REMEDIAL INVESTIGATION / FEASIBILITY STUDY
SCOPE OF WORK
BAHAMA AVENUE AND BIMINI LANE
WATER QUALITY ASSURANCE REVOLVING FUND REGISTRY SITE
LAKE HAVASU CITY, ARIZONA

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REMEDIAL INVESTIGATION / FEASIBILITY STUDY SCOPE OF WORK FOR THE BAHAMA AVENUE AND BIMINI LANE WQARF SITE

The Bahama Avenue and Bimini Lane Water Quality Assurance Revolving Fund (WQARF) Site (the Site) is located in Lake Havasu City, Mohave County, Arizona. During the Preliminary Investigation (PI) groundwater contamination of trichloroethene (TCE), tetrachloroethene (PCE) and thallium was detected above the respective Arizona Aquifer Water Quality Standards (AWQS). In addition, arsenic levels in shallow soils was above Soil Remediation Levels (SRLs), and PCE and TCE in shallow soil gas were above Soil Vapor Screening Levels (SVSLs). The site is generally bounded to the north by Industrial Boulevard, to the south by Palo Verde Boulevard, to the east by the Orion Lane alignment, and to the west by London Bridge Road. These boundaries are subject to change as new data is discovered during the Remedial Investigation (RI).

This scope of work was prepared in accordance with Arizona Revised Statute (A.R.S.) §49-287.03 and Arizona Administrative Code (A.A.C.) R18-16-403 which requires a scope of work be prepared by the Department prior to implementing the RI and Feasibility Study (FS). The basic elements of this scope of work are detailed under the Arizona Administrative Code (A.A.C.) R18-16-403(B and C). Pursuant to A.R.S. §49-287.03(C), this scope of work shall be made available for public comment and the Department shall prepare a responsiveness summary to comments prior to implementation.

Remedial Investigation

According to A.R.S. §49-287.03(E), the RI shall collect the data necessary to adequately characterize the site or a portion of the site for the purpose of developing and evaluating effective remediation alternatives pursuant to the FS requirements in A.R.S. §49-287.03(F). The scope of work for a RI shall generally describe the extent of the RI based on site-specific conditions and information obtained from the PI. The RI shall provide for the preparation of the following, as applicable:

1. Characterization of soil and vadose zone contamination, including identification of sources;
   This may include soil and soil vapor surveys conducted in the potential source areas. This can be done using temporary boreholes or through the installation of permanent monitoring probes.
2. Characterization of groundwater contamination, including identification of sources;
   This shall include groundwater investigations in the area and on property where potential sources are located. Monitoring wells may be drilled and installed to aid in the data collection process.
3. Characterization of surface water contamination, including identification of sources;
   This may include surface water sampling of potentially impacted waters of the state.
4. Identification of actual and potential human and ecological receptors;
   This shall be conducted as part of developing the conceptual site model (CSM) and take

into consideration the complete, partially complete, and incomplete exposure pathways identified at the site through investigation.

5. Identification of current and reasonably foreseeable uses of waters of the state that have been or are threatened to be impaired;
   This shall be conducted as part of a Land and Water Use Study (LWUS) pursuant to A.A.C. R18-16-406(D) and directly aid in the development of site remedial objectives pursuant to A.A.C. R18-16-406(I).

6. Identification of current and reasonably foreseeable land uses that have been or are threatened to be impaired;
   This shall be conducted as part of a Land and Water Use Study (LWUS) pursuant to A.A.C. R18-16-406(D) and directly aid in the development of site remedial objectives pursuant to A.A.C. R18-16-406(I).

7. Assessment of current risk to public health;
   This may be conducted as a risk assessment or as a risk evaluation that identifies receptors, exposure pathways, and the associated risk determined by standards or health-based screening levels.

8. Assessment of ecological risk.
   This may be conducted as a risk assessment or as a risk evaluation that identifies impacted species, exposure pathways, and the associated risk.

9. Development of Remedial Objectives.
   Remedial Objectives (ROs) will be developed pursuant to A.A.C. R18-16-406(G, H or I) as applicable and included in the Final RI Report.

The RI will also be conducted in accordance with the A.A.C. R18-16-406 which states that the RI for a site or a portion of a site shall:

1. Establish the nature and extent of the contamination and the sources thereof;
   This will include the extent and general characteristics of the site including important surface features, soils, geology, hydrogeology, meteorology and ecology. The extent and general characteristics of the hazardous substance released including physical state, concentration, toxicity, propensity to bioaccumulate, persistence and mobility. The extent, general characteristics and degree of the source of the release(s) will be established.

2. Identify current and potential impacts to public health, welfare, and the environment,
   This will include current and reasonably foreseeable exposure routes for the hazardous substance released such as inhalation, ingestion and dermal contact. Other factors such as sensitive populations that pertain to the characterization of the site or support the analysis of potential remedies will be identified. Current and reasonably foreseeable impacts to aquatic and terrestrial biota will be identified.

3. Identify current and reasonably foreseeable uses of land and waters of the state.
   This will include the collection of information regarding current and reasonably foreseeable uses of land and waters of the state that have been or are threatened to be impacted by the release. This will be included in the LWUS pursuant to A.A.C. R18-16-406(D).
4. Obtain and evaluate any other information necessary for identification and comparison of alternative remedial actions.
   This may include additional investigations, research, or studies associated with collecting data on possible remedial actions that will be capable of achieving the remedial objectives.

Feasibility Study

The FS is a process to identify a reference remedy and alternative remedies that appear to be capable of achieving remedial objectives and to evaluate them based on the comparison criteria to select a remedy that complies with A.R.S. §49-282.06. According to A.R.S. §49-287.03(F), the FS shall be fully integrated with the results of the RI and shall include an alternative screening step to select a reasonable number of alternatives in a manner consistent with the rules and procedures adopted in A.R.S §49-282.06. This scope of work for the FS generally describes the process for conducting the FS as prescribed in A.A.C. R18-16-407, and specifies potential additional work to be performed, taking into account the information gathered in the RI.

Prior to the development of the FS Report, an FS Work Plan (WP) will be prepared and will outline the contents of the FS Report pursuant to A.A.C. R18-16-407(B).

The FS shall provide for the development of a reference remedy and at least two alternative remedies, each will be detailed in the FS Report according to the following:

1. The reference remedy and alternative remedies shall be capable of achieving all of the remedial objectives.
   Each remedy shall be justified by its ability to achieve the site-specific ROs established for the site during the RI.

2. The reference remedy and each alternative remedy shall consist of a remedial strategy and all remedial measures employed.
   The remedial strategies that shall be considered are:
   a. *Plume remediation to achieve water quality standards for contaminants of concern in waters of the state throughout the site.*
   b. *Physical containment of the contaminants within definite boundaries.*
   c. *Controlled migration to control the direction or rate of migration but not necessarily to contain migration of contaminants.*
   d. *Source control to eliminate or mitigate a continuing source of contamination.*
   e. *Monitoring to observe and evaluate the contamination at the site through the collection of data.*
   f. *No action at the site.*

3. The reference remedy and any alternative remedies may include contingent remedial strategies or remedial measures to address reasonable uncertainties regarding the

achievement of remedial objectives or uncertain timeframes in which remedial objectives will be achieved.
Each remedy may describe any additional considerations or contingencies associated with the remedial strategy or measures.

4. The reference remedy and other alternative remedies shall be developed and described in sufficient detail to allow evaluation using the comparison criteria pursuant to A.A.C. R18-16-407(H).
   Each remedy shall be explained in detail so that comparisons of practicability, risk, cost, and benefit can be made.

5. The reference remedy shall be developed based upon the best engineering, geological, or hydrogeological standards or practice.
   Considerations shall include:
   a. *The information in the RI;*
   b. *The best available scientific information concerning available remedial technologies; and*
   c. *Preliminary analysis of the comparison criteria and the ability of the reference remedy to comply with A.R.S.* §49-282.06.

6. Based upon the evaluation and comparison of the reference remedy and the other alternative remedies developed, a proposed remedy shall be developed and described in the FS.
   This shall describe the reasons for selection of the proposed remedy including all of the following:
   a. *How the proposed remedy will achieve the remedial objectives;*
   b. *How the comparison criteria were considered; and*
   c. *How the proposed remedy meets the requirements of A.R.S. §49-282.06.*

If there was not sufficient work conducted during the RI to aid in the evaluation or screening of remedial strategies and technologies, additional work may be conducted.
This may include and not be limited to:

1. *Additional soil, soil vapor, indoor air, or groundwater investigations*
2. *Additional research into remedial technologies*
3. *Pilot Testing of potential remedial actions*
4. *Modeling*