

AL WAHDA  
WATER TREATMENT PLANT  
BAGHDAD, IRAQ

**SIGIR PA-05-001**  
**MARCH 15, 2006**

# Special Inspector General for Iraq Reconstruction

SIGIR PA-05-001

March 15, 2006

## Al Wahda Water Treatment Plant in Baghdad, Iraq

### Synopsis

**Introduction.** This report was previously provided on a limited distribution basis only in Iraq to representatives of the Gulf Region Division of the U.S. Army Corps of Engineers and the Project and Contracting Office. In accordance with the revised policy of the Office of the Special Inspector General for Iraq Reconstruction, all project assessment reports are being issued publicly.

This project assessment was initiated as part of our continuing assessments of selected sector reconstruction activities for electricity, oil, public works and water. The overall objectives were to determine whether selected sector reconstruction contractors complied with the terms of their contracts or task orders and to evaluate the effectiveness of the monitoring and controls exercised by administrative quality assurance and contract officers. This project assessment was conducted in accordance with the Quality Standards for Inspections issued by the President's Council on Integrity and Efficiency. The assessment team included a professional engineer and an auditor.

**Project Assessment Objectives.** The objective of this project assessment was to provide real-time relief and reconstruction project information to interested parties in order to enable appropriate action, when warranted. Specifically, we determined whether:

1. Project results will be consistent with original objectives;
2. Project components were adequately designed prior to construction or installation;
3. Construction or rehabilitation met the standards of the design; and
4. The contractor's quality control plan and the U.S. Government's Quality Assurance program were adequate.

**Conclusions.** This project assessment determined that:

1. The stated objective of the Al Wahda Water Treatment Plant project will not be met under existing plans. Due to significant reductions in the Scope of Work being performed under the project, the Al Wahda Water Treatment Plant did not and will not increase the quantity of water to the Iraqi people or elevate the quality of the water to potable standards.
2. The design package appears to be complete and specific enough to construct the chemical facility and complete the electrical and mechanical upgrades as identified in the reduced Scope of Work. The total design package was not adequate to complete all work required for a fully functional water treatment facility. Even if the original Scope of Work had been completed, the Iraqi Plant Manager sited numerous additional requirements needed to make the Al Wahda Water Treatment Plant fully operational.
3. The rehabilitation work on the clarifiers and settling tanks, and the chemical building construction met the standards of the design.

4. The contractor's quality control plan and the U.S. Government's quality assurance program for this project needed improvement and contributed to insufficient quality control at Al Wahda Water Treatment Plant. In addition, the U.S. Government project engineer, with knowledge of construction progress and the quality of work performed at the project site, was not approving invoices for work claimed by the contractor.

**Assessment Comment.** Additionally, the assessment disclosed that information relating to Al Wahda Water Treatment Plant in the Project and Contracting Office database needed to be updated. The Project and Contracting Office data showed projected total estimated cost as \$8.7 million and that the project was 30% complete. Due to substantial de-scoping, the on-site inspection determined that the Al Wahda Water Treatment Plant project was approximately 70%-80% physically complete and that the actual total cost should be revised substantially lower. Revised cost estimates for the Al Wahda Water Treatment Plant project were approximately \$2.2 million.

**Recommendations and Management Comments.** We discussed the results of this project assessment with the Deputy Director, Project and Contracting Office and U.S. Army Corps of Engineers officials on 5 July 2005. Formal management comments were not requested. Management concurred with our conclusions. Formal recommendations to address the issues identified in this project assessment will be included in a summary report.

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# **Introduction**

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## **Objective of the Project Assessment**

The objective of this project assessment was to provide real-time relief and reconstruction project information to interested parties in order to enable appropriate action, when warranted. Specifically, we determined whether:

1. Project results will be consistent with original objectives;
2. Project components were adequately designed prior to construction or installation;
3. Construction or rehabilitation met the standards of the design; and
4. The contractor's quality control plan and the U.S. Government's quality assurance program were adequate.

## **Background**

### **Contract, Task Order, and Costs**

The Al Wahda Water Treatment Plant (WTP) project is being completed under Task Order 0009 of Contract W914NS-04-D-008. Contract W914NS-04-D-008, dated 23 March 2004, is an indefinite delivery/indefinite quantity contract with a \$600 million ceiling. The contract was made between the Coalition Provisional Authority (CPA) and FluorAMEC, LLC. Task Order 0009 is a design/build, cost-plus award fee, task order for the refurbishment of the Al Wahda WTP and a second water treatment plant, the Al Wathba WTP. Both plants are located in Baghdad, Iraq.

Task Order 0009 initially was un-definitized and FluorAMEC, LLC was directed by a notice to proceed, dated 26 June 2004, to perform a technical assessment and 30% design at Al Wathba WTP and Al Wahda WTP. FluorAMEC, LLC was subsequently directed to prepare a detailed cost proposal for the rehabilitation of both plants. The Project and Contracting Office (PCO) provided a notice to proceed, dated September 15, 2004, to begin rehabilitation work. The task order was definitized on 8 January 2005. Definitization was based on the FluorAMEC, LLC proposal and an Independent Government Estimate.

The initial un-definitized total contract price for both projects was \$13,609,053, but increased to \$14,929,370 after the contract was definitized. Correspondence from FluorAMEC, LLC to the PCO, dated May 30, 2005, disclosed that the projects had a \$3.4 million "cost to complete" increase pending.

Although contracting actions include both projects under a single task order, this assessment addresses only the Al Wahda WTP portion of Task Order 0009.

## **Project Objective**

The June 26, 2004, Statement of Work (SOW) provides that: “The overall objective of this task order is to increase the quantity of potable water available to citizens living in Baghdad by rehabilitation of the two existing water treatment plants, thereby improving their living conditions.”

## **Description of the Facility**

The description of the facility is based on information from the initial Scope of Work and FluorAMEC, LLC’s Technical Study. The Al Wahda WTP is an existing water treatment plant in Baghdad, Iraq. The plant’s purpose is to pump water from the Tigris River, treat the water to potable standards, and then pump the treated pressurized water to the local distribution system where it is utilized by residences and businesses. The facility was initially constructed in 1945 and expanded in 1951. Due to substantial deterioration, the plant requires extensive rehabilitation.

Current operations at the facility include pumping water from the Tigris River and treating the water through two parallel treatment trains. Treatment train #1 consists of a clarifier, an alum feed to the clarifier inlet, a settling tank, rapid sand gravity filters, chlorination, and high lift pumps to the distribution system. Treatment train #2 consists of alum feed to clarifier flash mix tanks, a clarifier, a settling tank, pressure filtration, chlorination and high lift pumps to the distribution system.

## **Scope of Work of the Task Order**

The initial SOW for the project, dated June 26, 2004, included refurbishment or replacement of chlorination systems, clarifier tanks, settling tanks, gravity rapid sand filters, pressure filters, alum systems, and the sludge holding tank. The PCO contract file showed the Scope of Work was reduced during the definitization phase. Discussions with FluorAMEC, LLC disclosed further reductions during the construction phase. (See Appendix B for a listing of all tasks in the original Scope of Work, with the reductions in the scope highlighted.)

## **Reported Project Work Completed and Pending**

The reported status of work at the project prior to the site visit was determined through discussions with the U.S. Government quality assurance representative, Project Engineer, and the FluorAMEC, LLC Project Manager, as well as a review of the PCO contract file.

Project site work completed:

- General refurbishment of treatment train #1 & #2 clarifier tanks, including flash mix tank.
- General refurbishment of treatment train #1 and #2 sedimentation tanks.
- Construction of a new chemical building.

Project site work not eliminated during the reductions in SOW, but not yet underway:

- Upgrade of the treatment train #1 chlorination system.
- Installation of a new treatment train #2 chlorination system.
- Refurbishment of the existing laboratory/administration building, a small one-room structure.
- Provision of a shaded area for chlorine tank storage and handling.
- Installation of flow meters.

## Site Assessment

On 6 June 2005, our assessment team, which included a professional engineer and an auditor, performed an on-site assessment at the Al Wahda WTP. The site visit included an interview with the Iraqi Plant Manager and the FluorAMEC, LLC Project Manager, as well as an assessment of the facility. No site work was being accomplished by FluorAMEC, LLC at the time of the visit. The assessment covered work completed, work pending, and also systems which were originally planned for refurbishment, but were deleted from the SOW.

### Work Completed

Completed work included the rehabilitation of clarifiers and settling tanks, and construction of the chemical building.

#### Clarifiers and settling tanks

The original SOW required the clarifiers and settling tanks to be drained, cleaned, repaired, and painted. The quality assurance documentation disclosed, and the site assessment found, that the clarifiers and settling tanks (Site Photos 1 & 2) had been drained, cleaned, repaired and painted. The quality of work performed could not be determined because the tanks were filled with water and in operation. During the site assessment, the Iraqi Plant Manager said he was satisfied with the rehabilitation of the clarifiers and settling tanks.



**Site Photo 1: Clarifier tank**



**Site Photo 2: Settling tank**

### Chemical building

The original SOW called for an 18.3 meter by 9.2 meter new chemical building to house new alum system equipment and to store a 10-day supply of alum. The FluorAMEC, LLC Technical Study indicated that the alum system was operational and recommended no repairs be made to the system.



The site assessment found that the chemical building (Site Photos 3 & 4), had been completed. The existing alum feed system with roof structure had not been removed and the new building was built around it.

The cost of this new structure appeared to be extremely high compared to the cost of a comparable sized building of the same design that was constructed under the same task order at Al Wathba WTP. A FluorAMEC, LLC Progress Measurement Worksheet, dated 8 June 2005, showed the cost of both the chemical and administration buildings at Al Wathba WTP to be budgeted at \$141,032. But, the current project cost for just the chemical building at Al Wahda was \$180,307, at 85% completed, not including contractor overhead and fees. A breakdown of the specific charges was requested from the contractor, but had not been furnished at the time of the issuance of this report.



**Site Photo 3: New chemical building**



**Site Photo 4: New chemical building**

### **Work Pending**

The site assessment found that each of the pending tasks is an essential component of a fully operational facility. These tasks include the upgrade of the two chlorination systems, refurbishment of the laboratory/administration building, installation of flow meters and adequate chlorine tank storage. No evidence was observed during the site visit to indicate that this work had begun.

### **Work Removed from the SOW**

The assessment also covered the plant systems that had been addressed in the original SOW, but were later removed, according to the contractor. This work included rehabilitation of the rapid sand gravity filters, replacement or refurbishment of the pressure filter system, refurbishment of the sludge tank, and construction of a new administration/laboratory building.

#### **Rapid Sand Gravity Filters**

The FluorAMEC, LLC technical study and the original SOW identified the following actions as necessary for refurbishment of the rapid sand gravity filter system: drain and inspect each tank, repair tanks as needed, replace the under-drain system, and replace filter media. This refurbishment was, however, deleted from the SOW, according to the contractor.

During the site assessment, the Iraqi Plant Manager stated that the rapid sand gravity filter system (Site Photos 5 & 6) needed substantial repair. During backwash

operations, backwash water should flow to the sludge pit; however, due to the poorly operating system and possible faulty valves, some of the backwash water (backwash effluent) gets into the clear well tanks. The clear well tanks are the final storage location of the treated water before chlorination and distribution. The Iraqi Plant Manager said customers have sand and sediment in their drinking water. The deteriorated state of the entire system was confirmed during the site assessment.



**Site Photo 5: Rapid sand gravity filter**



**Site Photo 6: Backwash effluent**



### Pressure filter system

The initial SOW required rehabilitation of the filters to proper working order, to include the evaluation and rehabilitation or replacement of the existing filters. The FluorAMEC, LLC technical study states, “Although the Task Order calls for rehabilitation of the existing filters, field investigation has determined that the filters are in poor condition. Refurbishment would be cost-prohibitive due to the extent of work required.” According to the contractor, only the inspection of the filters, installation of monitoring equipment, and minor repairs to the system pipe work are planned.

During the site assessment, the Iraqi Plant Manager said he did not think refurbishment was practical and a new system was warranted. He also said the turbidity (which is a measure of suspended solids in a liquid) of outflow from the filters was equal to that of the inflow, which means that the filter system was not functional.

The site assessment found that no rehabilitation work on the filters had been performed, only minor work was planned, and the system still required replacement as recommended in the technical study. (Site Photo 7).



**Site Photo 7: Pressure filters and piping**

### The Sludge tank

The FluorAMEC, LLC technical study and SOW included the following repairs for the sludge tank: drain and inspect tank, sludge removal, minor crack and spalled concrete repair, seal tank with Thoroseal coating, earthwork to repair erosion around tank foundation, and a \$10,000 allowance for unforeseen repairs. All of this work, however, was removed from this project, according to the contractor.

In addition to work listed above, the Iraqi Plant Manager demonstrated that the sludge tank and outflow pumps are undersized and cannot handle the effluent from the rapid sand gravity filter backwash operations (used to clean the filters). This negatively impacts the total time required and efficiency of the rapid sand gravity filter backwash operations. (Site Photo 8).



Site Photo 8: Sludge tank

#### The Administration/Laboratory Building

The FluorAMEC, LLC technical study and SOW included construction of a new administration/laboratory facility, furniture, lab equipment, and training. These tasks were removed from the SOW and replaced with only the refurbishment of the existing building, per the contractor. The site assessment found that the Iraqi Plant Manager works out of a small one-room building and the only existing lab equipment is a turbidity meter.

## Conclusions

Review of contract documentation, the design package, and quality assurance documentation; as well as interviews with key project personnel; and the site visit led to the following conclusions for each of the stated project assessment objectives.

### 1. Determine whether project results will be consistent with original objectives.

The overall objective of this task order was to increase the quantity of potable water available to citizens living in Baghdad by rehabilitation of the Al Wahda WTP, thereby improving their living conditions. Due to the reduction in the Scope of Work being performed under the project, the Al Wahda WTP does not, and will not, increase the quantity of water or elevate the quality to potable standards.

2. Determine whether project components were adequately designed prior to construction or installation.

The design package appears to be complete and specific enough to construct the chemical facility and complete the electrical and mechanical upgrades as identified in the reduced Scope of Work. The total design package was not adequate to complete all work required for a fully functional water treatment facility. Even if the original Scope of Work had been completed, the Iraqi Plant Manager sited numerous additional requirements needed to make the Al Wahda WTP fully operational.

3. Determine whether construction or rehabilitation met the standards of the design.

The rehabilitation work on the clarifiers and settling tanks, and the chemical building construction appear to meet the standards of the design.

4. Determine whether the contractor's quality control plan and the Government quality assurance program are adequate.

The contractor's quality control plan and U.S. Government's quality assurance program for this project need improvement and contributed to insufficient quality control at the Al Wahda WTP. The U.S. Government project engineer, with knowledge of construction progress and the quality of work performed at the project site, was not approving invoices for worked claimed by the contractor.

**Assessment Comment.** Additionally, the assessment disclosed that information relating to Al Wahda WTP in the PCO database needed to be updated. PCO data showed projected total estimated cost as \$8.7 million and that the project was 30% complete. Due to substantial de-scoping, the on-site inspection determined that the Al Wahda WTP project was approximately 70%-80% physically complete and that the actual total cost should be revised substantially lower. The revised cost estimate for the Al Wahda WTP was approximately \$2.2 million.

**Recommendations and Management Comments.** We discussed the results of this project assessment with the Deputy Director, Project and Contracting Office and U.S. Army Corps of Engineers' officials on 5 July 2005. Formal management comments were not requested. Management concurred with our conclusions. Formal recommendations to address the issues identified in this project assessment will be included in a summary report.

## **Appendix A. Scope and Methodology**

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We performed this project assessment from June through July 2005 in accordance with the Quality Standards for Inspections issued by the President's Council on Integrity and Efficiency. The assessment team included a professional engineer and auditor.

In performing this Project Assessment we:

- Reviewed contract documentation, to include the Independent Government Estimate, Scope of Work, Contract, and contract modifications;
- Reviewed the design package (drawings and specifications), Quality Assurance Plan, Quality Control Plan, and quality control and assurance reports;
- Interviewed the Contracting Officer, Project Manager, Project Engineer, quality control/assurance representatives, and Iraqi Al Wahda Plant Manager; and
- Conducted an on-site assessment of the Al Wahda Water Treatment Plant.

# Appendix B. Scope of Work for Al Wahda WTP Task Order

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The Scope of Work for the portion of Task Order 0009 of Contract W914NS-04-D-008 for the Al Wahda WTP is listed below. According to the contractor and PCO contract file a number of tasks in the original Statement of Work were deleted during definitization. We have indicated the deleted tasks in bold italics.

## Al Wahda Train 1

***Train 1 & 2 shared aluminum sulfate (alum) feed system: A complete new system is included in the chemical building:***

- ***New combined alum system will be provided in a new chemical building to service trains 1 & 2.***
- ***2 S/S saturation tanks (including access ladders and walkways).***
- ***Stainless steel Alum feed tank.***
- ***Stainless steel mixer (1 per tank).***
- ***5 Alum dosing pump (2 duty / 2 standby / 1 common standby).***
- ***All valves, fittings and piping.***
- ***Monorail & lifting equipment.***

Train 1 chlorination system: The task order calls for a complete new gas chlorination system. Field investigations show that the train 1 & 2 chlorination systems are located adjacent to each other. Train 1 appears to be in adequate condition; train 2 is in poor condition and needs to be replaced in total. Train 1 chlorine system modification includes:

- Bottle racks.
- Headers with inlet and outlet valves.
- Gas safety system and leak detection.
- Cylinder scales.
- Monorail & bottle lifting equipment.

Train 1 clarifier tank (including rapid mix tank): A general tank refurbishment (excluding major structural repairs), to include the following:

- Drain and inspect tank.
- Sludge removal.
- Minor crack and spalled concrete repairs.
- Seal tank with Thoroseal coating.
- Earthwork to repair erosion around tank foundation.
- Repair tank scraper.
- \$10,000 allowance has been added for unforeseen repairs that are becoming apparent now the early works package is being carried out.

Train 1 sedimentation (settling) tank: A general tank refurbishment (excluding major structural repairs), to include the following:

- Drain and inspect tank.
- Sludge Removal.
- Minor crack and spalled concrete repairs.
- Seal tank with Thoroseal coating.
- Earthwork to repair erosion around tank foundation.
- \$10,000 allowance has been added for unforeseen repairs that are becoming apparent now the early works package is being carried out.



**Train 1 rapid sand gravity filter station:** *The task order calls for replacement of motor and electrical service for the backwash pumps. However, field investigation found train 1 backwash pumps are being replaced by the U.S. Army Corps of Engineers. (This has not been confirmed.)*

*A general filter structure refurbishment (excluding major structural repairs), to include the following:*

- *Drain and inspect structure.*
- *Minor crack and spalled concrete repairs.*
- *Seal tank with Thoroseal coating.*
- *Survey under drain system (currently fully operational).*
- *Replace filter media.*
- *Earthwork to repair erosion around tank foundation.*
- *\$10,000 allowance has been added for unforeseen repairs that are becoming apparent now the early works package is being carried out.*

## **Al Wahda Train 2**

**Train 2 aluminum sulfate (alum) system:** *New combined alum system will be provided in a new chemical building to service trains 1 & 2, as detailed in train 1 narrative (above).*

**Train 2 chlorination system:** A complete new system will be provided, to include:

- 2 chlorinators, 6 kg/hr capacity each.
- Headers with inlet and outlet valves.
- 3 injector water pumps (2 duty, 1 standby), 1.6 m<sup>3</sup>/hr each.
- Injectors, change over devices, filters, and catch pipes.
- Gas safety system and leak detect.
- All associated valves, fittings, and piping.
- Cylinder scales.
- Automatic switch-over device.
- Monorail & bottle lifting equipment.
- *No new structure required. (There is an existing chlorine facility within the existing pressure filter building which can be re-used.)*

**Train 2 clarifier tank** (including rapid mix tank): A general tank refurbishment (excluding major structural repairs), to include the following:

- Drain and inspect tank.
- Sludge removal.
- Minor crack and spalled concrete repairs.
- Seal tank with Thoroseal coating.
- Earthwork to repair erosion around tank foundation.
- Repair tank scraper.
- \$10,000 allowance has been added for unforeseen repairs that are becoming apparent now the early works package is being carried out.

**Train 2 sedimentation (settling) tank:** A general tank refurbishment (excluding major structural repairs), to include the following:

- Drain and inspect tank.
- Sludge removal.
- Minor crack and spalled concrete repairs.
- Seal tank with Thoroseal coating.
- Earthwork to repair erosion around tank foundation.

- \$10,000 allowance has been added for unforeseen repairs that are becoming apparent now the early works package is being carried out.

Train 2 Pressure Filter Station: Field investigation has shown limited work is needed on filter system. To include:

- Drain and inspect existing (8) filters, replace media, new under filter drains and NDT included.
- Provision of monitoring instrumentation.
- Minor repairs to system pipework.

### **Al Wahda Systems shared by Train 1 and 2**

Train 1&2 control system: Existing control systems to be retained.

***Train 1&2 ground storage tank:***

- ***Repair tank hatch.***
- ***Drain and inspect tank.***
- ***Minor crack and spalled concrete repairs.***
- ***Seal tank with Thoroseal coating.***
- ***\$10,000 allowance has been added for unforeseen repairs that are becoming apparent now the early works package is being carried out.***

***Train 1&2 sludge holding tank:*** A general tank refurbishment (excluding major structural repairs), to include the following:

- ***Drain and inspect tank.***
- ***Sludge Removal.***
- ***Minor crack and spalled concrete repairs.***
- ***Seal tank with Thoroseal coating.***
- ***Earthwork to repair erosion around tank foundation.***
- ***\$10,000 allowance has been added for unforeseen repairs that are becoming apparent now the early works package is being carried out.***

### **Al Wahda General Plant Rehabilitation**

Chemical building

- 18.3m X 9.2m, with new alum equipment and storage capacity for a 10-day supply.
- Existing administration building to be retained, with an area refurbished to provide for a small laboratory facility. (***Note: The original SOW called for a complete new administration/laboratory facility to be constructed.***)

Chlorine storage area

- A shaded chlorine cylinder storage and handling area is to be provided.

***Electrical:*** Rehabilitation of the existing electrical systems includes the items listed below.

- ***Refurbishment of high tension electrical equipment, completed by USAID (not verified).***
- ***Refurbish transformers, completed by USAID (not verified).***
- ***Refurbish main distribution board.***
- ***Refurbish site lighting.***

## **Appendix C. Acronyms**

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LLC	Limited Liability Company
PCO	Project and Contracting Office
SIGIR	Special Inspector General for Iraq Reconstruction
SOW	Statement of Work
USACE	U.S. Army Corps of Engineers
WTP	Water Treatment Plant

## **Appendix D. Assessment Team Members**

The Office of the Assistant Inspector General for Inspections, Office of the Special Inspector General for Iraq Reconstruction, prepared this report. The principal staff members who contributed to the report include:

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