April 4, 2022

Colonel James L. Booth, District Commander
U.S. Army Corps of Engineers, Jacksonville District
Jacksonville, FL 32207
Submitted electronically via OkeechobeeWatershedRestoration@usace.army.mil

Subject: LOWRP — Draft PIR/EIS

Dear Col. Booth:

These comments are related to the February 2022 report *Lake Okeechobee Watershed Restoration Project Draft Revised Project Implementation Report and Environmental Impact Statement (PIR/EIS)*[1], and prepared for Friends of the Everglades, Center for Biological Diversity and Sierra Club Florida, three non-governmental, non-profit organizations that advocate for protection of the Everglades.

The Lake Okeechobee Watershed Restoration Project (LOWRP) as presented in the draft PIR now consists of two components: Aquifer Storage and Recovery (ASR) and Paradise Run/Kissimmee River wetlands enhancement. The ASR component is roughly 85% of the costs[2] and as such represents the most significant component.

ASR has been the subject of considerable scientific uncertainty, and therefore, controversy. The National Academy of Sciences was asked as early as 2001[3] to evaluate the plan for scientific investigations into the feasibility of ASR in the Comprehensive Everglades Restoration Plan (CERP). These investigations were reported by the Corps of Engineers and the South Florida Water Management District (SFWMD) in the 2013 report knowns as the ASR Regional Study[4]. Those

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[1] accessed on March 12 from https://www.saj.usace.army.mil/LOWRP/

[2] Table ES-5, page ES-12

[3] National Research Council. *Aquifer Storage and Recovery in the Comprehensive Everglades Restoration Plan: A Critique of the Pilot Projects and Related Plans for ASR in the Lake Okeechobee and Western Hillsboro Areas*— 2001. Washington, DC: The National Academies Press. Accessible at https://www.nap.edu/catalog/10061/aquifer-storage-and-recovery-in-the-comprehensive-everglades-restoration-plan

[4] USACE and SFWMD. 2013. *Central and Southern Florida Project Comprehensive Everglades Restoration Plan: Final Technical Data Report*, **Comprehensive Everglades Restoration Plan Aquifer Storage and Recovery Pilot Project**. December, 2013 accessible at https://www.saj.usace.army.mil/Missions/Environmental/Ecosystem-Restoration/Aquifer-Storage-and-Recovery-ASR-Regional-Study/

investigations centered on characterizing the hydrogeology, which led to a recommendation to reduce the number of ASR wells from the 333 proposed in CERP to 131 (further investigations reduced this to 80 wells). In a review of the ASR Regional Study, the National Academy of Sciences[5] noted the progress on ASR, but also identified five areas of major uncertainty that needed to be addressed before it was clear that ASR would be viable on a regional scale in CERP. The primary concerns with ASR were not the technology of injecting and extracting water, but its efficacy in this particular application related to ecosystem restoration and flood control. The five areas of particular concern were 1) operations to protect water quality, 2) ecotoxicology risk, 3) potential for phosphorus reduction, 4) disinfection and treatment, and 5) costs.

The risk assessment done as part of the planning, described in Appendix B Section B.3[6], only partially incorporated those concerns. For example, the ecotoxicological risk is incorporated in RG13 as "Arsenic" and given a high risk level, while water quality (RG10) is seen as a water filtering issue, though still identified as high risk; phosphorus reduction and disinfection and treatment are not included. This is corrected in Annex D, Part 4, the ASR Science Plan, which largely is structured around investigating the uncertainties raised in the 2015 National Academy review.

The scientific review by the National Academy has proven far-sighted and accurate in identifying the specific areas of concern. Start with the cost: In the August 2020 draft report, the ASR component of 80 wells had an estimated total construction cost of $388 million, while the current draft estimates $780 million for 55 wells. Additionally, operational costs went from an expected $14.4 million per year in the 2020 draft to $33 million. Furthermore, these new costs raise serious questions about the cost of ASR relative to more conventional options. Assuming a 2.75% discount rate[7] and a 50 year project life, the lifetime operational costs translate to $890 million present value, giving a combined total total cost for ASR of $1.67 billion in present value. The ASR's previously touted low cost per acre-foot of storage has apparently dramatically risen, leading to questions of cost effectiveness compared to other options, which was exactly the point made by the scientific review. In the risk assessment in Appendix B[8], cost was estimated at $7 million per well pair, and only a "Medium" risk to project cost. Yet estimated cost in this draft was almost $28 million per well pair; ASR costs rose by 300% between this draft PIR and when the risk assessment in Appendix B was done.

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[5] National Research Council 2015. *Review of the Everglades Aquifer Storage and Recovery Regional Study*. Washington, DC: The National Academies Press. https://doi.org/10.17226/21724.
[6] Appendix B, Figure B-9, page B-14
[7] p. 4-11
[8] Appendix B, Figure B-6, p. Appendix B-12

Another area pointed out by scientific review as fundamentally important is potential toxicity. If there is even a modest risk that water returned from ASR is toxic to aquatic ecosystems, then the very premise of ASR in CERP is called into question. However, some of the tests in the ASR Regional study did point to potential risks, including reproductive effects on *Ceriodaphnia dubia (*water flea) and potential bioaccumulation of arsenic and other elements in fish and mussels. This led the reviewers to conclude:

> However, because the work raised several uncertainties, the committee judges that the findings are not yet conclusive enough to suggest that ASR is environmentally safe on a regional scale in south Florida. A more detailed understanding of potential toxicity, especially under chronic exposure and in situ conditions, is needed before incorporating ASR at a regional scale. This additional testing will reduce uncertainties associated with potential hazards to aquatic biota and significantly improve public perception and trust that broad-scale ASR is safe for protection of freshwater resources.[9]

The scientific review called for more robust risk assessment and toxicology testing. While not discussed in the text of the PIR[10], Annex D is referenced to indicate that the evaluation of any risks is to be considered there. Sections 7.2 to 7.6 of Annex D, Part 4 purport to spell out the details on planned assessments to address these risks, but lack details on what is proposed. For example, in response to the recommendation of a more robust risk assessment, the plan in Section 7.2 says: "The quantitative ecological risk assessment will incorporate all chemical, toxicity, bioaccumulation, and other data collected throughout the project (past and future studies) and available through relevant peer-reviewed literature into a comprehensive assessment to define the suitable receptor (e.g., periphyton, aquatic invertebrates, fish, amphibians) attributes based on the conditions expected in the modeled ecosystems." While the plan promises a comprehensive and exhaustive analysis, it does not include any mention of specific assessments that are planned. The same observation can be applied to toxicological assessments in Section 7-2; the issue is recognized, but no details are provided. Therefore, one must conclude that this PIR does not sufficiently address the fundamental question: "Is ASR safe for Everglades aquatic ecosystems?"

The PIR does recognize the potential for water quality impacts as one of the possible effects of ASR:

> While in storage, the recharged water may react with ambient water within the aquifer, and the minerals composing the aquifer matrix to form subtle chemical reactions that are difficult to predict, and can only be assessed during cycle testing. However, these chemical reactions typically are temporal, declining over

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[9] p.36

[10] Section 5, Risk and Uncertainty

time as a result of the gradual re-equilibration of conditions within the ASR zone.[11]

That is, the possibility of water quality issues, such as arsenic leaching, is recognized but will be temporary because the injected freshwater bubble will come to an equilibrium with the aquifer. This assumes that there is some maximum size of the bubble. Yet the hydrologic simulations of proposed ASR operations show that the maximum size of the bubble is not in equilibrium. The size of the bubble grows with any event that is larger than the previous one; this happens 4 times in the course of 50 years of simulation. The bubble appears to follow the well-known Hurst phenomenon, where the maximum bubble size increases with the length of operation.

The scientific review pointed out that operational modifications could reduce water quality impacts, which is essential if ASR is deployed regionally. As described above, Section 5.2.2 even suggests that the approach to limit water quality would be to enforce an equilibrium and not allow the maximum bubble size to grow with each larger event. However, in the Draft Operations in Annex C[12], the only constraint to operations is that outflow is limited to what was pumped in. The entire "*Operational Safeguards*" section reads: "Initial operations of the ASR wells have not been determined at this time."[13] Even the recognized risks and approaches to manage those risks were not incorporated into the operational plan.

An evaluation of the consequences of even this most fundamental of safeguards to protect water quality (e.g., limiting the maximum size of the bubble) was not included in this PIR, yet potentially would have significant effects on benefits. For example, if the total bubble size were limited to 308,000 acre-feet (the claimed effective storage), then there would potentially be an increase in discharges to the St. Lucie and Caloosahatchee estuaries, and the reported benefits would decrease. Thus, the uncertainty with respect to operations to protect water quality also calls into question whether or not the claimed benefits can be delivered while simultaneously protecting water quality. Similarly, it might be possible to add water quality treatment facilities, which would drive up the cost and potentially make ASR infeasible.

Given the magnitude of the potential risks associated with ASR and extent of the proposed scientific investigations and assuming that all of the studies are thorough and wrapped up in FY25[14], it is likely that some important findings will emerge. Yet the proposed schedule moves seamlessly from wrapping up the Science Plan in FY25,

[11] Section 5.2.2., p 5-50
[12] Section 7.1.1 p Annex C-8
[13] Section 7.1.1.1. p Annex C-9
[14] Annex D Part 4 Table 9-1

planning and design of ASR wells beginning in October of 2026[15], and then moving sequentially through five construction contracts. There is no mechanism to continuously evaluate and then modify the plan, suggesting that an entirely new Environmental Impact Statement will be required if anything significant is discovered.

What this suggests is that the only prudent way forward is to conduct the investigations in Annex D, Part 4, and then update the PIR to reflect the findings rather than move immediately and directly to full scale implementation. This will provide the requisite scientific foundation to assure the project will not adversely affect aquatic ecosystems, is cost effective, and provides the claimed benefits.

Friends of the Everglades, Sierra Club Florida, and Center for Biological Diversity respectfully request that the Corps of Engineers sufficiently determine whether ASR is safe for Everglades aquatic ecosystems before proceeding any further with LOWRP.

Sincerely,

Thomas Van Lent, Ph.D.

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[15] Appendix B, Figure B-2, page Appendix B-7