United States Department of Agriculture
Rural Development
Arizona State Office

DATE: February 22, 2013

SUBJECT: Hopi Arsenic Mitigation Project
Preliminary Engineering Report (PER)

TO: Loretta Orona, CP Specialist, Show Low, AZ (email)

FROM: Mike Luecker, RD Civil Engineer, Phoenix, Arizona

CC: Joel Trachtenberg, Acting CP Director, Phoenix, Arizona (email)

I have reviewed the Preliminary Engineering Report (PER) for the Hopi Arsenic Mitigation Project (HAMP), prepared by Brandon Beckman, P.E., Indian Health Service (IHS), Lakeside Arizona, dated April 2012, received by RD Engineer on September 25, 2012.

I attended a meeting at the Hopi Wellness center on August 21, 2013 to discuss the PER and also Environmental Assessment (EA) development, attended by tribal members, consultants working on the project and also staff from IHS and EPA. This meeting was very productive in discussing the PER development and also provided me with a better understanding of the project.

I offer the following comments:

1. Engineer's Seal: The PER needs to be stamped and signed by an Engineer licensed in Arizona.
2. General: It would be beneficial if the PER followed the outline of the recently developed PER Template, which was developed in a January 16, 2013 interagency memo, which included USDA-RD, HIS, EPA and HUD. My understanding is that Indian Health Service is moving forward immediately with implementation of this document.
3. RD Open and Free Competition requirements are identified in PART 1780 - WATER AND WASTE LOANS AND GRANTS, which is a policy document for this RD water and waste disposal program. Guidance to meet policy in Part 1780 is provided in RD memo dated 5/17/12 (attached). The Engineer should refer to this memo when preparing the PER. :
    a. Material selection: Multiple material types for waterline (PVC, HDPE, Ductile Iron, etc), water storage (welded steel, bolted steel, glass fused to steel, welded stainless steel, etc) should be considered. The Engineer should document the type of material(s) selected for the project. This can be addressed within the PER or it can be addressed during the design, with separate memo to RD (as outlined in 5/17/12 memo).

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4. Section 1.2, Project Background: The PER identifies that arsenic mitigation feasibility studies were completed. Please provide a copy of these studies (completed in 2007, 2008 and 2011 - PDF is acceptable).

5. Section 2.0, Project Planning Area:

   a. BIA Arsenic Treatment Systems: The PER identifies that water treatment systems are currently being employed to reduce arsenic. Is information regarding construction cost, system size/flowrate and operation and maintenance costs available on these systems, including the new system that is being installed in Keams Canyon (as noted in Section 8.0, which has a daily demand of 59,800 gpd)? This information would be beneficial when discussing treatment options, as noted in comments below.

   b. BIA Participation: The PER identifies that BIA may contribute funding and become an end user of the HAMP. The proposed system within the HAMP has been sized to accommodate flows to serve the BIA systems. The increased project scope and also projects costs associated with increasing the size of the project to serve the BIA system should be documented in the PER.

6. Section 2.3, Growth Areas and Population Trends: Population projections should be based on historical records with justification from recognized sources. The PER identifies that the 2000 and 2010 U.S. Census data appears to be inaccurate and grossly underestimates the actual population. The PER therefore uses population estimates from 2005, as developed in the Hopi Source Water Assessment, completed in 2006. In addition, a 2% growth rate was assumed. U.S. Census data from 2000 and 2010 must be used to identifying current population and to identify historical growth, which can also be used to estimate future population growth. The assumed population growth of 2 % results in population increasing of 49% over 20 years. RD loan and grant funds are to be used for projects that are modest in size, design, and cost. Typically, a modest growth rate is considered to be an increase of 20% to 30% over a 20-year period (this is equal to a yearly growth rate of about 1.0 to 1.25% over 20 years). The assumed growth rate in the PER should be based on historical records. It would be beneficial to also identify the source(s) from which population was determined in the 2006 report. In addition, this section of the PER identifies an existing population of 500 within the Keams Canyon area, which appears to conflict with the population and average daily demands identified in Section 8.0 (which identify combined usage of 87,445 gpd). Historical water system data, by service type, can also be used as supplemental information to identify population trends.

7. Section 3.0, Existing Facilities

   a. Treatment: It would also be beneficial to discuss the type/location of treatment that is currently being provided, which I understand is limited to chlorination.

   b. Existing Waterlines and Meters: The PER does a good job in providing system capacity related to storage and well capacity. The PER should also identify information on the existing waterlines, along with the number of meters on the system. Are maps available of the existing system showing pipeline location/size, which can be provided in the Appendix? Is leakage an issue or have any water/energy/waste audits been conducted? If audits are available, include as an appendix to the PER.

   c. Existing Components to be Abandoned: Section 3.6 identifies that the HAMP will relieve some of the existing O&M burden by eliminating several existing booster pumps,

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well pumps and chlorination systems. It would be helpful to quantity these items, relative to current size/condition, salvage value and O&M savings realized by eliminating these system components.

d. Section 3.7, Financial Status of Existing Facilities: The rates/monthly income should be provided, along with subsidies provided to cover O&M (from village, IHS, etc). Annual O&M costs (with breakdown of current energy costs), other capital improvement programs. Provide status of existing debts and required reserve accounts.

8. Section 4.2, System Operation and Maintenance: The PER identifies that a new utility authority is being pursued as a co-requisite to the project. The PER notes: *'As an element of regional system planning, IHS retained a consultant (GHD Inc.) to assist in the development of operations, maintenance, and management plans for the new facilities. The project is titled the Hopi Water System Strategic Plan (HWSSP) and is intended to assist the Tribe in creating a new self-sustaining utility enterprise and organization to support the operation, maintenance, and management of the regional system (see Appendix E).'* Appendix E is the Scope of Work for developing the HWSSP. In general, I support the effort in establishing a new utility authority, since having a plan for O&M is a condition that must be met for RD funding.

9. Section 4.3, Growth Considerations:

a. Section 4.3.1, Water Use Trends: The PER identifies per capita water usage as 30-50 gpcpd. Please provide data to support this. Meter records from multiple years should be provided within the PER to help estimate population projections and also per capita water use. Since the BIA system is being included in this project, meter records from the BIA system should also be included. Note that quantity of unaccounted for water (e.g., distribution system losses) should also be identified (well records can be compared to meter records to determine loss). Water use shall be determined based on Equivalent Domestic Units (EDUs), as follows:

A. Total Monthly Water Use

B. Total Residential Monthly Water

C. Total Number of Existing Residential Customers

D. Average Residential Customer Use = B/C (1 EDU)

E. Total System EDUs = A/D

b. Section 4.3.2, Planned Development: The planned community of Tawa'ovi is discussed in the PER, with an estimated 300 gpm future demand (equal to 86,400 gpd, which appears to be a substantial demand, when compared to demand projections within the HAMP, provided in Appendix B). A USDA-RD program decision may be needed to determine whether this is eligible for RD water program funding. RD funds are normally not used to finance new development. The PER does not clarify whether the proposed HAMP improvements are designed to supply the estimated 300 gpm average day demand at future build out. RUS Instruction 1780.11(c) says *"Developers are normally expected to provide utility-type facilities in new or developing areas in compliance with appropriate State statutes. RUS financing will be considered to an eligible applicant only in such cases when failure to complete development would result in an adverse economic condition for the rural area (not the community being developed); the proposal*

is necessary to the success of a current area development plan; and loan repayment can be assured by: ..." The PER does not discuss whether this condition is satisfied.

10. Section 5.0, Alternatives Considered:

    a. Section 5.1, Treatment: Costs for a treatment alternative should be provided. This would include a life-cycle cost (include capital, and also operation and maintenance costs). As comparison, it would be helpful to identify the capital costs and also current O&M costs for the BIA systems, including flowrates. Do the current wells have the capacity (production rate) to meet existing and future demands within each Mesa? If not, what additional well capacity is needed? Costs for providing additional wells should be included in this alternative.

    b. Table 5.1.1 – Water Quality Summary: What is the water quality for Keams Canyon Wells 2 and 3 non-composite? What is the water quality of Polacca Well #5? What are the historical water quality levels and production rates? (Has arsenic been stable/increasing/decreasing/etc over time). It would be helpful to identify Maximum Contaminant Levels for all EPA primary standards.

    c. Section 5.1.2 – Treatment Conclusion: It is concluded that '*arsenic treatment systems would be burdensome and that arsenic compliance issues would likely persist.*' The PER should provide quantitative data to support this conclusion. What are the treatment options available? Identify capital, operation, and maintenance and life cycle costs. If adequate treatment technologies are provided, why would compliance issues persist?

    d. Table 5.2 – Turquoise Trail Water Quality Data: What are the historical water quality levels and production rates? (Has arsenic been stable/increasing/decreasing/etc over time). What are the solids and turbidity levels for the NTUA well? It would be helpful to identify Maximum Contaminant Levels for all EPA primary standards.

    e. Section 5.X New Alternative; Treatment First Mesa and Turquoise Wells Second Mesa: All three alternatives (A, B and C) are variations based on providing water to both First and Second Mesa from the new well fields in the Turquoise Trail region. Based on the existing and projected population (Table 2.3) and also existing and projected water usage (Appendix B), First Mesa constitutes about 2/3 of the demand (not including the BIA demands). Second Mesa has a smaller demand, similar to the BIA Keams Canyon system (which is currently being upgraded with a treatment system, as noted in Section 8.0). Is it technically feasible for treatment systems to be provided on Second Mesa, with First Mesa being served by the new well fields from the Turquoise Trail region? Would this option also be compatible with the proposed/future LCR pipeline? This alternative would be a combination of the treatment alternative and Alternative B. The PER should identify whether this alternative is technically feasible, and if so, it should be evaluated.

    f. Section 5.X New Alternative; Well Rehabilitation First Mesa and Second Mesa: Do the existing well bores display distinct zonal differences throughout their extent, which could make them candidates for rehabilitation to reduce arsenic? Could new wells be drilled with casing off portions of the bore to reduce arsenic concentrations? Was this discussed in any of the previous hydrogeological studies? If this alternative is not considered technically feasible, then an explanation/discussion should be provided in the PER.

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g. Section 5.3-5, Alternative A-C, Proposed Tanks: The PER should discuss how storage volumes were determined for the proposed tanks, with consideration of the existing storage capacities available, along with existing and projected water usage.

h. Section 5.6, Alternative D, Do Nothing: A compliance deadline of January 23, 2015 is identified. Has a notice of violation been issued? If so, it would be helpful to include as an Appendix to the PER.

11. Section 6.0, Selection of an Alternative

a. Section 6.2, Selection Criteria: The Environmental Assessment is not complete. Three of the selection criteria are based on the EA.

b. Section 6.2.15, Water Rights Compatibility: The PER acknowledges that Alternatives B and C are more compatible with the proposed LCR pipeline. What benefits would there be to having the pipe adjacent to the LCR pipeline? Would this reduce the capital cost of the LCR pipeline (in the future) or possibly the HAMP project?

c. Section 6.3, Present Worth Life-Cycle Cost: Operation and Maintenance costs have not been provided. This is needed in order to prepare a present worth life-cycle cost analysis. This is needed in order to determine the preferred alternative.

d. Section 6.4, Decision Scoring Matrix: A matrix rating system is useful on displaying information on each alternative. RUS Instruction 1780 defines outlines the policies and procedures for making and processing direct loans and grants for water and waste projects. Part 1780.10 identifies that '*loan and grant funds may not be used to finance facilities which are not modest in size, design, and cost.*' Further, RD Bulletin 1780-2 further identifies that *'if the range of present worth values is small, then non-monetary factors should be considered in determining which alternative should be selected.'* It is not clear how the selected alternative provides the best value, based on the somewhat qualitative and subjective non-monetary rankings that were developed. In general, a ranking matrix is useful in screening and also determining a selection when the range of present worth values is small. Life cycle and present worth values need to be developed, in order to determine the recommended alternative.

12. Section 7.0, Proposed Project (Recommended Alternative)

a. Section 7.1.2 Treatment: The PER identifies that chlorination will be achieved by means of sodium hypochlorite solution injection at the well head. The PER should discuss the feasibility of using existing chlorinators within each Mesa. Also, will residuals be an issue further downstream? (as compared to chlorination further downstream in the distribution system)

b. Section 7.1.6, Pipe Selection: Specific pipeline materials are identified. As discussed above, RD Open and Free Competition require the Owner and Engineer to consider all materials normally suitable for the project commensurate with sounds engineering practices and project requirements. The PER identifies that HDPE is not likely to be cost effective in high pressure applications. If it is still technically feasible to use HDPE, it would be preferred to specify both DIP and HDPE, to determine the most cost effective material. Please review pipeline materials selected and evaluate whether other materials may be suitable. This can be evaluated within the PER or as part of the design development.

c. Section 7.5, Annual Operating Budget: This section is incomplete.

13. Section 8.0, Consideration of BIA Systems: The PER identifies that an arsenic treatment system is currently being constructed within Keams Canyon in response to EPA compliance deadline. The demand of BIA Keams Canyon system is a majority of the flow from BIA system that may be connected to the HAMP. Will this new system be abandoned if the BIA is served by the HAMP? Could the treatment system from Keams Canyon be salvaged and used elsewhere within the HAMP (on Second Mesa)? How will Keams Canyon and the Hopi High School be connected to the HAMP, as schematics do not show new or existing pipes connecting from these areas to the HAMP?

14. Section 9, Conclusions and Recommendations: It is identified that '*the proposed HAMP project will cost end users less to operate and maintain than would treatment systems.....Despite the lure of lower initial capital cost, implementing arsenic treatment technologies in the region is clearly not in the best interest of the Hopis or the United States Government.*' I cannot concur with this statement, since the PER does not quantify this statement. In order to do so, a treatment alternative should be evaluated, with operation and maintenance costs identified. Also, while operation and maintenance costs are a consideration within the selection of an alternative, the life cycle costs (which include capital costs) are typically the basis in recommending the preferred alternative that is modest in size, design, and cost.

RECOMMENDATION:

I recommend that comments be addressed and a revised PER be submitted for review. I will be glad to meet with the Hopi Tribe and/or their Engineer to discuss these comments.

Michael A Luecker

MICHAEL A LUECKER, P.E.
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Enclosure

Open and Free Competition Memo – Guidance to meet policy in Part 1780, 5/17/12

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