the proposed “ASR” injections, can result in significant physical, chemical and biological changes in marine ecosystems. These changes include, but are not limited to: 1) predisposing organisms to disease via decreased resistance, 2) introducing new pathogens into the ground water and surface waters, 3) promoting the rapid evolution of dangerous microbes, 4) introducing hazardous chemicals, including endocrine disruptors, and 5) introducing excess nitrogen that causes harmful algae blooms. The adverse impacts to marine and aquatic life and human health from these types of aquifer injections and contaminated ground water mobilized by aquifer injections have been ignored.

15. **Dewatering impacts** - Adverse impacts associated with “ASR” wells are not confined to the injections, but can include dewatering of surrounding wetlands and other surface waters during periods of withdrawals and from sources supplying the water. In addition to adverse impacts from injected and mobilized pollutants flowing into neighboring wetlands, ditches, canals and other surface waters in the watershed, in my opinion the proposed “ASR” injections and withdrawals will adversely affect the natural hydroperiod of associated wetlands.

16. **Violation of federal laws** - In my opinion, the direct, indirect, secondary and cumulative impacts described above violate federal laws, including preventing the survival and recovery of and the unpermitted taking of federally endangered and threatened species. Those species may include, but are not limited to manatees, sea turtles and wood storks. Examples of the adverse impacts to federally

endangered and threatened species from aquifer injections are provided in my peer-reviewed publication included in **Attachment F** and incorporated by reference.

17. **No information on USFWS consultation** - The draft permit referenced above made no reference to formal (or even informal) consultations with the U.S. Fish and Wildlife Service regarding the inevitable taking of federally listed species that would result from the proposed aquifer injections. This critical information should have been included in the draft permit documents for public review and comment.

#### **Applicable Federal Laws and Legal Liability**

18. **Rivers and Harbors Act** - The Rivers and Harbors Act of 1899, 33 U.S.C. 403 et seq. provides that any construction affecting navigable waters and any obstruction, excavation, or filling, dumping, and dredging requires permits.

19. **Clean Water Act** - The stated purpose of the Clean Water Act, 33 U.S.C. 1281 et seq. is “to restore and maintain the chemical, physical, and biological integrity of the Nation's waters.” Pursuant to 33 U.S.C. 1365(b)(1)(A), a citizen suit under the Federal Water Pollution Control Act may be commenced against an alleged violator 60 days after a Plaintiff has given notice of the violation to the Administrator of the Environmental Protection Agency (EPA), to the state in which the violation occurs, and to the alleged violator.

20. **Endangered Species Act** - The Endangered Species Act (“ESA”) 16 U.S.C. 460 et seq. provides broad protection for species of fish, wildlife and plants that are listed as threatened or endangered in the U.S. or elsewhere. The ESA prohibits the "taking" of listed animals and, under certain circumstances, regulates destruction of habitat needed for feeding, reproduction, and shelter.

21. **Legal liability** - Based on reviews of such action as this proposed aquifer injection by attorneys, legal liability of proceeding with the proposed project appears to include common law trespass, nuisance, strict liability and negligence. If the city proceeds with its ill-conceived plans to inject wastewater, treated or otherwise, into the aquifer system discharging into the Indian River Lagoon, an Estuary of National Significance and part of the Everglades Restoration effort, the city as well as the regulatory agencies that have failed to implement federal regulatory requirements will be exposed to federal Court action seeking declaratory and injunctive relief, attorneys fees and costs pursuant to the above referenced statutes.

#### **Alternatives**

22. **Closed loop systems** - Environmentally sound alternatives are available to injection under the guise of “ASR” and aquifer-injection for the stated purpose of disposal. Infiltration of sewage effluent, including into wetlands, is **NOT** a viable alternative. This is because, as research has shown, the nutrients and other contaminants rapidly enter surrounding surface waters as shallow groundwater discharge. Closed-loop alternatives, such as those in California using reverse osmosis systems to recycle all previously discharged “waste water” for use again as potable water, would provide the most realistic, economical and environmentally conservative approach to resolving the city’s problems.

Thank you for the opportunity to provide public comments on the proposed aquifer-injection well referenced above. I look forward to the notice requesting comments on the draft EIS.

Sincerely,



Sydney T. Bacchus, Ph. D.  
Hydroecologist

#### **Attachments:**

A. Bacchus, S.T., 2005, Adverse Environmental Impacts of Artificial Recharge Known As "Aquifer Storage and Recovery" (ASR) In Southern Florida: Implications for Everglades Restoration.  
<http://www.thethirdplanet.org/downloads.html>

B. USEPA, 2003, Relative Risk Assessment of Management Options for Treated Wastewater in South Florida. April 2003. [www.epa.gov/region4/water/uic/ra.html](http://www.epa.gov/region4/water/uic/ra.html)

C. SFWMD, 2010, Aquifer Storage and Recovery Update. Larry Gerry, Chief Scientist, Federal and State Policy Division.  
[www.sfwmd.gov/portal/page/portal/xrepository/sfwmd\\_repository\\_pdf/rog\\_asr\\_20100520.pdf](http://www.sfwmd.gov/portal/page/portal/xrepository/sfwmd_repository_pdf/rog_asr_20100520.pdf)

D. 2008 Drinking Water Quality Report – Claude H. Dyal Water Treatment Plant

E. Mosaic’s Material Safety Data Sheet (MSDS) for Hydrofluosilicic Acid

F. Bacchus, S.T., 2001, Knowledge of Groundwater Responses – A Critical Factor in Saving Florida’s Threatened and Endangered Species, Part 1: Marine Ecological Disturbances

Other References

City of Deland, 2010a, Request for Commission Action. 4 October 2010.

City of Deland, 2010b Request for Commission Action. 28 September 2010.

SFWMD, 2010, Aquifer Storage and Recovery Update. Larry Gerry, Chief Scientist, Federal and State Policy Division. [www.sfwmd.gov/portal/page/portal/xrepository/sfwmd\\_repository\\_pdf/rog\\_asr\\_20100520.pdf](http://www.sfwmd.gov/portal/page/portal/xrepository/sfwmd_repository_pdf/rog_asr_20100520.pdf)

Connett, P., J. Beck and H.S. Micklem. The Case Against Fluoride: How Hazardous Waste Ended Up in Our Drinking Water and the Bad Science and Powerful Politics that Keep it There, published by Chelsea Green.

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