

**REQUEST FOR STATEMENTS OF QUALIFICATIONS
FOR
FINAL DESIGN SERVICES FOR AERATION FACILITIES
TO REMOVE TRIHALOMETHANES**

City of Tolleson
9555 W. Van Buren
Tolleson, AZ 85353

SOLICITATION INFORMATION AND SELECTION SCHEDULE

Solicitation Title:	THM Removal Project
Release Date:	APRIL 22, 2011
NON-MANDATORY	MAY 12, 2011
Pre-Submittal Conference:	10:00 AM (local time, Phoenix, Arizona) Tolleson Wastewater Treatment Plant Conference Room 9501 W. Pima St. (1/4 mile South 91 st Ave. & Buckeye Rd) Tolleson, AZ 85353
Final Date for Inquiries	MAY 19, 2011
SOQ Due Date and Time:	JUNE 3, 2011 10:00 AM (local time, Phoenix, Arizona)
Letters to Final Listed Firms:	JUNE 10, 2011
Oral Interviews:	(if conducted) JUNE 22, 2011
Target City Council Award Date:	JULY 12, 2011
City Representative:	Paul Gilmore pgilmore@tollesonaz.org 623-474-4960

Notice Given By: Chris Hagen
City Clerk
Friday, April 22, 2011

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I. RFQ PROCESS; AWARD OF AGREEMENT

1. **Purpose; Scope of Work.** The City of Tolleson (the “City”) is issuing this Request for Statements of Qualifications (this “RFQ”) from qualified engineering consultants (“Vendors”) interested in providing professional consulting services to the City for final design services for aeration facilities to remove trihalomethanes from its potable water, as more particularly described in the Scope of Work attached to the sample Professional Services Agreement as Exhibit C (the “Services”), and incorporated herein by reference.
2. **Preparation/Submission of SOQ.** Vendors are invited to participate in the competitive selection process for the Services outlined in this RFQ. Responding parties shall review their SOQ submissions to ensure the following requirements are met.
 - 2.1 **Irregular or Non-responsive SOQs.** The City shall consider as “irregular” or “non-responsive” and reject any SOQ not prepared and submitted in accordance with this RFQ, or any SOQ lacking sufficient information to enable the City to make a reasonable determination of compliance to the minimum qualifications. Unauthorized conditions, limitations, or provisions shall be cause for rejection. SOQs may be deemed non-responsive at any time during the evaluation process if, in the sole opinion of the City:
 - a. Vendor does not meet the minimum required skill, experience or requirements to perform or provide the Service.
 - b. Vendor has a past record of failing to fully perform or fulfill contractual obligations.
 - c. Vendor cannot demonstrate financial stability.
 - d. Vendor’s SOQ contains false, inaccurate or misleading statements that, in the opinion of the City Manager or authorized designee, is intended to mislead the City in its evaluation of the SOQ.
 - 2.2 **Submittal Quantities.** Interested Vendors must submit **one (1) original and four (4) copies (five (5) total submittals)** of the SOQ. In addition, interested parties must submit **one (1) original copy** of the SOQ on a CD-ROM (or electronic media approved by the City) in printable Adobe or Microsoft Word format (or other format approved by the City). Failure to adhere to the submittal quantity criteria shall result in the SOQ being considered non-responsive.
 - 2.3 **Required Submittal.** The SOQ shall be submitted with a cover letter with an **original ink** signature by a person authorized to bind the Vendor. SOQs submitted without a cover letter with an **original ink signature** by a person authorized to bind the Vendor shall be considered non-responsive. The SOQ shall be a maximum of **twelve (12)** pages to address the SOQ criteria (excluding resumes, the Vendor Information Form, but including the materials necessary to address Project understanding, general information, organizational chart, photos, tables, graphs, and diagrams). Each page side (maximum 8 1/2” x 11”) with criteria information shall be counted. However, one page may be substituted

with an 11" x 17" sheet of paper, folded to 8 1/2" x 11", showing a proposed Project schedule or organizational chart and only having information on one side. Cover, back, table of contents and tabs may be used and shall not be included in the page count, unless they include additional project-specific information or SOQ criteria responses. The minimum allowable font for the SOQ is **11 pt**. Failure to adhere to the page limit and size criteria and font size shall result in the SOQ being considered non-responsive. Telegraphic (facsimile), electronic (e-mail) or mailgram SOQs will not be considered.

- 2.4 Vendor Responsibilities. All Vendors shall (a) examine the entire RFQ, (b) seek clarification of any item or requirement that may not be clear, (c) check all responses for accuracy before submitting an SOQ and (d) submit the entire SOQ by the SOQ Due Date and Time. Late SOQs will not be considered. A Vendor submitting a late SOQ shall be so notified. Negligence in preparing an SOQ confers no right of withdrawal after the SOQ Due Date and Time.
- 2.5 Sealed Submittals. All SOQs shall be sealed and clearly marked with the RFQ title, **THM Removal Project**, on the lower left hand corner of the mailing envelope. A return address must also appear on the outside of the sealed SOQ. The City is not responsible for the pre-opening of, post-opening of, or the failure to open, any SOQs not properly addressed or identified.
- 2.6 Address. All SOQs shall be directed to the following address: City Clerk, 9555 West Van Buren Street, Tolleson, Arizona 85353, or hand-delivered to the City Clerk's office by the SOQ Due Date and Time indicated on the cover page of this RFQ.
- 2.7 Amendment/Withdrawal of SOQ. At any time prior to the specified SOQ Due Date and Time, a Vendor (or designated representative) may amend or withdraw its SOQ. Any erasures, interlineations, or other modifications in the SOQ shall be initialed in **original ink** by the authorized person signing the SOQ. Facsimile, electronic (e-mail) or mailgram SOQ amendments or withdrawals will not be considered. No SOQ shall be altered, amended or withdrawn after the specified SOQ Due Date and Time.
3. Cost of SOQ Preparation. The City does not reimburse the cost of developing, presenting or providing any response to this solicitation. SOQs submitted for consideration should be prepared simply and economically, providing adequate information in a straightforward and concise manner. The Vendor is responsible for all costs incurred in responding to this RFQ. All materials and documents submitted in response to this RFQ become the property of the City and will not be returned.
4. Inquiries.
 - 4.1 Written/Verbal Inquiries. Any question related to the RFQ shall be directed to the City Representative whose name appears on the cover page of this RFQ. Questions shall be submitted in writing or via e-mail by the close of business on the Final Date for Inquiries indicated on the cover page of this RFQ or submitted verbally (A) at the Pre-Submittal Conference on the date indicated on the cover

page of this RFQ or (B) after the Pre- Submittal Conference but before the Final Date for Inquiries indicated on the cover page of this RFQ. Any inquiries related to this RFQ shall refer to the title, page and paragraph. However, the Vendor shall not place the RFQ title on the outside of any envelope containing questions, because such an envelope may be identified as a sealed SOQ and may not be opened until after the SOQ Due Date and Time.

- 4.2 Inquiries Answered. Written questions will be read and answered at the Pre-Submittal Conference on the date indicated on the cover page of this RFQ. Verbal or telephone inquiries directed to City staff **will not be answered.** Within two (2) business days following the Pre-Submittal Conference, answers to all questions received in writing or via e-mail or verbally at the Pre-Submittal Conference will be mailed, sent via facsimile and/or e-mailed to all parties who obtained an RFQ package from the City and who legibly provided their mailing address, facsimile and/or e-mail address to the City. No questions, submitted in any form, will be answered after the final date for inquiries listed on the cover of this RFQ.
5. Pre-Submittal Conference. A Pre-Submittal Conference will be held. The date and time of this conference is indicated on the cover page of this RFQ. This conference may be designated as mandatory or non-mandatory on the cover page of this RFQ. Additionally, if the Pre-Submittal Conference is designated as mandatory, failure to attend shall render that Vendor's SOQ non-responsive. Vendors are strongly encouraged to attend those Pre-Submittal Conferences designated as non-mandatory. The purpose of this conference will be to clarify the contents of this RFQ in order to prevent any misunderstanding of the City's requirements. Any doubt as to the requirements of this RFQ or any apparent omission or discrepancy should be presented to the City at this conference. The City will then determine if any action is necessary and may issue a written amendment or addendum to the RFQ. Oral statements or instructions will not constitute an amendment or addendum to this RFQ. Any addendum issued as a result of any change in this RFQ shall become part of the RFQ and must be acknowledged in the SOQ submittal. Failure to indicate receipt of the addendum shall result in the SOQ being rejected as non-responsive.
6. Public Record. All SOQs shall become the property of the City and shall become a matter of public record available for review, subsequent to the award notification, in accordance with the City's Procurement Code.
7. Confidential Information. If a Vendor believes that an SOQ or protest contains information that should be withheld from the public record, a statement advising the City Representative of this fact shall accompany the submission and the information shall be identified. The information identified by the Vendor as confidential shall not be disclosed until the City Representative makes a written determination. The City Representative shall review the statement and information and shall determine in writing whether the information shall be withheld. If the City Representative determines to disclose the information, the City Representative shall inform the Vendor in writing of such determination.

8. Vendor Licensing and Registration. Prior to the award of the Agreement, the successful Vendor shall (a) be licensed with the Arizona Corporation Commission to do business in Arizona and (b) have a completed Request for Vendor Number on file with the City Financial Services Department. The Vendor shall provide licensure information with the SOQ. Corporations and partnerships shall be able to provide a Certificate of Good Standing from the Arizona Corporation Commission.
9. Certification. By submitting an SOQ, the Vendor certifies:
 - 9.1 No Collusion. The submission of the SOQ did not involve collusion or other anti-competitive practices.
 - 9.2 No Discrimination. It shall not discriminate against any employee or applicant for employment in violation of Federal Executive Order 11456.
 - 9.3 No Gratuity. It has not given, offered to give, nor intends to give at any time hereafter, any economic opportunity, future employment, gift, loan, gratuity, special discount, trip favor or service to a City employee, officer or agent in connection with the submitted SOQ. It (including the Vendor's employees, representatives, agents, lobbyists, attorneys, and subcontractors) has refrained, under penalty of disqualification, from direct or indirect contact for the purpose of influencing the selection or creating bias in the selection process with any person who may play a part in the selection process, including the Selection Committee, elected officials, the City Manager, Assistant City Managers, Department Heads, and other City staff. All contact must be addressed to the City's Procurement Agent, except for questions submitted as set forth in Section 4, Inquiries, above. Any attempt to influence the selection process by any means shall void the submitted SOQ and any resulting Agreement.
 - 9.4 Financial Stability. It is financially stable, solvent and has adequate cash reserves to meet all financial obligations including any potential costs resulting from an award of the Agreement.
 - 9.5 No Signature; False or Misleading Statement. Failure to sign the SOQ, or signing it with a false or misleading statement, shall void the submitted SOQ and any resulting Agreement.
 - 9.6 Professional Services Agreement. In addition to reviewing and understanding the submittal requirements, it has reviewed the attached sample Professional Service Agreement including the Scope of Work and other Exhibits.
10. Award of Agreement.
 - 10.1 Selection. A Selection Committee composed of representatives from the City will conduct the selection process according to the schedule listed on the cover page of this RFQ. The Selection Committee will create a final ranking of the Vendors based upon its evaluation of (i) the SOQ, (ii) information provided by references and (iii) criteria outlined in this RFQ. The Selection Committee may select three, but no more than five finalists that may be invited for oral

interviews with the Selection Committee. If interviews are conducted, the City will conduct the oral interviews with the selected Vendors and upon completion of the final tabulation of points for scored components, will create a final list, in order of preference, of the three most qualified Vendors. The Selection Committee will enter into negotiations with the highest scoring Vendor from the final list, for entry into the single contract for his Project.

- 10.2 Form of Agreement. The selected Vendor will be required to execute the City's standard Professional Services Agreement in a form acceptable to the City Attorney. A sample of the standard agreement is included with this RFQ. If the City is unsuccessful in negotiating an Agreement with the highest-scoring Vendor, the City may then negotiate with the second, then third, highest-scoring Vendor until an Agreement is executed. City Council approval may be required. The City reserves the right to terminate the selection process at any time.
 - 10.3 Waiver; Rejection; Reissuance. Notwithstanding any other provision of this RFQ, the City expressly reserves the right to: (i) waive any immaterial defect or informality, (ii) reject any or all SOQs or portions thereof and (iii) reissue an RFQ.
 - 10.4 Protests. Any Vendor may protest this RFQ issued by the City, the proposed award of an Agreement, or the actual award of an Agreement. All protests will be considered in accordance with the City Procurement Code, and the protest policy and procedures of the Arizona Department of Administration, pursuant to ARIZ. REV. STAT. § 34-603(J). The City's Procurement Code is available from the City Clerk's office.
11. Offer. An SOQ submittal is an offer to contract with the City based upon the terms, conditions and specifications contained in this RFQ and the Vendor's responsive SOQ, unless any of the terms, conditions, or specifications is modified by a written addendum or agreement amendment. Provided, however, that no contractual relationship shall be established until the Vendor has signed, and the City has approved, a professional services agreement between the City and the Vendor in the form acceptable to the City Attorney. A sample Professional Services Agreement is included herein.

II. STATEMENT OF QUALIFICATIONS FORMAT; SCORING

Upon receipt of an SOQ, each submittal will be reviewed for compliance with the SOQ requirements by the Selection Committee. SOQs shall be organized and submitted in the format as outlined below. Failure to conform to the designated format, standards and minimum requirements shall result in a determination that the SOQ is non-responsive. Additionally, the Selection Committee will evaluate and award points to each SOQ based upon the scoring criteria as outlined in this document. Points listed below are the maximum number of points possible for each criteria and not the minimum number that the Selection Committee may award. The Selection Committee may conduct oral interviews with at least three, but not more than five, of the highest ranked Vendors based upon the identified scoring.

Section 1: General Information

5 pts

- A. One page cover letter as described in Section I, 2.3.
- B. Explain the legal organization of the Vendor. Provide identification information of the Vendor. Include the legal name, address, identification number and legal form of the Vendor (e.g., partnership, corporation, joint venture, sole proprietorship). If a joint venture, identify the members of the joint venture and provide all of the information required under this section for each member. If the Vendor is a wholly owned subsidiary of another company, identify the parent company. Provide the name, address and telephone number of the person to contact concerning the SOQ.
- C. Identify the location of the Vendor's principal office and the local work office, if different.
- D. Provide a general description of the Vendor that is proposing to provide the Services, including number of years in business.

Section 2: Licenses; Governmental References

5 pts

- A. Provide current licenses and certifications for all employees proposed to provide the services.
- B. Provide the names, address and telephone numbers for at least three (3) municipal or other local government references. If more than one reference cannot be contacted, the submission may be disqualified.
- C. Vendor Information Form (may be attached as separate appendix).

Section 3: Experience and Qualifications of the Vendor

35 pts

- A. Provide a description of projects in which the Vendor has served as Design and Planning Consultants on similar successful projects for organizations or municipalities of the same size as, or larger than, the City, completed within in the last three years. For each project, provide, at a minimum, the following:

- (i) Project description. Include details about how your project is similar to the one described in this SOQ.
 - a. Name of the company or organization.
 - b. Role of the firm.
 - c. Name of Project Manager for the project (state if still with the Vendor).
 - d. Organization name.
 - e. Contact name.
 - f. Contact address, telephone number, and e-mail address.

- B. Identify any contract or subcontract held by the company or officers of the company that have been terminated within the last five years. Identify any claims arising from a contract which resulted in litigation or arbitration within the last five years. Briefly describe the circumstances and the outcomes.

- C. Describe the firm's project experience in the following areas:
 - (i) Experience with THM removal studies and modelling.
 - (ii) Experience with potable water storage tank and appurtenances design.
 - (iii) Experience with applicable state and local regulatory agencies.

Section 4: Key Personnel

20 pts

- A. Provide an organizational chart showing key personnel to be involved in this Project and company affiliation. If a subcontractor will be used for all work of a certain type, include information on this subcontractor. A detailed plan for providing supervision must be included with the SOQ.

- B. Identify each key personnel member that will render services to the City including title and relevant experience required.

- C. Indicate the roles and responsibilities of each key position. Include senior members of the Vendor only from the perspective of what their role will be in providing services to the City. For each key personnel member identified, list at least two comparable contracts in which they have played a primary role. Provide:
 - (i) Description of the contract.
 - (ii) Role of the individual employee.
 - (iii) Contract owner reference information.

- D. Attach a brief résumé (two page maximum) and evidence of certification, if any, for each key personnel member and/or subcontractor to be involved in this Project. Résumés shall be attached together as a single appendix at the end of the SOQ and will not count toward the SOQ page limit.

- E. Describe the experience of the key project team members in the following areas:
- (i) THM removal studies.
 - (ii) Alternatives evaluation.
 - (iii) Potable water facility planning and design.
 - (iv) Process operation and optimization.
 - (v) Project management.
 - (vi) Regulatory compliance and regulatory agency coordination.

Section 5: Project Understanding and Approach

35 pts

- A. Provide a brief summary project indicating the Vendor's understanding of the Scope of Work described in the Professional Services Agreement in Exhibit C. Include a sample of the proposed schedule of Services.
- B. Describe the Vendor's project approach, including the following processes:
- (i) Planning.
 - (ii) Estimating.
 - (iii) Scheduling.
 - (iv) Cost controls.
 - (v) Project management and team organization during design and construction phase services.
 - (vi) Bid package management.
 - (vii) Management of overhead costs.
 - (viii) Managing subcontractors.
 - (ix) Quality control.
 - (x) Safety.
- C. Describe any alternate approaches if it is believed that such an approach would best suit the needs of the City. Include rationale for alternate approaches, and indicate how the Vendor will ensure that all efforts are coordinated with the City's general representation.
- D. Describe the firm's approach to completing the evaluation and developing the plan.
- E. Provide a detailed scope of the work.
- F. Provide recommended interaction and meetings with the City including interim deliverables and review.
- G. Provide a project schedule with major task breakdown and project milestones.
- H. Describe project management and project controls to be used to ensure timely completion of the plan.

Total Possible Points for SOQ:

100

III. ORAL INTERVIEWS; SCORING

Vendors selected for oral interviews will be invited to participate in discussions with the Selection Committee on the date indicated on the cover page of this RFQ and awarded points based upon the criteria as outlined below. Vendors may be given additional information for these oral interviews. These discussions will relate less to the past experience and qualifications already detailed in the SOQs and relate more to identification of the Vendor's program approach and to an appraisal of the people who would be directly involved in the Services for this RFQ.

Oral Interview

5	General Information
15	Experience and Qualifications of the Vendor
20	Key Personnel Experience
25	Project Understanding and Approach
10	Licenses; Governmental References
<u>25</u>	Questions and Answers
100	Total Possible Points for Oral Interview

IV. VENDOR INFORMATION FORM

By submitting an SOQ, the submitting Vendor certifies that it has reviewed the administrative information and draft of the Professional Services Agreement's terms and conditions and, if awarded the Agreement, agrees to be bound thereto.

_____ VENDOR SUBMITTING SOQ			_____ FEDERAL TAX ID NUMBER	
_____ PRINTED NAME AND TITLE			_____ AUTHORIZED SIGNATURE	
_____ ADDRESS			_____ TELEPHONE	_____ FAX #
_____ CITY	_____ STATE	_____ ZIP	_____ DATE	
WEB SITE: _____			EMAIL ADDRESS: _____	

**SAMPLE PROFESSIONAL SERVICES AGREEMENT
BETWEEN
THE CITY OF TOLLESON
AND**

THIS PROFESSIONAL SERVICES AGREEMENT (this "Agreement") is made as of _____, 2011, between the City of Tolleson, an Arizona municipal corporation (the "City") and _____, a(n) _____ (the "Consultant").

RECITALS

- A. The City issued a Request for Statements of Qualifications "Request for Statements of Qualifications for _____" (the "RFQ"), attached hereto as Exhibit A and incorporated herein by reference, seeking statements of qualifications from vendors for professional consulting services.
- B. The Consultant submitted a statement of qualifications in response to the RFQ (the "SOQ"), attached hereto as Exhibit B and incorporated herein by reference, and the City desires to enter into an Agreement with the Consultant for design engineering and consulting services for the City's _____ (the "Services").

AGREEMENT

NOW, THEREFORE, in consideration of the foregoing recitals, which are incorporated herein by reference, the following mutual covenants and conditions, and other good and valuable consideration, the receipt and sufficiency of which is hereby acknowledged, the City and the Consultant hereby agree as follows:

- 1. Term of Agreement. This Agreement shall be effective as of the date first set forth above and shall remain in full force and effect until _____.
- 2. Scope of Work. Consultant shall provide the Services as set forth in the Scope of Work, attached hereto as Exhibit C and incorporated herein by reference.
- 3. Compensation. The City shall pay Consultant an amount not to exceed \$_____.00 for the Services at the rates as set forth in the Fee Proposal, attached hereto as Exhibit D and incorporated herein by reference.
- 4. Payments. The City shall pay the Consultant monthly, based upon work performed and completed to date, and upon submission and approval of invoices. All invoices shall document and itemize all work completed to date. The invoice statement shall include a record of time expended and work performed in sufficient detail to justify payment.
- 5. Documents. All documents prepared and submitted to the City pursuant to this Agreement shall be the property of the City.

6. Consultant Personnel. Consultant shall provide adequate, experienced personnel, capable of and devoted to the successful completion of the Services to be performed under this Agreement. Consultant agrees to assign specific individuals to key positions. Consultant agrees that, upon commencement of the Services to be performed under this Agreement, key personnel shall not be removed or replaced without prior written notice to the City. If key personnel are not available to perform the Services for a continuous period exceeding 30 calendar days, or are expected to devote substantially less effort to the Services than initially anticipated, Consultant shall immediately notify the City of same and shall, subject to the concurrence of the City, replace such personnel with personnel of substantially equal ability and qualifications.
7. Inspection; Acceptance. All work shall be subject to inspection and acceptance by the City at reasonable times during Consultant's performance. The Consultant shall provide and maintain a self-inspection system that is acceptable to the City.
8. Licenses; Materials. Consultant shall maintain in current status all federal, state and local licenses and permits required for the operation of the business conducted by the Consultant. The City has no obligation to provide Consultant, its employees or subcontractors any business registrations or licenses required to perform the specific services set forth in this Agreement. The City has no obligation to provide tools, equipment or material to Consultant.
9. Performance Warranty. Consultant warrants that the Services rendered will conform to the requirements of this Agreement and to the highest professional standards in the field.
10. Indemnification. To the fullest extent permitted by law, the Consultant shall indemnify, defend and hold harmless the City and each council member, officer, employee or agent thereof (the City and any such person being herein called an "Indemnified Party"), for, from and against any and all losses, claims, damages, liabilities, costs and expenses (including, but not limited to, reasonable attorneys' fees, court costs and the costs of appellate proceedings) to which any such Indemnified Party may become subject, under any theory of liability whatsoever ("Claims"), insofar as such Claims (or actions in respect thereof) relate to, arise out of, or are caused by or based upon the negligent acts, intentional misconduct, errors, mistakes or omissions, in connection with the work or services of the Consultant, its officers, employees, agents, or any tier of subcontractor in the performance of this Agreement. The amount and type of insurance coverage requirements set forth below will in no way be construed as limiting the scope of the indemnity in this Section.
11. Insurance.
 - 11.1 General.
 - a. Insurer Qualifications. Without limiting any obligations or liabilities of Consultant, Consultant shall purchase and maintain, at its own expense, hereinafter stipulated minimum insurance with insurance companies authorized to do business in the State of Arizona pursuant to ARIZ. REV. STAT. § 20-206, as amended, with an AM Best, Inc. rating of A- or above with policies and forms satisfactory to the City. Failure to maintain insurance as

specified herein may result in termination of this Agreement at the City's option.

- b. No Representation of Coverage Adequacy. By requiring insurance herein, the City does not represent that coverage and limits will be adequate to protect Consultant. The City reserves the right to review any and all of the insurance policies and/or endorsements cited in this Agreement but has no obligation to do so. Failure to demand such evidence of full compliance with the insurance requirements set forth in this Agreement or failure to identify any insurance deficiency shall not relieve Consultant from, nor be construed or deemed a waiver of, its obligation to maintain the required insurance at all times during the performance of this Agreement.
- c. Additional Insured. All insurance coverage and self-insured retention or deductible portions, except Workers' Compensation insurance and Professional Liability insurance, if applicable, shall name, to the fullest extent permitted by law for claims arising out of the performance of this Agreement, the City, its agents, representatives, officers, directors, officials and employees as Additional Insured as specified under the respective coverage sections of this Agreement.
- d. Coverage Term. All insurance required herein shall be maintained in full force and effect until all work or services required to be performed under the terms of this Agreement are satisfactorily performed, completed and formally accepted by the City, unless specified otherwise in this Agreement.
- e. Primary Insurance. Consultant's insurance shall be primary insurance with respect to performance of this Agreement and in the protection of the City as an Additional Insured.
- f. Waiver. All policies, except for Professional Liability, including Workers' Compensation insurance, shall contain a waiver of rights of recovery (subrogation) against the City, its agents, representatives, officials, officers and employees for any claims arising out of the work or services of Consultant. Consultant shall arrange to have such subrogation waivers incorporated into each policy via formal written endorsement thereto.
- g. Policy Deductibles and/or Self-Insured Retentions. The policies set forth in these requirements may provide coverage that contains deductibles or self-insured retention amounts. Such deductibles or self-insured retention shall not be applicable with respect to the policy limits provided to the City. Consultant shall be solely responsible for any such deductible or self-insured retention amount.
- h. Use of Subcontractors. If any work under this Agreement is subcontracted in any way, Consultant shall execute written agreements with its subcontractors containing the indemnification provisions set forth in this Section and insurance requirements set forth herein protecting the City and Consultant. Consultant shall be responsible for executing any agreements with its

subcontractors and obtaining certificates of insurance verifying the insurance requirements.

- i. Evidence of Insurance. Prior to commencing any work or services under this Agreement, Consultant will provide the City with suitable evidence of insurance in the form of certificates of insurance and a copy of the declaration page(s) of the insurance policies as required by this Agreement, issued by Consultant's insurance insurer(s) as evidence that policies are placed with acceptable insurers as specified herein and provide the required coverages, conditions and limits of coverage specified in this Agreement and that such coverage and provisions are in full force and effect. Confidential information such as the policy premium may be redacted from the declaration page(s) of each insurance policy, provided that such redactions do not alter any of the information required by this Agreement. The City shall reasonably rely upon the certificates of insurance and declaration page(s) of the insurance policies as evidence of coverage but such acceptance and reliance shall not waive or alter in any way the insurance requirements or obligations of this Agreement. In the event any insurance policy required by this Agreement is written on a "claims made" basis, coverage shall extend for two years past completion of the Services and the City's acceptance of the Consultant's work or services and as evidenced by annual certificates of insurance. If any of the policies required by this Agreement expire during the life of this Agreement, it shall be Consultant's responsibility to forward renewal certificates and declaration page(s) to the City 30 days prior to the expiration date. All certificates of insurance and declarations required by this Agreement shall be identified by referencing the RFQ number and title or this Agreement. A \$25.00 administrative fee shall be assessed for all certificates or declarations received without the appropriate RFQ number and title or a reference to this Agreement, as applicable. Additionally, certificates of insurance and declaration page(s) of the insurance policies submitted without referencing the appropriate RFQ number and title or reference to this Agreement, as applicable, will be subject to rejection and may be returned or discarded. Certificates of insurance and declaration page(s) shall specifically include the following provisions:

- (1) The City, its agents, representatives, officers, directors, officials and employees are Additional Insureds as follows:
 - (a) Commercial General Liability - Under Insurance Services Office, Inc., ("ISO") Form CG 20 10 03 97 or equivalent.
 - (b) Auto Liability - Under ISO Form CA 20 48 or equivalent.
 - (c) Excess Liability - Follow Form to underlying insurance.
- (2) Consultant's insurance shall be primary insurance as respects performance of the Agreement.

- (3) All policies, except for Professional Liability, including Workers' Compensation, waive rights of recovery (subrogation) against City, its agents, representatives, officers, officials and employees for any claims arising out of work or services performed by Consultant under this Agreement.
- (4) A 30-day advance notice cancellation provision. If ACORD certificate of insurance form is used, the phrases in the cancellation provision "endeavor to" and "but failure to mail such notice shall impose no obligation or liability of any kind upon the company, its agents or representatives" shall be deleted. Certificate forms other than ACORD form shall have similar restrictive language deleted.

11.2 Required Insurance Coverage.

- a. Commercial General Liability. Consultant shall maintain "occurrence" form Commercial General Liability insurance with an unimpaired limit of not less than \$1,000,000 for each occurrence, \$2,000,000 Products and Completed Operations Annual Aggregate and a \$2,000,000 General Aggregate Limit. The policy shall cover liability arising from premises, operations, independent contractors, products-completed operations, personal injury and advertising injury. Coverage under the policy will be at least as broad as ISO policy form CG 00 010 93 or equivalent thereof, including but not limited to, separation of insured's clause. To the fullest extent allowed by law, for claims arising out of the performance of this Agreement, the City, its agents, representatives, officers, officials and employees shall be cited as an Additional Insured under ISO, Commercial General Liability Additional Insured Endorsement form CG 20 10 03 97, or equivalent, which shall read "Who is an Insured (Section II) is amended to include as an insured the person or organization shown in the Schedule, but only with respect to liability arising out of "your work" for that insured by or for you." If any Excess insurance is utilized to fulfill the requirements of this subsection, such Excess insurance shall be "follow form" equal or broader in coverage scope than underlying insurance.
- b. Vehicle Liability. Consultant shall maintain Business Automobile Liability insurance with a limit of \$1,000,000 each occurrence on Consultant's owned, hired and non-owned vehicles assigned to or used in the performance of the Consultant's work or services under this Agreement. Coverage will be at least as broad as ISO coverage code "1" "any auto" policy form CA 00 01 12 93 or equivalent thereof. To the fullest extent allowed by law, for claims arising out of the performance of this Agreement, the City, its agents, representatives, officers, directors, officials and employees shall be cited as an Additional Insured under ISO Business Auto policy Designated Insured Endorsement form CA 20 48 or equivalent. If any Excess insurance is utilized to fulfill the requirements of this subsection, such Excess insurance shall be "follow form" equal or broader in coverage scope than underlying insurance.
- c. Professional Liability. If this Agreement is the subject of any professional services or work, or if the Consultant engages in any professional services or

work adjunct or residual to performing the work under this Agreement, the Consultant shall maintain Professional Liability insurance covering negligent errors and omissions arising out of the Services performed by the Consultant, or anyone employed by the Consultant, or anyone for whose negligent acts, mistakes, errors and omissions the Consultant is legally liable, with an unimpaired liability insurance limit of \$2,000,000 each claim and \$2,000,000 annual aggregate. In the event the Professional Liability insurance policy is written on a “claims made” basis, coverage shall extend for two years past completion and acceptance of the Services, and the Consultant shall be required to submit certificates of insurance and a copy of the declaration page(s) of the insurance policies evidencing proper coverage is in effect as required above.

- d. Workers’ Compensation Insurance. Consultant shall maintain Workers’ Compensation insurance to cover obligations imposed by federal and state statutes having jurisdiction over Consultant’s employees engaged in the performance of work or services under this Agreement and shall also maintain Employers Liability Insurance of not less than \$500,000 for each accident, \$500,000 disease for each employee and \$1,000,000 disease policy limit.

- 11.3 Cancellation and Expiration Notice. Insurance required herein shall not expire, be canceled, or materially change without 30 days’ prior written notice to the City.

12. Applicable Law; Venue. In the performance of this Agreement, Consultant shall abide by and conform to any and all laws of the United States, State of Arizona and City of Tolleson, including but not limited to, federal and state executive orders providing for equal employment and procurement opportunities, the Federal Occupational Safety and Health Act and any other federal or state laws applicable to this Agreement. This Agreement shall be governed by the laws of the State of Arizona and suit pertaining to this Agreement may be brought only in courts in the State of Arizona.

13. Termination; Cancellation.

- 13.1 For City’s Convenience. This Agreement is for the convenience of the City and, as such, may be terminated without cause after receipt by Consultant of written notice by the City. Upon termination for convenience, Consultant shall be paid for all undisputed services performed to the termination date.

- 13.2 For Cause. This Agreement may be terminated by either party upon 30 days’ written notice should the other party fail to substantially perform in accordance with this Agreement’s terms, through no fault of the party initiating the termination. In the event of such termination for cause, payment shall be made by the City to the Consultant for the undisputed portion of its fee due as of the termination date.

- 13.3 Due to Work Stoppage. This Agreement may be terminated by the City upon 30 days’ written notice to Consultant in the event that the Services are permanently abandoned. In the event of such termination due to work stoppage, payment shall

be made by the City to the Consultant for the undisputed portion of its fee due as of the termination date.

13.4 Conflict of Interest. This Agreement is subject to the provisions of ARIZ. REV. STAT. § 38-511. The City may cancel this Agreement without penalty or further obligations by the City or any of its departments or agencies if any person significantly involved in initiating, negotiating, securing, drafting or creating this Agreement on behalf of the City or any of its departments or agencies is, at any time while the Agreement or any extension of the Agreement is in effect, an employee of any other party to the Agreement in any capacity or a consultant to any other party of the Agreement with respect to the subject matter of the Agreement.

13.5 Gratuities. The City may, by written notice to the Consultant, cancel this Agreement if it is found by the City that gratuities, in the form of economic opportunity, future employment, entertainment, gifts or otherwise, were offered or given by the Consultant or any agent or representative of the Consultant to any officer, agent or employee of the City for the purpose of securing this Agreement. In the event this Agreement is cancelled by the City pursuant to this provision, the City shall be entitled, in addition to any other rights and remedies, to recover or withhold from the Consultant an amount equal to 150% of the gratuity.

13.6 Agreement Subject to Appropriation. The provisions of this Agreement for payment of funds by the City shall be effective when funds are appropriated for purposes of this Agreement and are actually available for payment. The City shall be the sole judge and authority in determining the availability of funds under this Agreement and the City shall keep the Consultant fully informed as to the availability of funds for the Agreement. The obligation of the City to make any payment pursuant to this Agreement is a current expense of the City, payable exclusively from such annual appropriations, and is not a general obligation or indebtedness of the City. If the City Council fails to appropriate money sufficient to pay the amounts as set forth in this Agreement during any immediately succeeding fiscal year, this Agreement shall terminate at the end of then-current fiscal year and the City and the Consultant shall be relieved of any subsequent obligation under this Agreement.

14. Miscellaneous.

14.1 Independent Contractor. The Consultant acknowledges and agrees that the Services provided under this Agreement are being provided as an independent contractor, not as an employee or agent of the City. Consultant, its employees and subcontractors are not entitled to workers' compensation benefits from the City. The City does not have the authority to supervise or control the actual work of Consultant, its employees or subcontractors. The Consultant, and not the City, shall determine the time of its performance of the services provided under this Agreement so long as Consultant meets the requirements of its agreed Scope of Work as set forth in Section 2 above. Consultant is neither prohibited from entering into other contracts nor prohibited from practicing its profession

elsewhere. City and Consultant do not intend to nor will they combine business operations under this Agreement.

- 14.2 Laws and Regulations. The Consultant shall keep fully informed and shall at all times during the performance of its duties under this Agreement ensure that it and any person for whom the Consultant is responsible remains in compliance with all rules, regulations, ordinances, statutes or laws affecting the Services, including the following: (a) existing and future City and County ordinances and regulations, (b) existing and future state and federal laws and (c) existing and future Occupational Safety and Health Administration (“OSHA”) standards.
- 14.3 Amendments. This Agreement may be modified only by a written amendment signed by persons duly authorized to enter into contracts on behalf of the City and the Consultant.
- 14.4 Provisions Required by Law. Each and every provision of law and any clause required by law to be in the Agreement will be read and enforced as though it were included herein and, if through mistake or otherwise any such provision is not inserted, or is not correctly inserted, then upon the application of either party, the Agreement will promptly be physically amended to make such insertion or correction.
- 14.5 Severability. The provisions of this Agreement are severable to the extent that any provision or application held to be invalid by a Court of competent jurisdiction shall not affect any other provision or application of the Agreement which may remain in effect without the invalid provision or application.
- 14.6 Relationship of the Parties. It is clearly understood that each party will act in its individual capacity and not as an agent, employee, partner, joint venturer, or associate of the other. An employee or agent of one party shall not be deemed or construed to be the employee or agent of the other for any purpose whatsoever. The Consultant is advised that taxes or Social Security payments will not be withheld from any City payments issued hereunder and Consultant agrees to be fully and solely responsible for the payment of such taxes or any other tax applicable to this Agreement.
- 14.7 Entire Agreement; Interpretation; Parol Evidence. This Agreement represents the entire agreement of the parties with respect to its subject matter, and all previous agreements, whether oral or written, entered into prior to this Agreement are hereby revoked and superseded by this Agreement. No representations, warranties, inducements or oral agreements have been made by any of the parties except as expressly set forth herein, or in any other contemporaneous written agreement executed for the purposes of carrying out the provisions of this Agreement. This Agreement shall be construed and interpreted according to its plain meaning, and no presumption shall be deemed to apply in favor of, or against the party drafting the Agreement. The parties acknowledge and agree that each has had the opportunity to seek and utilize legal counsel in the drafting of, review of, and entry into this Agreement.

- 14.8 Assignment. No right or interest in this Agreement shall be assigned by Consultant without prior, written permission of the City signed by the City Manager and no delegation of any duty of Consultant shall be made without prior, written permission of the City signed by the City Manager. Any attempted assignment or delegation by Consultant in violation of this provision shall be a breach of this Agreement by Consultant.
- 14.9 Subcontracts. No subcontract shall be entered into by the Consultant with any other party to furnish any of the material or services specified herein without the prior written approval of the City. The Consultant is responsible for performance under this Agreement whether or not subcontractors are used.
- 14.10 Rights and Remedies. No provision in this Agreement shall be construed, expressly or by implication, as waiver by the City of any existing or future right and/or remedy available by law in the event of any claim of default or breach of this Agreement. The failure of the City to insist upon the strict performance of any term or condition of this Agreement or to exercise or delay the exercise of any right or remedy provided in this Agreement, or by law, or the City's acceptance of and payment for services, shall not release the Consultant from any responsibilities or obligations imposed by this Agreement or by law, and shall not be deemed a waiver of any right of the City to insist upon the strict performance of this Agreement.
- 14.11 Attorneys' Fees. In the event either party brings any action for any relief, declaratory or otherwise, arising out of this Agreement or on account of any breach or default hereof, the prevailing party shall be entitled to receive from the other party reasonable attorneys' fees and reasonable costs and expenses, determined by the court sitting without a jury, which shall be deemed to have accrued on the commencement of such action and shall be enforced whether or not such action is prosecuted through judgment.
- 14.12 Liens. All materials or services shall be free of all liens and, if the City requests, a formal release of all liens shall be delivered to the City.
- 14.13 Offset.
- a. Offset for Damages. In addition to all other remedies at law or equity, the City may offset from any money due to the Consultant any amounts Consultant owes to the City for damages resulting from breach or deficiencies in performance or breach of any obligation under this Agreement.
 - b. Offset for Delinquent Fees or Taxes. The City may offset from any money due to the Consultant any amounts Consultant owes to the City for delinquent fees, transaction privilege taxes and property taxes, including any interest or penalties.
- 14.14 Notices and Requests. Any notice or other communication required or permitted to be given under this Agreement shall be in writing and shall be deemed to have been duly given if (a) delivered to the party at the address set forth below, (b)

deposited in the U.S. Mail, registered or certified, return receipt requested, to the address set forth below, (c) given to a recognized and reputable overnight delivery service, to the address set forth below or (d) delivered by facsimile transmission to the number set forth below:

If to the City: City of Tolleson
9555 West Van Buren Street
Tolleson, Arizona 85353
Facsimile: (623) 907-2629
Attn: Reyes Medrano Jr., City Manager

With copy to: GUST ROSENFELD, P.L.C.
One East Washington Street, Suite 1600
Phoenix, Arizona 85004-2553
Facsimile: (602) 254-4878
Attn: Scott W. Ruby, Esq.

If to Consultant: _____

Facsimile: _____
Attn: _____

or at such other address, and to the attention of such other person or officer, as any party may designate in writing by notice duly given pursuant to this subsection. Notices shall be deemed received (a) when delivered to the party, (b) three business days after being placed in the U.S. Mail, properly addressed, with sufficient postage, (c) the following business day after being given to a recognized overnight delivery service, with the person giving the notice paying all required charges and instructing the delivery service to deliver on the following business day, or (d) when received by facsimile transmission during the normal business hours of the recipient. If a copy of a notice is also given to a party's counsel or other recipient, the provisions above governing the date on which a notice is deemed to have been received by a party shall mean and refer to the date on which the party, and not its counsel or other recipient to which a copy of the notice may be sent, is deemed to have received the notice.

14.15 Confidentiality of Records. The Consultant shall establish and maintain procedures and controls that are acceptable to the City for the purpose of ensuring that information contained in its records or obtained from the City or from others in carrying out its obligations under this Agreement shall not be used or disclosed by it, its agents, officers, or employees, except as required to perform Consultant's duties under this Agreement. Persons requesting such information should be referred to the City. Consultant also agrees that any information pertaining to individual persons shall not be divulged other than to employees or officers of Consultant as needed for the performance of duties under this Agreement.

14.16 Records and Audit Rights. Consultant's and its subcontractor's books, records, correspondence, accounting procedures and practices, and any other supporting

evidence relating to this Agreement, including the papers of any Consultant and its subcontractors' employees who perform any work or Services pursuant to this Agreement to ensure that the Consultant and its subcontractors are complying with the warranty under subsection 14.17 below (all the foregoing hereinafter referred to as "Records"), shall be open to inspection and subject to audit and/or reproduction during normal working hours by the City, to the extent necessary to adequately permit (a) evaluation and verification of any invoices, payments or claims based on Consultant's and its subcontractors' actual costs (including direct and indirect costs and overhead allocations) incurred, or units expended directly in the performance of work under this Agreement and (b) evaluation of the Consultant's and its subcontractors' compliance with the Arizona employer sanctions laws referenced in subsection 14.17 below. To the extent necessary for the City to audit Records as set forth in this subsection, Consultant and its subcontractors hereby waive any rights to keep such Records confidential. For the purpose of evaluating or verifying such actual or claimed costs or units expended, the City shall have access to said Records, even if located at its subcontractors' facilities, from the effective date of this Agreement for the duration of the work and until three years after the date of final payment by the City to Consultant pursuant to this Agreement. Consultant and its subcontractors shall provide the City with adequate and appropriate workspace so that the City can conduct audits in compliance with the provisions of this subsection. The City shall give Consultant or its subcontractors reasonable advance notice of intended audits. Consultant shall require its subcontractors to comply with the provisions of this subsection by insertion of the requirements hereof in any subcontract pursuant to this Agreement.

- 14.17 E-verify Requirements. To the extent applicable under ARIZ. REV. STAT. § 41-4401, the Consultant and its subcontractors warrant compliance with all federal immigration laws and regulations that relate to their employees and compliance with the E-verify requirements under ARIZ. REV. STAT. § 23-214(A). Consultant's or its subcontractor's failure to comply with such warranty shall be deemed a material breach of this Agreement and may result in the termination of this Agreement by the City.
- 14.18 Scrutinized Business Operations. Pursuant to ARIZ. REV. STAT. §§ 35-391.06 and 35-393.06, the Consultant certifies that it does not have scrutinized business operations in Sudan or Iran. For the purpose of this subsection the term "scrutinized business operations" shall have the meanings set forth in ARIZ. REV. STAT. § 35-391 or 35-393, as applicable. If the City determines that the Consultant submitted a false certification, the City may impose remedies as provided by law including terminating this Agreement pursuant to subsection 13.2 above.
- 14.19 Conflicting Terms. In the event of any inconsistency, conflict or ambiguity among the terms of the Agreement, the Scope of Work, the Fee Proposal, the RFQ and the Consultant's SOQ, the documents shall govern in the order listed herein.
- 14.20 Non-Exclusive Contract. This Agreement is entered into with the understanding and agreement that it is for the sole convenience of the City. The City reserves the right to obtain like goods and services from another source when necessary.

14.21 Cooperative Purchasing. This Agreement shall be for the use of the City. In addition, specific eligible political subdivisions and nonprofit educational or public health institutions may also participate, at their discretion and with the agreement of the awarded Consultant. In order to participate in this Agreement, a political subdivision or nonprofit educational or public health institution must agree to the terms and conditions in the solicitation and the Consultant must be in agreement with the cooperative transaction. Any orders placed to the successful Consultant will be placed by the specific agencies participating in this purchase. Payment for purchases made under this Agreement will be the sole responsibility of each participating agency. The City shall not be responsible for any disputes arising out of transactions made by others.

IN WITNESS WHEREOF, the parties hereto have executed this instrument as of the date and year first set forth above.

“City”

CITY OF TOLLESON, an Arizona
municipal corporation

Reyes Medrano Jr., City Manager

ATTEST:

Chris Hagen, City Clerk

“Consultant”

_____,
a(n) _____

By: _____

Name: _____

Its: _____

EXHIBIT A
TO
PROFESSIONAL SERVICES AGREEMENT
BETWEEN
THE CITY OF TOLLESON
AND

[RFQ]

See following pages.

EXHIBIT B
TO
PROFESSIONAL SERVICES AGREEMENT
BETWEEN
THE CITY OF TOLLESON
AND

[Consultant's SOQ]

See following pages.

EXHIBIT C
TO
PROFESSIONAL SERVICES AGREEMENT
BETWEEN
THE CITY OF TOLLESON
AND

[Scope of Work]

See following pages.

SCOPE OF WORK

I. Background:

The City of Tolleson's (the City) water system supplies potable water to approximately 6,500 customers in a six square mile area. The City has an agreement with the City of Phoenix (COP) for 10 years to purchase water, with an option for 10 additional years. The City purchases potable water from COP via two interconnections located at the intersections of 67th Avenue and Buckeye Road, and 83rd Avenue and Interstate (I-10) Freeway. In addition, the City owns and operates two wells, Well 7 and Well 8, each with a production capacity of 1 million gallons per day (MGD). Water from both wells is treated by the electro dialysis reversal (EDR) process. A third well (Well 4) is currently out of service due to high nitrate levels.

The City's current average water demand is approximately 3.4 MGD, of which approximately twenty percent is supplied by the wells. As part of the Stage 1 Disinfectants/Disinfection By-Products (D/DBP) Rule, the City began monitoring for trihalomethanes (THMs) and haloacetic acids (HAA5) in 2004. Based on the collected data, the City believes that it may not comply with the Stage 2 D/DBP Rule THM regulatory limits. The compliance would shift to a locational running average with the same regulatory limits for THMs and HAA5 as part of the Stage 2 D/DBP Rule which would be effective in April 2012. The City selected THM compliance sites based on the Initial Distribution System Evaluation. Based on a previous study, the City is intending to move forth with aeration for control of THMs. The City funded a pilot study that investigated two aeration processes. The study recommended spray aeration using Bete TF30FC (60°) nozzles for control of THMs.

The pilot study report recommended constructing a 6 MGD treatment aeration facility. The selected firm will develop final design drawings and specifications for the recommended facilities/improvements.

A copy of the pilot study report entitled "Aeration Treatment for Trihalomethane Compliance, Executive Summary", prepared by NCS Engineers and dated April 2011 is attached.

II. Scope of Services:

The following project elements have been preliminarily identified:

- a. Preliminary and final design of an aeration tank with nozzles and any additional auxiliary equipment for reduction of THMs.
- b. Ensure that the hydraulics and disinfection prior to construction of new facilities is maintained after the construction of new facilities.
- c. The selected firm will develop :
 - i. Update Preliminary Design Report
 - ii. 60% Design Submission
 - iii. 90% Design Submission
 - iv. 100% Design Submission

- v. Engineering Specifications
 - vi. Estimated Construction Costs
 - vii. Bidding Documents
 - viii. Permitting Requirements
- d. The selected firm may also assist the City in selection of a quality contractor for construction of THM removal facilities.
 - e. The selected firm may also assist the City as a construction management consultant during the construction phase.

EXHIBIT D
TO
PROFESSIONAL SERVICES AGREEMENT
BETWEEN
THE CITY OF TOLLESON
AND

[Fee Proposal]

See following page(s).

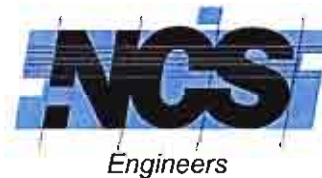
CITY OF TOLLESON



AERATION TREATMENT FOR
TRICHALOMETHANE COMPLIANCE

EXECUTIVE SUMMARY

April 2011



EXPIRATION DATE: 09/30/12

3660 North Third Street
Phoenix, AZ 85012
T. (602) 629-0206
F. (602) 629-0223

**CITY OF TOLLESON
AERATION TREATMENT FOR
TRICHALOMETHANE COMPLIANCE**

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**CITY OF TOLLESON
AERATION TREATMENT FOR
TRICHALOMETHANE COMPLIANCE**

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CITY OF TOLLESON AERATION TREATMENT FOR TRICHALOMETHANE COMPLIANCE

1.0 BACKGROUND

Over the past several years, the City of Tolleson (City) has performed research and conducted several studies relative to compliance with the Stage 1 and 2 Disinfectants/Disinfection By-Products Rules (D/DBP). These projects that NCS Engineers has assisted the City with included a Desk Top Analysis of Treatment Strategies, Development of an Updated Stage 1 DBP Sampling Plan, Initial Distribution System Evaluation (IDSE) Study and Modeling for Stage 2 D/DBP sample site selection, and Pilot Aeration Treatment Study for THM Removal.

The City's water system supplies potable water to approximately 6,500 customers in a six square mile area. The City has an agreement with the City of Phoenix (COP) for 10 years to purchase water, with an option for 10 additional years. The City purchases potable water from COP via two interconnections located at the intersections of 67th Avenue and Buckeye Road, and 83rd Avenue and Interstate (I-10) Freeway. In addition, the City owns and operates two wells, Well 7 and Well 8, each with a production capacity of 1 million gallons per day (MGD). Water from both wells is treated by the electro dialysis reversal (EDR) process. A third well (Well 4) is currently out of service due to high nitrate levels.

The City's current average water demand is approximately 3.4 MGD, of which approximately twenty percent is supplied by the wells. The current maximum demand for the City is 4.8 MGD. The 67th Avenue and Buckeye Road interconnection with the COP provide approximately 68 percent of the City's water demand. The City has storage at four locations, and the total storage capacity is four million gallons (MG).

As part of the Stage 1 D/DBP Rule, the City began monitoring for trihalomethanes (THMs) and haloacetic acids (HAA5) in 2004. To comply with the Stage 1 D/DBP Rule, a public water system (PWS) must be below THM and HAA5 levels of 80 and 60 ppb, respectively, on a running annual average (RAA) basis. However, the compliance criteria would shift to a locational running average (LRAA) with the same regulatory limits for THMs and HAA5 as part of the Stage 2 D/DBP Rule which would be effective in April 2012. Under the Stage 2 Rule compliance must be achieved at each sample location and without system wide averaging. Historically, the City has experienced high THM levels in the distribution system and has been concerned about its continued compliance with the D/DBP rule, and wishes to evaluate all possible short term and long term compliance options which may include validation/revision of existing compliance sampling locations, and treatment and non-treatment options.

2.0 PHASE 1 PROJECT - DESKTOP EVALUATION OF TREATMENT STRATEGIES

Based on the distribution system sampling data in 2004 to 2005, City has elevated levels of quarterly average THM levels ranging from 36.8 to 96.5 ppb, and quarterly HAA5 levels ranging from 11.1 to 87.8 ppb, and is concerned with future THM compliance. The estimated quarterly THM LRAA levels ranged from 56.8 to 108.6 ppb at the selected 11 sampling locations from October 2007 to July 2008. At the same sampling locations, HAA5 levels ranged from 16 to 36.3 ppb. These data clearly indicate that City may not meet THM regulatory limits unless additional treatment strategies are adopted. To control THMs and HAA5 in City's distribution system, the available options include treatment of preformed DBPs. Other options which may include reduced formation of DBPs by reducing level of precursors and optimizing disinfection practices can not be implemented as the City purchases its water supply. Treatment for preformed DBPs may include aeration, adsorption onto granular activated carbon, oxidation or blending. The objective of the Phase 1 of this project was to evaluate feasibility of these technologies as the City's compliance options.

2.1 Historical THM and HAA5 Data Trends

The THM and HAA5 data from March 2004 to January 2005 were obtained and analyzed for trends. Based on the analysis, the majority of the THMs observed in the City's distribution system can be attributed to the COP purchased water. The maximum quarterly average THM level of 96.5 ppb was observed during July 20, 2004 sampling event. The maximum quarterly average THM level of 103.8 ppb was observed at COP POEs during the January 19, 2005 sampling event. The maximum quarterly average HAA5 level of 87.8 ppb was observed during March 9, 2004 sampling event. The maximum quarterly average HAA5 level of 89.7 ppb was observed at COP POEs during the January 19, 2005 sampling event. The THM and HAA5 data were also evaluated for each species of DBPs. Based on the data, chloroform, bromodichloromethane, chlorodibromomethane and bromoform represented approximately 40, 27, 28 and 5 percent, respectively, of the total THMs observed at the COP POEs. Similarly, monochloroacetic, dichloroacetic, trichloroacetic, monobromoacetic and dibromoacetic acids represented approximately 8, 38, 45, 2 and 7 percent, respectively, of the total HAA5 observed at the COP POEs. The observed percentages were used to develop treatment objectives for each considered DBP control technology.

2.2 City of Tolleson Water Demand Data

The 2004 average and maximum water demands for the City were 3.4 and 4.8 MGD, respectively. The City utilized the 67th Avenue and Buckeye POE to supply approximately 67 percent of the water demands. The 83rd Avenue and I-10 POE and Well #8 supplied approximately 27 and 6 percent, respectively, of the water demands. The City's maximum water demands are expected to double to 10 MGD by 2015. Based on these data, the treatment technologies were compared for a treatment capacity of 5 MGD at each POE.

2.3 Evaluation of Treatment Technologies

The treatment objectives (80 percent of MCLs) for THMs and HAA5 were assumed at 64 and 48 ppb, respectively. The regulated DBPs represent a set of volatile and semivolatile individual DBPs. For volatile DBPs (such as chloroform), aeration technologies, such as tray aeration system, packed tower aeration, or diffused multistage bubble aeration, can be used. GAC is a treatment technology that is generally effective for control of brominated THMs and HAA5 (adsorption and biodegradation). These technologies were evaluated for control of THMs and HAA5 at COP POEs.

2.3.1 Granular Activated Carbon

Activated carbon systems use adsorption as the removal mechanism for dissolved contaminants from water. GAC has a large internal surface area and porosity thus allowing for dissolved contaminants to transfer out of solution and adsorb to its surface. Presence of bio activity on GAC also results in biodegradation of organic contaminants such as haloacetic acids. One of the important design criteria for the fixed bed adsorption process is empty bed contact time, which is the contact time of water with the GAC. Typical empty bed contact times (EBCTs) for control of synthetic organic compounds range from 5 to 20 minutes, and a 10 minute EBCT is typically used for removal of most organic compounds (USEPA, 1989). Pilot studies are conducted to determine the optimum EBCT and the corresponding carbon usage rate (CUR) (amount of GAC for treating a unit volume of water), which is the other important design consideration for the GAC process. To estimate performance of GAC process, mathematical models based on published data may also be used to estimate CURs for the purpose of comparing different feasible treatment alternatives. For the THMs and HAAs, CURs were estimated based their distilled water isotherms (Speth and Miltner, 1990) and then adjusted for background organics (USEPA, 1989). For a 5 MGD treatment capacity and a hydraulic loading rate of 5 gpm/ft² (gpm per square foot), seven contactors, each 12 feet in diameter were estimated. Each contactor would contain 5.3 feet of GAC. The estimated GAC replacement frequency is 72 days.

The GAC facility costs include equipment concrete pads, contactors, GAC media, flow controls, and piping. Each vessel would treat one-sixth of the total flow. GAC is backwashed during its initial installation to remove any fines in the bed. Additional backwashing of GAC bed may be required if headloss within the bed exceeds 6 to 8 psi. A backwash equalization basin would also be provided at each site for periodic processing of spent backwash water from the GAC vessels. Equalized spent filter backwash water can be discharged to a sanitary sewer. The units would be located outside on a concrete equipment pad. Primary operations and maintenance (O&M) costs include routine monitoring, power and carbon replacement costs. For a 5 MGD GAC treatment system, the estimated capital cost for the facility including pumping, equalization/recycle tanks, building, site work and other incidental costs was \$4.0 million. The annual operation and maintenance cost, which consist of expenses associated with power, semi-skilled labor, GAC replacement and chemicals required for settling solids in the backwash holding tank includes GAC replacement, are estimated at \$643,700. The 20 year present worth costs (based on 6 % interest rate) are estimated at \$7.4 million.

At exhaustion, GAC would either be reactivated by a certified facility or disposed in a municipal landfill. The spent GAC is expected to pass the Toxicity Characteristic Leaching Procedure (TCLP) test. It is possible that small amount of radon or other radionuclides may be observed in the

groundwater, and their adsorption onto GAC may lead to presence of radioactive material on the GAC. The level of radioactive contaminants, if observed in the future, would determine the final disposal practice of GAC and should be addressed at that particular time.

2.3.2 Aeration Technologies

Aeration Technologies remove organic contaminants from water by transferring them from the water phase to gas phase. The commonly used aeration technologies for control of volatile organic chemicals include packed tower aeration (PTA), tray aeration system (TAS) and diffused bubble aeration (DBA). Generally, the costs of these technologies are comparable and only TAS was chosen for costs. The operation of a TAS involves pumping the contaminated water to the top of a tower where it flows through a distribution device to evenly discharge the water over a series of trays which enhances the mass transfer rates. Several trays can be used to increase flow capacity or stripping efficiency. A blower introduces air at the bottom of the tower where it flows counter currently with the water. A contaminant's characteristics determine its effective removal by aeration, and the size of TAS is governed by the required removal efficiency of the contaminant. For example, TAS design parameter air-to-water ratio is contaminant-specific as it is related to its volatility. The air to water ratio determines the size of the system's blower size. Operating costs are primarily represented with energy costs associated with the pumping and blowers. Capital cost elements for TAS include the tower, internal column parts, trays, blower building, and any associated piping. Site specific costs may include a raw water holding tank, restaged well pump, chemical facility, noise control installation, and air emission control (EPA, 1990). Aeration strips carbon dioxide and depending on the water characteristics (such as pH, alkalinity and hardness), scaling can form on the TAS internals. Control of scales may require an acid feed system. Ancillary equipment includes piping and flow controls, a chemical feed system for acid washing the trays, and a waste chemical holding tank.

For conceptual design of the TAS, a vendor (Carbonair, Inc.) was contacted. Based on the physical characteristics of THM species, chloroform is the most volatile compound. Haloacetic acids are not expected to be removed by aeration because of their high solubility and low volatility. The vendor recommended five STAT 720 model TAS to treat 5 MGD of water. An additional STAT 720 will be provided for redundancy purposes. For the THM levels observed in COP water and their respective treatment objectives (see Table 1), a TAS system with two trays would be required. Each unit will be 12 ft (L) x 6 ft (W) x 7 (H). Additional trays can be added to enhance the removal of THMs and will be evaluated during the design phase of the project. The TAS units will be operated at an air to water ratio of 40 to 1.

Ancillary equipment includes piping and flow controls, a chemical feed system for acid washing TAS, waste chemical holding tank, and a building to house the blowers, controls and chemical feed systems. For a 5 MGD TAS treatment system, the estimated capital cost for the facility including pumping, building, site work and other incidental costs is \$2.6 million. The annual operation and maintenance cost, which consist of expenses associated with power, semi-skilled labor and chemicals are estimated at \$269,100. The 20 year present worth costs (based on 6 % interest rate) are estimated at \$3.1 million. It should be noted that effectiveness of aeration technologies for the HAA5 removals will be evaluated on bench/pilot scale testing before the TAS can be recommended for their removal.

The aeration technology will transfer contaminants into the atmosphere. At the influent and treated THM levels using the STAT720 TAS, the VOC emissions from a 5 MGD treatment facility are estimated at 1.7 pounds/day. This is below the threshold level 3 lbs/day DeMinimus quantity and 12.5 tons per year for requiring off-gas treatment. It is anticipated that the type of VOCs emitted from the Tolleson TAS treatment facility will not require additional treatment as these compounds are not regulated compounds by Maricopa County Environmental Services Department for air pollution control. Off-gas treatment technologies such as gas-phase GAC adsorption are capable of reducing, and in some cases eliminating, the discharge of VOCs from aeration technologies.

2.3.3 Other Aeration Technologies

There are other methods of aeration, including spray and surface aeration, which may be used for reducing volatile organics from water. However, application of these aeration methods has been very limited. An May 2008 Opflow article described how the Suisun-Solano Water Authority (SSWA) in California used nozzle spray aeration to reduce THMs from 120 ppb to 36.4 ppb (a 70 % reduction) in a one million gallon tank. Similar to SSWA, a small water system in Ontario, Township of North Shore, used showerheads for spray aeration, and reported THM reduction of less than 68% (actual numbers were not reported). The article (Opflow, September 2009) indicated that the testing would continue at the North Shore.

Based on a desktop study that compared spray aeration, surface aeration and TAS, the City of Phoenix developed a basis of design for surface aeration (City of Phoenix, Water Services Department, Project#WS85500369, June 2010). COP will install the surface aerator to field test its effectiveness for THM control at the Lower Mineral Road Reservoir. The decision to use surface aeration was based on model calculations to predict the THMs removal and preliminary cost estimates.

The existing tank has a capacity of 2 million gallons per day with average daily flow of 680,000 gallons per day. The peak reservoir outflow is 2.1 MGD. The water level in the reservoir varies from 5 to 25 ft, with an average water level of 13 ft. Based on the AWWA Water Quality and Treatment book procedure, 330 nozzles would be required for 40% THM reduction. It is not clear an air removal system for removal of saturated air from the tank was considered, or not. A surface aerator (Aqua Aerobic, Aqua Jet Aerator, 5 to 7.5 HP) was designed by using a model developed by the Michigan Technological University (MTU). Based on model simulation, a 41% THM reduction can be achieved using a 5 to 7.5 HP surface aerator for a water flow of 680,000 gallons per day. It should be noted here that the MTU model is for open to atmosphere conditions versus closes finished water reservoirs (personal communication, David W. Hand, MTU model developer). It is not clear if the closed reservoir conditions requiring continuous air removal system were considered for model calculations. As observed during the City's (see Phase 3 below) and North Shore pilot testing, removal of saturated air is a significant factor in reducing THMs. COP's basis of design report did not provide details of costs comparison but concluded that the surface aeration was the preferred alternative. However, the recommendation of the surface aeration is preliminary and without pilot testing.

It is noted that the costs for surface aeration in the Phoenix report appear to be underestimated as only the costs for the aeration equipment were considered. The actual costs for the tank structural modifications to accommodate the system and the tank re coating costs were much higher than anticipated. Costs of ventilation for the tank were also not considered. Based on these added costs NCS does not agree with the conclusion that surface aeration is a lower cost option.

2.4 Non Treatment Option

To meet growing water demands, City plans to construct new wells. The DBP levels in the City's groundwater are much lower than those observed in the COP purchase water. Assuming the COP water has the maximum THMs level of 80 ppb, it was estimated that a 50% COP/50% Well blend ratio (on an annual average basis COP supplies 68% of City's water) would produce a water that meets the THM MCL. The example shows that blending the two sources of water can result in City's compliance with DBP MCLs, the non-treatment option is a feasible option and City should compare present worth costs of non treatment options with the treatment options before making a final decision.

2.5 Recommended Treatment

Based on a comparison of the costs, aeration was recommended for THM control for the City. Pilot testing for TAS and spray aeration was recommended to develop design and operations information. Based on a review of the COP report on the surface aerator and discussions held with the manufacturer of the surface aerator, the application of surface aerator determination does not appear to be ideal. The following reasons are provided for not considering the surface aerator proposed in COP report:

1. The proposed aerator has not been tested in pilot or demonstration conditions for control of THMs. COP plans to test the aerator in a finished water storage tank.
2. NCS has estimated a cost of \$350,000 (not including the cost for aerator and its installation) for structural and coating costs associated with installation of the proposed aerator in COP finished water tank. The COP report estimated the total costs for installing the aerator, including any structural modifications, at \$240,000. The COP estimated costs appear to be much lower than those would be expected based on NCS estimated costs for tank improvements.
3. The estimated costs for installing 330 nozzles in a 2 MG tank is \$602,000. While these costs are not explained in the COP report, these cost appear to be much higher based on similar costs estimated for the City for 140 nozzles.
4. The anticipated THM removal may not be experienced in the COP tank because the model used assumed uncovered tanks while the finished water tanks must be covered. As observed during the City's testing, THM removal is impacted for covered versus uncovered tanks. Further, forced ventilation is required to replace saturated air with THMs.
5. For installation of surface aerators, approximately a head space of 3 to 4 ft would be required. Therefore, the amount of available storage would be reduced in City's tank. Additional storage would be required if a surface aerator similar to one proposed for COP is installed.
6. Several mechanical aerators may be required for the City at the 1 MG tank, due to the flow rate through the tank.

3.0 PHASE 2 PROJECT - HYDRAULIC MODELING TO SELECT IDSE SITES

As part of the Phase 2 Project, NCS completed the following tasks:

1. Distribution system hydraulic modeling to identify sampling locations for the Initial Distribution System Evaluation (IDSE) as required by the Stage 2 D/DBP Rule.
2. Surface water and groundwater samples were analyzed to investigate effectiveness of blending for compliance with D/DBP regulations:
 - a. The evaluation indicated that blending surface water with groundwater could be an effective strategy for the City's compliance with the D/DBP rules, however, surface water THM levels and detention times in the City's distribution system can influence compliance attainment.
3. Submitted an IDSE with MCLS standard monitoring plan to the Maricopa County Environmental Services Department (MCESD) for approval.
4. Analyzed the IDSE data and developed a report with Stage 2 compliance locations for submission to MCESD.

A total of eleven sites were selected for collecting DBP samples from October 2007 to July 2008. Based on an evaluation of the DBP data, two primary sites and two alternate sites were selected for Stage 2 D/DBP compliance monitoring, as shown below:

1. 91st Ave & Lillian lane (Highest THM)
2. Irene Lane & Christa Way (Highest HAA)
3. Alzora Way + Lizanne Way (Alternate THM)
4. 91st Ave + Lillian lane (Alternate HAA)

Based on the IDSE data, seven out of eleven sites would exceed the Stage 2 THM maximum contaminant level (MCL) of 80 ppb, which is based on a locational running annual average. All eleven sites would comply with the HAA5 MCL of 0.060 mg/L (60 ppb). Therefore, based on the observed levels, it was determined that the City would have to treat water for THMs. The treatment could be provided at the 83rd Avenue point of entry. In order to develop design and operational criteria for the recommended treatment strategy, a pilot program was recommended to test aeration technology using TAS and spray aeration.

4.0 PHASE 3 PROJECT - AERATION TREATMENT FOR THM CONTROL

As part of the Phase 3 Project, a pilot testing program using TAS and spray aeration was conducted from February 2009 to January 2011. The project objectives for Phase 3 are summarized below:

- Conduct pilot testing of aeration processes to assess compliance with the Stage 2 D/DBP Rule.
- Develop design and operational data for the THM treatment facility.

Aeration was pilot tested using the following equipment:

1. TAS Testing: A pilot TAS unit was leased from Carbonair and testing was conducted to evaluate THM reduction and fouling of aeration system internal components.
2. Spray Aeration:
 - a. Custom nozzles in a small 500 gallon tank.
 - b. Commercial fire sprinklers, irrigation nozzles, and a showerhead in a 3,500 gallon tank:
 - i. Optimize THM removal as a function of spray depth.
 - ii. Estimate distribution system THM formation based on simulated distribution system THM formation.

4.1 Pilot Testing Description

Pilot testing was conducted at the Well 4 site. Well 4 is presently out of service due to high levels of nitrate. Apart from the wellhead, this site also has a booster station, a one million gallons (MG) water storage tank, an abandoned ion exchange (IX) facility, a 3,500 gallon temporary storage tank, and a backwash holding tank. This site obtains water from one of the COP interconnects (83rd Avenue and I-10) and Well 4 (not in service).

4.1.1 TAS Pilot Testing

For testing aeration using TAS, a pilot unit (Model# STAT 15) was leased from Carbonair Environmental Systems, Inc. The STAT 15 unit consists of four trays and can treat from 0.5 to 12 gallons per minute (gpm). The air flow rate was fixed at 80 standard cubic feet per minute (scfm) throughout the TAS pilot study. Therefore, water flow rate was varied to change the air to water ratio, a parameter that impacts removal efficiency. The TAS pilot testing was conducted from May 18 to June 26, 2009.

4.1.2 Spray Aeration Pilot Testing Using Customized Nozzles

The spray aeration pilot testing was conducted using both custom nozzles and commercially available nozzles. Pilot testing of custom nozzles was conducted in a 500 gallon tank. One of the nozzles had five 1/4" holes, and another had five 5/16" holes. This pilot unit was fed directly from the 1 MG water storage tank. The water pressure from the 1 MG storage tank was sufficient for the spray aerator pilot testing using customized nozzles.

4.1.3 Spray Aeration Pilot Testing Using Commercial Nozzles

Spray aeration pilot testing using commercial nozzles was conducted in a 3,500 gallon tank that was available at the Well 4 site (old brine storage tank from ion exchange facility). The purpose of using a larger tank was to compare THM removal rates as a function of water spray height. Several different commercially available nozzles were pilot tested including fire suppression nozzles (models K7.2 and K11.2) and a spiral spray nozzle (model TF56). A showerhead was also pilot tested. Pilot testing also compared THM reduction in the uncovered tank, covered tank with a tarp with a 1-foot square hole for ventilation, and completely covered tank with and without a fan to simulate forced aeration to remove saturated air.

NCS was responsible for installation, start-up, and operation of the pilot units and had overall management responsibilities.

4.2 Pilot Testing Results

4.2.2 TAS Pilot Testing Results

During TAS pilot testing, the air to water ratio ranged from 60 to 299 and raw THM levels ranged from 65.6 to 79.4 ppb. The THM removal ranged from 22% at an air to water ratio of 75 to 44.6% at an air to water ratio of 60. Average removals for individual THM species ranged from 21.3% for dibromochloromethane to 31.5% for chloroform. The observed removals were lower than those expected and the manufacturer was contacted to assess the causes.

Carbonair, the manufacturer for TAS, utilized its proprietary model to compare the expected removal with observed removal. Henry's law constant (H) determines the equilibrium for a chemical between its water and air phase concentrations. Carbonair estimated the H values for the observed removal and compared them to their database values. It was determined that the H values were lower by 76% for bromoform to 95% for chloroform. The ratio of observed to expected removals ranged from 0.39 for chloroform to 0.57 for bromoform. While several reasons were hypothesized for the observed low removal, several factors may be responsible. Continued chlorine reaction to form THMs may be a factor, however collected samples were purged for chlorine. The impact of the observed low removals would require a higher number of TAS units, and therefore, would result in a much higher capital and O&M costs than those estimated as part of the Phase 1 project.

4.2.3 Spray Aeration Using Custom Nozzles - Pilot Testing Results

Spray aeration was pilot tested using custom nozzles in a 500 gallon tank. Two nozzles (1/4 inch and 5/16 inch holes) were operated between flow rates of 5 to 11.5 gpm. For the nozzle with 1/4 inch holes, THM removals of 3.4% and 10.7% were observed at flow rates of 5 and 10 gpm, respectively. For the nozzle with 5/16 inch holes, THM removals of 6.6% and 3.7% were observed at flow rates of 8 and 11.5 gpm, respectively.

The observed removals were much lower than anticipated and it was hypothesized that depth of water spray may be an important factor for volatilization of THMs. Therefore, it was decided to conduct the remaining aeration experiments in a larger tank (3,500 gallons) which was available on site. Since the performances of the custom nozzles were poor, they were eliminated from further consideration.

4.2.4 Spray Aeration Using Commercial Nozzles - Pilot Testing Results

Spray aeration pilot tests using fire suppression nozzles, irrigation nozzles, and a showerhead were conducted in the 3,500 gallon tank. The tank is approximately 8 ft. in diameter and 10 ft. deep. Fire suppression nozzles were manufactured by Tyco Fire Suppression and Building Products and included a pendant type nozzle (designated as K11.2) and a directional spray type nozzle (designated as K7.2). Aeration testing was also conducted using a spiral spray nozzle manufactured by BETE (designated as TF56). The aeration tests were conducted with an open tank (uncovered), covered tank, and a partially covered tank.

4.2.4.1 Uncovered Tank

Aeration tests were conducted with the tank uncovered using the fire suppression nozzles and the showerhead in October and November 2009 by collecting treated water from the bottom of the tank (approximately 8 ft of water spray depth). For the October tests, the THM removals ranged from 74% for the K7.2 nozzle to 86% for the showerhead during October tests. The influent THM level was 67.7 ppb. For the November 2009 tests, the THM removals ranged from 78% for the K7.2 nozzle to 81% for the showerhead, with the influent THM level at 64.5 ppb. Based on these results, further aeration tests were designed to simulate actual operations in a finished water storage tank. Additional aeration tests were conducted in March 2010 using commercial nozzles (K7.2 and K11.2) and the showerhead to simulate removals for a different season and as a function water spray fall. The THM removals at water depths of 2, 4, 6, and 8 feet from the nozzles were 55%, 82%, 81% and 75%, respectively. The influent THM was 67 ppb. These data indicate that a water spray depth of 4 feet from the nozzle would be adequate for optimized THM removal.

4.2.4.2 Covered Tank

Since finished water tanks cannot be operated in an open arrangement, aeration tests were conducted by covering the tank with a tarp fitted with and without holes (to represent ventilation). The first test with a covered tank with a 2.5-foot square hole in the tarp was conducted on August 6, 2010. Water samples were collected at a water spray depth of 4 ft from the nozzle. A THM removal rate of 62% was observed for the K11.2 nozzle with an influent THM level of 76 ppb. The instantaneous treated THM level of 29 ppb with a chlorine residual of 0.92 mg/L increased to a 48-hour THM level of 75.5 ppb with a chlorine residual of 0.5 mg/L.

Aeration tests with the tank completely covered with the tarp (i.e., no hole in the tarp) and using the K11.2 nozzle and showerhead were conducted on August 12, 2010. With an influent THM level of 57.7 ppb, THM removal rates for the showerhead and the K11.2 nozzle were 47% and 42%, respectively. The removals were much lower than those observed with the open tank or with the tank covered with tarp with a 2.5-foot square hole. The instantaneous treated water THM level of 33.4 ppb with a chlorine residual of 0.94 mg/L for K11.2 nozzle increased to 57.8 ppb after a reaction time of 48 hours with a final chlorine residual of 0.75 mg/L.

Additional tests were conducted with the TF56 and K11.2 nozzles in a tank covered with a tarp with a 1-foot square hole, and forced ventilation provided by a 50 cubic feet per minute (cfm) box fan. Pilot testing with forced air with the K11.2 nozzle was conducted on October 21, 2010 which resulted in a THM removal rate of 43%, with an influent THM level of 64.4 ppb. The effluent THM level increased from 36.4 ppb to 54.5 ppb after a reaction time of 48 hours and a chlorine residual of 0.47 mg/L. Pilot testing with forced air with the TF56 nozzle at a flowrate of 100 gpm resulted in a THM reduction of 26% with an influent THM level of 66.5 ppb. This reduction was lower than the 31% observed without forced aeration. Pilot testing with the TF56 nozzle at a higher flowrate of 125 gpm and forced aeration (tank covered with tarp with a hole and a fan) resulted in a THM reduction of 31% from an influent THM level of 64 ppb. The results are similar to other results for the TF56 nozzle with a covered tank with and without forced aeration.

Pilot testing with forced air with an air inlet to replenish saturated air were conducted for K11.2, TF56 and two new nozzles. The new nozzles, TF32FC-60 and TF32FC150, were similar in design to TF56 but operate at lower flowrate (similar to K11.2). Also, there was a difference in spray pattern between the two new nozzles. Based on their design, it was hypothesized that the TF nozzles would be prone to less fouling compared to K11.2 nozzle. The additional pilot tests were conducted from January 14 to 28, 2011. The influent THM levels ranged from 13.8 ppb to 55.8 ppb. All pilot testing was conducted with a water drop of 4 ft.

For the TF56 nozzle under improved ventilation conditions, A THM reduction of 38% was observed. s reduced to 21.7 ppb resulting in a reduction of 38%. Additional testing showed THM reduction of 44% for K11.2 nozzle and 32% for TF56 nozzle. The influent THM level at 18.9 ppb was relatively lower than previous pilot tests. The results indicate that lower flow nozzle performs better than the larger flow nozzle. Therefore, additional pilot tests were conducted with nozzles similar in design to TF56 but operating at low flowrate similar to K11.2.

Testing with the TF32FC-60 nozzle (30 gpm) under improved ventilation conditions resulted in a 41% reduction of THMS (from 4.3 ppb to 8.5 ppb). These results are similar to those observed for K11.2 (see Table 4.12). After 48 hours, the THM increased to 14.8 ppb, simulating the THMs in the distribution system. The observed THM reduction was 14% for the TF32FC-150 nozzle (25 gpm) and this removal was that observed for TF32FC-60 nozzle. Since the influent THM levels were relatively lower (14 ppb) compared to previous pilot tests, two additional pilot tests were conducted at high influent THM levels.

At an influent THM level of 55.8 ppb, a THMs of 67% was observed for the TF32FC-60. These results compare to those with uncovered tank. Therefore, TF32FC-60 nozzle was chosen for full-scale design. It should also be noted that the THM removal appears to be a function of influent THM level, and additional tests should be conducted at higher influent THM level of around 80 ppb.

4.3 Summary of Aeration Pilot Testing

The following conclusions and recommendations are observed based on pilot testing:

1. TAS aeration testing resulted in THM removals of 22% at an air to water ratio of 75 to 44.6% at an air to water ratio of 60. These removals were lower than expected based on the modeling conducted by the TAS manufacturer. Lower removals would result in a larger treatment facility with a higher capital and O&M costs compared to the costs estimated as part of the Phase 1 study. For example, to treat a flow of 5 MGD, five 6-tray TAS units (STAT 720) would be required based on the observed results compared to four single tray TAS units based on Carbonair database results. The influent and effluent THM levels were assumed at 94 ppb and 56 ppb, respectively. The cost for five STAT 720 units were estimated at \$2.6 million in 2005 dollars. The estimated costs would be higher if more units are required. Due to poor THM removal performance and the substantial anticipated costs, TAS was eliminated from further consideration.
2. Spray aeration using custom nozzles in a small (500 gallon) tank resulted in THM removals of less than 10%.

3. Spray aeration using fire suppression nozzles (Tyco) and a showerhead resulted in THM removals of more than 70% in an uncovered tank. A water spray depth of 4 feet is required to optimize THM reductions. The treated water THM levels increased to the influent THM levels after a reaction time of 48 hours and sufficient chlorine residual (greater than 0.5 mg/L). This is acceptable as long as influent THM levels in water supplied by the COP are below 80 ppb.
4. The larger nozzle (TF56) did not result in higher THM reductions compared to the K11.2 nozzle.
5. Additional pilot testing with improved ventilation conditions with an air inlet were conducted. Based on pilot testing, K11.2 and TF32FC-60 nozzles performed the best with observed THM reduction of up to 67%. Therefore, TF32FC-60 nozzle was chosen for full-scale design.
6. THM removal appears to be a function of influent THM level. The higher THMs, the higher the removal rate.

5.0 TREATMENT ALTERNATIVES

Implementation of spray aeration at City may be accomplished by installation of nozzles either inside the existing 1 MG tank at the Well 4 site, or inside a new 200,000 gallon aeration tank constructed at the same site. A new aeration tank would provide more flexibility from an operational standpoint, especially if blending of surface water with groundwater is employed as a future strategy. A New aeration facility would be designed for 6 MGD. The following four alternatives are therefore considered for the design of a full scale treatment facility at the Well 4 site:

- Alternative 1: Install TF32 nozzles inside the existing 1 MG tank.
- Alternative 2: Install TF32 nozzles inside a new 200,000 gallon aeration tank.
- Alternative 3: Install K11.2 nozzles inside the existing 1 MG tank.
- Alternative 4: Install K11.2 nozzles inside a new 200,000 gallon aeration tank.

Table 5.1 summarizes the treatment process costs of the four treatment alternatives (not including site work, engineering and contingencies). The least costly alternatives are installation of spray nozzles at the existing tank, however the incremental cost to construct a new aeration tank would provide an added value in the provision of increased operational flexibility. The K11.2 and TF32 nozzles are expected to perform similarly but TF32 is expected to be less prone to fouling. Therefore Alternative 2 the total project costs are estimated at \$1.04M, including site work, engineering and a 30% contingency (land costs are not included) is the preferred treatment option.

Table 5.1 : Capital Costs Comparison for Various Treatment Alternatives

Treatment Alternatives	Capital Cost
Alternative 1 - TF32 Nozzles Inside the Existing Storage Tank	\$655,000
Alternative 2 - TF32 Nozzles Inside a New Aeration Tank	\$785,000
Alternative 3 - K11.2 Nozzles Inside the Existing Storage Tank	\$655,000
Alternative 4 - K11.2 Nozzles Inside a New Aeration Tank	\$785,000

Under this alternative, a new 200,000 gallon tank would be provided for aeration. The existing tank would remain in service and would not lose any storage capacity. This alternative would also be advantageous from the blending and maintenance point of view.

The capital costs were also estimated for future aeration facility at 67th Avenue and Buckeye Road. This cost is calculated based on the Alternative 4. The City also wants to provide a 1 MG water storage tank at this site. The total capital cost for an aeration facility and 1 MG tank is estimated at \$2.43 million, including total facility costs; 30% contingency; taxes, insurance, and bonding; and 20% design and construction management fees. The estimated costs include cost of installing a new aeration tank at \$180,000 along with T32 nozzles for aeration.

6.0 BLENDING FOR NITRATE MCL COMPLIANCE

The maximum contaminant limit for nitrate is 10 mg/L. Based on sampling conducted in August 2006, the nitrate level for Well 4 was estimated at 19.6 mg/L. With an applied factor of safety of 20% (nitrate level of 8 mg/L), the minimum blending ratio required for nitrate MCL compliance would be 62% of surface water (assuming nitrate level for surface water as 1 mg/L) mixed with 38% of groundwater. Well 4 can produce up to 1,100 gpm (1.6 MGD), therefore, to meet nitrate MCL compliance, the minimum amount of surface water required would be 2.6 MGD.

7.0 CONCLUSIONS AND RECOMMENDATIONS

Based on the simulated distribution system (SDS) THM data collected as part of the aeration testing, the increase in THMs after 48 hours of contact time ranged from 26% to 160%. The City could comply with the THM levels of 64 (20% safety factor) or 72 (10% safety factor) ppb if the 48 hour increase in THMs is less than 33% or 50%, respectively.

For higher THM formation levels, the City would use spray aeration to further reduce THMs prior to blending with groundwater. In this manner, City would be able to comply with the nitrate MCL without treatment at wells, and with THM MCL by a combination of blending with groundwater and/or spray aeration. The blending ratio would depend on the groundwater nitrate level and would be adjusted such that nitrate level in blended water is equal to (or below) 8 mg/L.

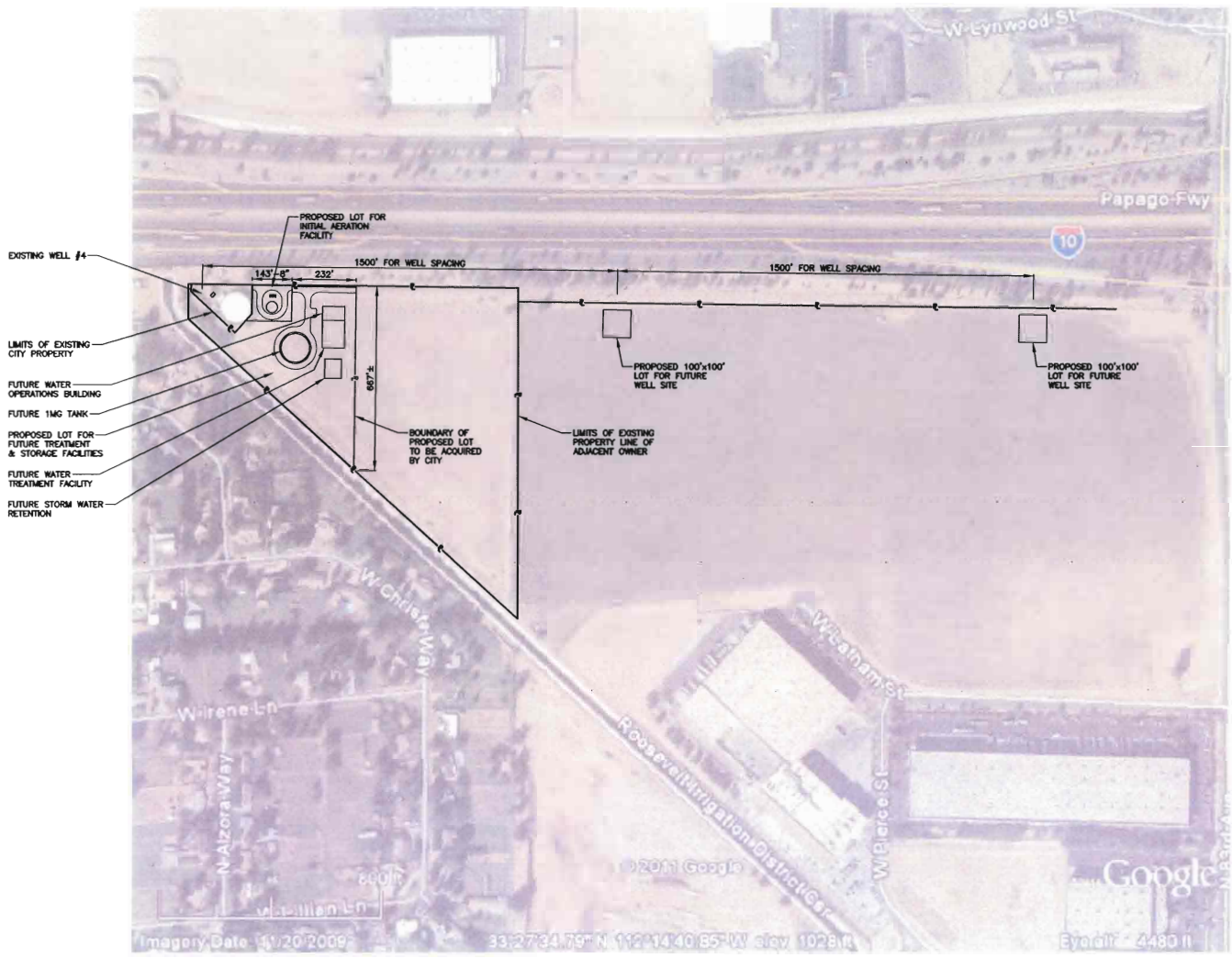
The existing site does not have enough space to accommodate new aeration tank and booster pump station. It is recommended to acquire additional land on the east side of the property to accommodate the new aeration facility and other future water facilities. The total capital cost for aeration facility at the Well 4 site is estimated at \$1.04M, not including land acquisition costs.

The capital cost for the future aeration facility at 67th Avenue interconnect is estimated at \$2.43 million. It includes cost of installing a new aeration tank with K11.2 nozzles, booster pump station for aeration, and a 1 MG water storage tank.

8.0 IMPLEMENTATION OF SPRAY AERATION

The design and construction of the aeration facility at the Well 4 site would take 15 months (5 months for design and 10 months for construction). Assuming design phase starts in April 2011, the construction of the aeration facility at Well 4 site would be completed by May 2012. The design and construction of the aeration facility at the 67th Avenue site would be dependent on the City's population growth and future water demand.

It is recommended that the City advertise a Request for Proposal to retain a consulting firm to design the spray aeration treatment system at the Well 4 site so that the City is can meet the Stage 2 THM regulatory limits. A one month period can be assumed to retain a consulting firm for the overall schedule.



ALL DIMENSIONS ARE ESTIMATES FOR DISCUSSION PURPOSES ONLY. CITY TO CONFIRM DIMENSIONS WITH BOUNDARY SURVEY.

FIGURE 1
PROPOSED LOTS FOR ACQUISITION
WATER FACILITIES
MARCH 16, 2011
CITY OF TOLLESON

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Horizon Consulting Services, Inc.