Re-Use System at SMARC

- SMARC has two wells and two pumps
    - Well and pump on McCarty Lane:
        - 466 g.p.m tied to a 40-kW diesel generator
        - The pump is 40 hp
        - The well is 436 ft deep
        - The 14 inch case is 240 ft deep
        - It has 4 inch pipe
    - Well and pump on Hunter Road:
        - 566 g.p.m. pump
        - The pump is 30 hp
        - The well is 285 ft deep
        - The 14 inch case is 132 ft deep
        - It has 6 inch pipe

- Re-Use system is Partially Constructed - The Service committed funding to a reuse system more than ten years ago. As a result the reuse systems foundation, building, plumbing, and electrical system are complete; however, due to delays in construction the Federal funding was not sufficient to complete the system. The system is not equipped with ozonation, CO^2, temperature, and standby power supply systems.

- Water Use will Double - EAHCP goals effectively double the number of organisms and aquatic holding systems at the SMARC. As a result, water use will effectively double to an average of 400ac-ft per year.
    - The reuse system increases productivity per unit of water input.
    - The reuse system would significantly reduce water usage to at an estimated 40 ac-ft per year.
    - This is based on the assumption that the SMARC would only require 10 to 20% make-up water due to evaporation, spillage etc.

- Flexibility in Operations - The reuse system provides flexibility for refugia particularly in lieu of any changes or additions that may occur through the EAHCP Adaptive Management Process. Currently the SMARC uses an average of 200 ac-ft per year of its permitted 566 ac-ft per year. If the SMARC doubles its capacity to 400 ac-ft per year it will result in only a 100 gpm reserve for alternate and future water use.

- Long-Term - The reuse system is also important given future projections of water use and availability. As water becomes more expensive and less available the value of reuse system will increase. Reductions in water use provide greater predictability of costs and reduce vulnerability to utility price volatility. Given the population growth projections for Central Texas there is a fair degree of certainty that water and utilities will increase in price as opposed to decrease.

- Sustainability - Reducing water requirements through conservation technologies and reclamation/recycling/reuse strategies is a core element of a sustainable facility. By minimizing water requirements, the facility is reducing the impacts on the entire water infrastructure including reductions in groundwater pumping, water treatment and its associated energy and chemical usage. The result is obtaining the most use from the least amount of water with the least impact, and may also result in reducing or eliminating the need for development of additional costly water resources in the future.

- Pumping Limits - The reuse system increases the SMARCs ability to provide functional refugia for all Covered Species by providing flexibility given the uncertainty that exists regarding regulatory agency and Service policy on water use and pumping. The SMARC has experienced at least three scenarios and has had two different regulatory agencies determine pumping limits.

- USFWS Policy - The SMARC is mandated to minimize use of Edwards Aquifer Water and will strive to increase and/or maximize reusable water capabilities (see *Biological Opinion for Edwards Aquifer Use by San Marcos National Fish Hatchery and Technology Center and Uvalde National Fish Hatchery* [Consultation No. 21450-2010-F-0066]. Additionally Federal Agencies must identify and implement water savings conserve and protect water resources through efficiency, reuse, and recycle, measures to achieve a reduction of water use by the end of fiscal year 2015 (see *Presidential Executive Orders 13514 and 13423* codified by the Omnibus Appropriations Act 2009).

- Backup - The reuse system also acts as a back-up system that can continue to circulate water thereby maintaining populations during well pump failure due to mechanical, pipe breakage or puncture, radio-link, and electrical failures. This has occurred more than once at the Center in the past.

- Estimated Costs
    - Estimated costs will have to be flushed out with engineering and go through the bid process.
        - 1.613 acre-foot/year = 1 gpm; so 566 acre-feet/year ÷1.613 acre-feet/gpm = 350 gpm
        - 350 gpm x 60min/h x 24 h/day = 504,000 gallons/day or 1,915,200 liters/day
        - Assuming a dose of 10 mg/l of ozone; would require 10 mg/l x 1,915,200 l/day = 19,152,000 mg/day or 19.152 kg/day or 0.798 kg/h
            - The Spartan Water Treatment Company MCP 14 would cover this range since it can make 10 wt% ozone at 0.984 kg/h.
            - The cost of this unit was $56,400.
        - To supply this with an oxygen concentrator, compressor, chiller and injection system would cost roughly: $197,400 for the major equipment.

The installed cost would be roughly $335,580 excluding buildings and tanks. If 100% redundancy, double the costs.

- Important to the program is the applied dose of ozone. Our application could be more or less, but is suspected to be more.
- Lastly, cost estimates do not include any other extraneous equipment such as the tanks, generator etc. USFWS engineering will determine what types of redundancy are truly needed and what size generator is needed. It is probable that not every component will need redundancy.

Photo 1: Existing Re-Use Infrastructure at SMARC

Photo 2: Existing Re-Use Infrastructure at SMARC

Attachment 1