OFFICE OF THE SPECIAL INSPECTOR GENERAL FOR IRAQ RECONSTRUCTION

MUJARRAH CANAL BRIDGE
RAMADI, IRAQ

SIGIR PA-09-170
JULY 14, 2009

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SIGIR

Special Inspector General for IRAQ Reconstruction

July 14, 2009

Summary of Report: PA-09-170

Why SIGIR Did this Study

SIGIR is charged to conduct assessments of Iraq reconstruction projects funded with amounts appropriated or made available by the U.S. Congress. SIGIR assessed this project to provide real-time information on relief and reconstruction to interested parties to enable appropriate action, when warranted.

The objective of this project assessment was to determine if:

- the project components were adequately designed prior to construction or installation
- the construction or rehabilitation met the standards of the design
- the contractor's quality control program and the U.S. government's quality assurance program were adequate
- project sustainability was addressed
- the project results were consistent with the original objectives

What SIGIR Recommends

SIGIR recommends that the Gulf Region Division of the U.S. Army Corps of Engineers investigate the hairline cracks on the girders and determine if the quantity and depth of the cracks are indicators of significant issues with the beams and take necessary corrective actions.

GRD concurred with the recommendation and provided the results of an investigation by the Fallujah Resident Office team conducted on-site on 20 May 2009. Their investigation revealed no structural cracking, only minor surface shrinkage cracks and cracks caused by form irregularities.

For more information, contact SIGIR Public Affairs at (703) 428-1100 or PublicAffairs@sigir.mil

Mujarrah Canal Bridge

What SIGIR Found

On 6 March 2009, SIGIR performed an on-site assessment of the Mujarrah Canal Bridge project. The $1.3 million project was funded from the Commander's Emergency Response Program. Due to security concerns, the total time available on site was approximately one hour; therefore, an in-depth review was not possible.

The objective of the project was to design, construct, and repair the Mujarrah Canal Bridge to increase commercial traffic between Ramadi and Falluja. The bridge had previously sustained devastating damage caused by a vehicle-borne improvised explosive device. The contract required that the bridge be restored to its original condition and be fully functional when completed.

SIGIR reviewed the contractor's design package, which contained information about the damage to the existing bridge, the temporary jacking and support of the existing structure, construction of the post-tensioned concrete beams and reinforced-concrete deck, and other project features. After reviewing the entire design package, SIGIR determined that the information was sufficient to complete the final design and to repair and construct the Mujarrah Canal Bridge.

SIGIR noted several construction issues during its on-site inspection of the bridge, including problems with the placement of the reinforcing for the concrete deck; the bottom mat of reinforcing steel was placed directly onto the precast-concrete pans; and vertical offsets between the individual precast-concrete deck pans. Also, SIGIR identified hairline cracking on the girders. SIGIR concluded that most of the construction work met the standards of the contractor's designs.

The project results are consistent with the original project objectives, and sustainability was addressed. However, the project results were not consistent with the contract requirement to complete the project within 240 days of the notice to proceed, issued on 12 February 2008, which required the contractor to complete the project by 9 October 2008. The estimated construction completion date was March 2009, but was changed to allow for the curing of the concrete. The bridge opened on 8 June 2009.

SPECIAL INSPECTOR GENERAL FOR IRAQ RECONSTRUCTION

July 14, 2009

MEMORANDUM FOR COMMANDING GENERAL, MULTI-NATIONAL FORCE-IRAQ
COMMANDING GENERAL, JOINT CONTRACTING COMMAND-IRAQ/AFGHANISTAN
COMMANDING GENERAL, GULF REGION DIVISION, U.S. ARMY CORPS OF ENGINEERS
DIRECTOR, IRAQ TRANSITION ASSISTANCE OFFICE

SUBJECT: Report on the Mujarrah Canal Bridge, Ramadi, Iraq
(Project Number SIGIR PA-09-170)

We are providing this project assessment report for your information and use. We assessed the design and construction work being performed at the Mujarrah Canal Bridge, Ramadi, Iraq to determine its status and whether objectives intended will be achieved. This assessment was made to provide you and other interested parties with real-time information on a relief and reconstruction project underway and in order to enable appropriate action to be taken, if warranted.

Comments on a draft of this report from the Gulf Region Division of the U.S. Army Corps of Engineers addressed our recommendations and provided additional clarifying information for this final report. As a result, no additional comments are required.

We appreciate the courtesies extended to our staff by representatives of the Iraq Transition Assistance Office, the Gulf Region Division, Gulf Region Central, and the Camp Falluja Resident Office of the U.S. Army Corps of Engineers. If you have any questions please contact Mr. Brian Flynn at brian.flynn@sigir.mil or at 240-553-0581, extension 2485. For public queries concerning this report, please contact SIGIR Public Affairs at publicaffairs@sigir.mil or at 703-428-1100.

Stuart W. Bowen, Jr.
Inspector General

Special Inspector General for Iraq Reconstruction

SIGIR PA-09-170 **July 14, 2009**

Mujarrah Canal Bridge
Ramadi, Iraq

Synopsis

Introduction. The Special Inspector General for Iraq Reconstruction (SIGIR) is assessing projects funded under the Commander's Emergency Response Program to provide real-time information on relief and reconstruction to interested parties to enable appropriate action, when warranted.

Project Assessment Objectives. SIGIR conducted this limited scope assessment in accordance with the Quality Standards for Inspections issued by the Council of the Inspectors General on Integrity and Efficiency. The assessment team comprised two engineers/inspectors and two auditors/inspectors. Specifically, SIGIR determined whether:

1. Project components were adequately designed prior to construction or installation;
2. Construction or rehabilitation met the standards of the design;
3. Adequate quality management programs were being utilized;
4. Sustainability was addressed in the contract or task order for the project; and
5. Project results were or will be consistent with original objectives.

Project Objective. The objective of the project was to design, construct, and repair the Mujarrah Canal Bridge to increase commercial traffic between Ramadi and Falluja. The bridge had previously sustained devastating damage caused by a vehicle-borne improvised explosive device.

In December 2007, the Gulf Region Central district, using Commander's Emergency Response Program funding, awarded a $1,261,000 contract to restore the bridge to its original condition and be fully functional when the project is completed.

Conclusions. The assessment determined that:

1. The Statement of Work required incorporating the design requirements of the original structures into the contractor's repair design. The contractor was required to coordinate with the appropriate ministry to obtain the original structure design documentation; however, if the original data was not available, the contractor could use similar bridge design data instead. The Statement of Work also required the contractor to submit 50% and 100% design packages to the Gulf Region Central (GRC) Falluja Resident Office for review and approval. SIGIR reviewed the contractor's generated design package, which contained specific information about the damage to the existing bridge, the temporary jacking and support of the existing structure, construction of the post-tensioned concrete beams and reinforced-concrete deck, and other project features. After reviewing the entire design package—including the drawings and technical specifications—and other applicable codes and standards, SIGIR determined that there was

adequate information to complete the final design and to repair and construct the Mujarrah Canal Bridge.

2. During the 6 March 2009 site visit, SIGIR observed that the contractor had completed a significant portion of the bridge construction, including reconstruction of the reinforced-concrete bent cap, abutment repair, fabrication and placement of the post-tensioned concrete girders, and construction of false work for the reinforced-concrete bridge deck. SIGIR noted areas of concern with the placement of the reinforcing for the concrete deck, such as areas of severe reinforcing steel congestion near the ends of the girders. SIGIR also identified the apparent vertical offsets between the individual precast-concrete deck pans. In several areas, the pans were offset from each other and from the post-tensioned concrete beams. SIGIR also determined that some areas of the wearing surface of the existing bridge deck are poor, specifically noting holes that extended through the wearing surface to the top of the concrete deck. The Statement of Work required the contractor to "install bituminous hot mix wearing course on full width of the new span and existing span as needed." In SIGIR's opinion, the entire structure requires a bituminous overlay. Also, SIGIR identified hairline cracking on the girders. Due to being limited to approximately 60 minutes on site, SIGIR could not map the cracking or determine if the quantity and depth of the cracks are indicators of significant issues with the beams.

   Aside from these construction issues, SIGIR concluded that most of the construction work met the standards of the contractor's designs.

3. The contractor's quality control (QC) plan was sufficiently detailed to effectively guide the contractor's quality management program. The contractor submitted a QC plan, which the GRC Fallujah Resident Office accepted as meeting the standards addressed in Engineering Regulation 1180-1-6 (Construction Quality Management). The QC representatives monitored field activities and completed daily QC reports, which presented a brief background on the number of workers on site and the work activities performed. In addition, the QC representatives supplemented the daily QC reports with photographs reinforcing the information provided in the daily reports. Although the project file contained multiple test results—cube tests, steel rebar tests, etc.—the QC reports did not mention that any testing had been performed. In addition, the daily QC reports did not have a section for construction deficiencies identified; consequently, the QC reports failed to document the construction deficiencies that SIGIR identified, such as missing wire ties, hairline cracks on the girders, and misaligned interior diaphragms.

   The U.S. government quality assurance (QA) program has not been completely effective in monitoring the contractor's QC program. The GRC Falluja Resident Office, which is responsible for the construction of the Mujarrah Canal Bridge project, employs local national Iraqi engineers to serve as QA representatives to visit the project site daily and write daily QA reports for the project engineer's review. The reports documented the number of workers on site and the work performed for the day. Also, the QA representatives supplemented the daily QA reports with detailed photographs that reinforced the information provided in the reports. Like the QC representatives, the QA representatives did not document the construction deficiencies that SIGIR identified, such as missing wire ties, hairline cracks on the girders, and misaligned interior diaphragms.

4. Sustainability was addressed in the contract requirements. The Statement of Work included sustainability elements to assist the Iraqi Ministry of Transportation in operating this project after turnover, such as requiring the contractor to:
    - provide and certify warranties in the name of the appropriate ministry for all materials and equipment
    - provide operations and maintenance support for all facilities and equipment installed, constructed, or rehabilitated in the scope of the project
    - on completion of each facility, prepare and furnish as-built drawings, which will be a record of the construction as installed and completed

5. To date, the project results are consistent with the original project objectives to design, construct, and repair the Mujarrah Canal Bridge. However, the project results are not consistent with the contract requirement to complete the project within 240 days of the notice to proceed. The GRC issued the notice to proceed on 12 February 2008, which required the contractor to complete the project by 9 October 2008. During the site visit, GRC Falluja Resident Office representatives estimated the construction completion as March 2009; the bridge opened on 8 June 2009.

Recommendations. SIGIR recommended that the Commanding General, Gulf Region Division of the U.S. Army Corps of Engineers investigate the hairline cracks on the girders and determine if the quantity and depth of the cracks are indicators of significant issues with the beams and take necessary corrective actions.

Management Comments. SIGIR received comments on the draft of this report from the Commanding General, GRD, concurring with the recommendation and providing the results of an investigation by the Fallujah Resident Office team conducted on site on 20 May 2009. Their investigation revealed no structural cracking—only minor surface shrinkage cracks and cracks caused by form irregularities.

GRD did not concur with a second recommendation in the draft report to investigate the need to provide bituminous overlay over the entire structure. GRD noted that the contractor conducted a contract-required assessment in March 2008 of the need to resurface the entire bridge. The contractor's assessment did not recommend resurfacing the entire bridge surface and the project manager agreed with the contractor's assessment.

GRD also provided additional information for clarity and accuracy of the final report.

Evaluation of Management Comments. SIGIR appreciates the prompt action taken by GRD to resolve Recommendation 1. While SIGIR continues to believe that the entire structure requires a bituminous overlay, SIGIR's review of the contractor required assessment made in March 2008 notes that bituminous overlay of the entire structure was not addressed. Because a fixed price contract is involved, it is not be possible to require the contractor to provide bituminous overlay of the entire structure at this point. As a result, SIGIR eliminated the second recommendation.

SIGIR also revised the draft report as appropriate to include the additional clarifying information provided by GRD.

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Introduction

Objective of the Project Assessment

The objective of this project assessment was to provide real-time relief and reconstruction project information to interested parties to enable appropriate action, when warranted. SIGIR conducted this limited scope assessment in accordance with the Quality Standards for Inspections issued by the Council of the Inspectors General on Integrity and Efficiency. The assessment team comprised two engineers/inspectors and two auditors/inspectors. Specifically, SIGIR determined whether:

1. Project components were adequately designed prior to construction or installation;
2. Construction or rehabilitation met the standards of the design;
3. Adequate quality management programs were being utilized;
4. Sustainability was addressed in the contract or task order for the project; and
5. Project results were or will be consistent with original objectives.

Pre-site Assessment Background

Contract, Costs and Payments

On 29 December 2007, using Commander's Emergency Response Program funding, the Gulf Region Central (GRC) of the U.S. Army Corps of Engineers awarded Contract W917BG-08-C-0020—a firm-fixed-price-contract for $1,261,500—to a local contractor. The contract required the contractor to complete the entire project within 240 days after receiving the notice to proceed (NTP), which was issued on 12 February 2008. The initial contract contained one modification.

Modification P00001, dated 7 May 2009, was a no cost modification issued to make changes to the Statement of Work (SOW). This modification deleted the original SOW requirements to completely remove all debris, excess materials, and rubble from the site location, replace damaged riprap slope protection from collapse of the bridge span, and supply materials and repair damaged concrete members. Instead, the modification required the contractor repair the entire bridge rail and damaged expansion joint at the west abutment since these items were not included in the original SOW.

Project Objective

The objective of the project was to design, construct, and repair the Mujarrah Canal Bridge, which sustained devastating damage caused by a vehicle-borne improvised explosive device (VBIED). The contract required that the bridge be restored to its original condition and be fully functional on completion of the project. This bridge is recognized throughout Iraq as one of the most significant bridges: it connects the main commercial traffic artery from western Iraq through Ramadi and Falluja—and ultimately to Baghdad.

Pre-construction Description

The description of the facility (pre-construction) was based on information that SIGIR obtained from the GRC Falluja Resident Office. The Mujarrah Canal Bridge is on Army Supply Route (ASR) Atlantic City, approximately midway between Falluja and Ramadi. The structure carries ASR Atlantic City over the Mujarrah Canal just south of Lake Habbaniyah.

The general topography surrounding the site is level, with no significant changes in elevation. The Mujarrah Canal is the only significant topographic feature in the vicinity, connecting Lake Habbaniyah immediately to the north with Lake Razzazah, approximately 12 kilometers to the south. The canal near the structure is approximately 12 meters (m) deep, with near-vertical sides. The underlying geology appears to be highly erodible, resulting in the deep, approximately rectangular, channel geometry (Site Photo 1).

Site Photo 1. Looking downstream from the Mujarrah Canal Bridge

In the confluence of the canal and Lake Habaniyah, a dam appears to control flows into the canal (Figure 1). GRC Falluja Resident Office representatives did not know if there is potential for a rapid release of storage from the dam; however, the span and under-clearance of the structure appear to permit unimpeded flow in the channel.

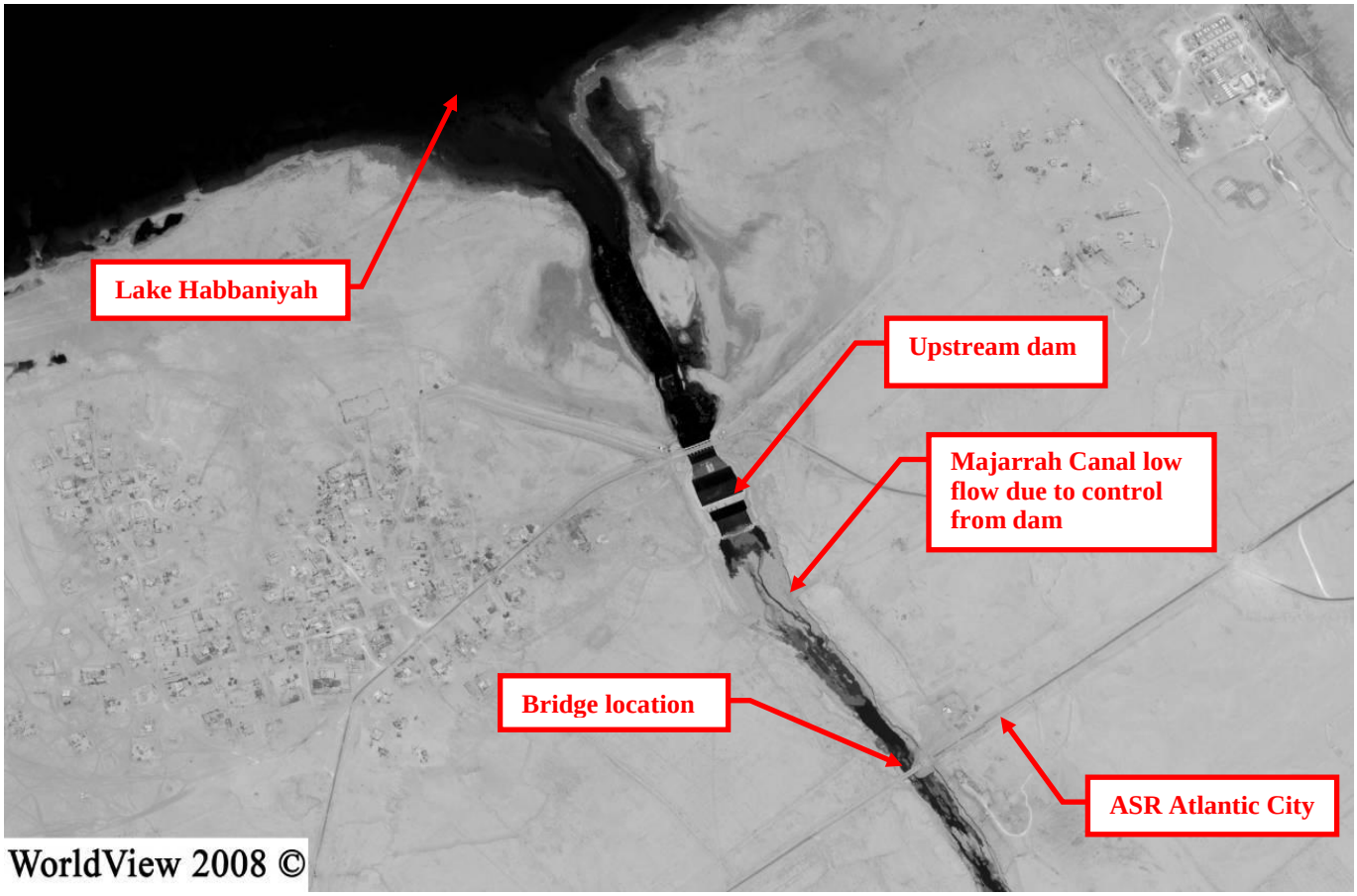
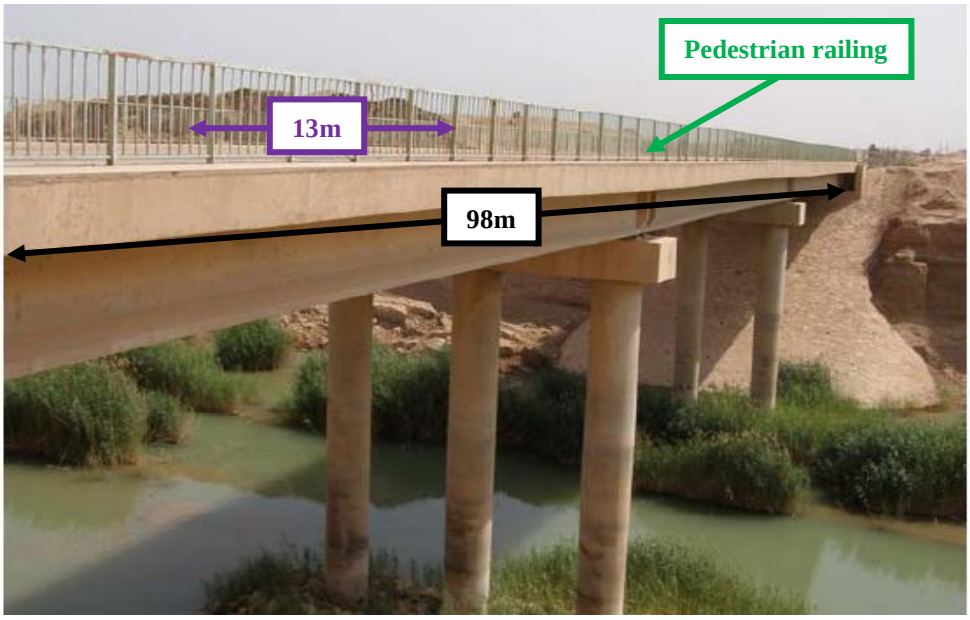


Figure 1. Location of Mujarrah Canal Bridge, dam, and Lake Habbaniyah (Courtesy of GRC)

Bridge description prior to VBIED damage

Constructed in 1983, the Murrajah Canal Bridge is a three-span structure, 98m long and 13m wide (Site Photo 2). A reinforced-concrete deck carries a two-lane, 9m-wide cart way, with 2m-wide pedestrian walkways along both sides of the bridge. The cart way is covered with a bituminous asphalt wearing surface and is separated from the walkways by concrete curbing. The cart way has metal pedestrian railing along the outside edge of the walkways. At the end of each girder, pre-molded expansion joints accommodate movement and protect the bearing seats from runoff and debris accumulation.



Site Photo 2. Mujarrah Canal Bridge prior to VBIED damage (Courtesy of GRC)

Each span of the bridge is supported by five post-tensioned[1] concrete girders, 30.7m in length. The bridge girders are simply supported, with no continuity between spans. Cast-in-place reinforced concrete diaphragms are located between the girders at each end of the span. There are no intermediate diaphragms present.

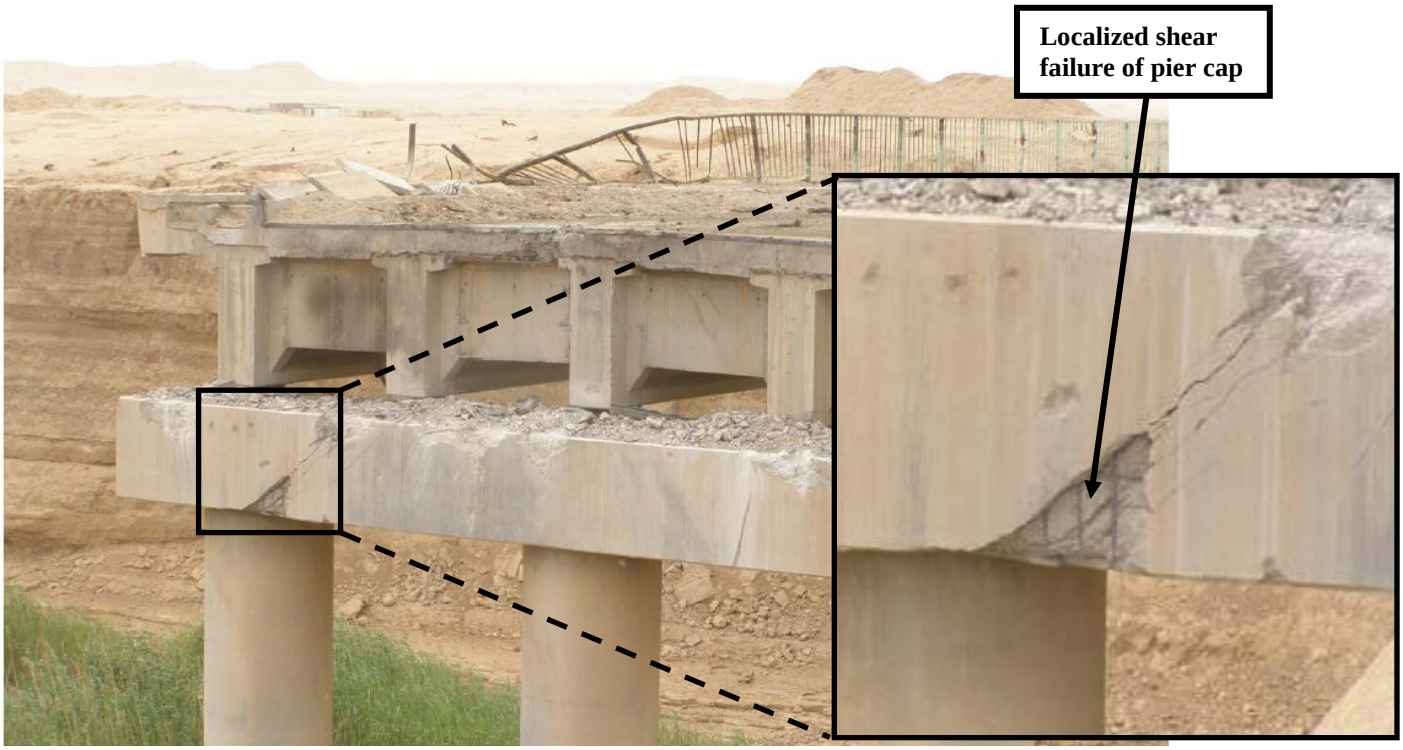
The girders bear on elastomeric[2] bearing pads and concrete pedestals. The structure is supported at the ends by reinforced-concrete abutments and in the interior with reinforced-concrete bents (precast-concrete components). The abutments appear to be stub-type abutments, which rely on the integrity of the ground surface at the face of the abutment.

Bridge description after VBIED damage

According to project file documentation, in May 2007, a VBIED was detonated on the eastern span (Span No. 1) of the structure. The detonation caused damage to the pier cap (the beam across the column top) of Bent No. 1 and post-tensioned concrete girders, resulting in the collapse of Span No. 1 (Site Photos 3 and 4).

[1] Post-tension or pre-stressed concrete is a method for overcoming the concrete's natural weakness in tension. It can be used to produce beams, floors or bridges with a longer span than is practical with ordinary reinforced concrete.

[2] The elastomeric bearing pads contain rubbery properties; they stretch easily and then quickly return to their original length when released.



Site Photo 3. VBIED damage to the Mujarrah Canal Bridge's pier cap at Bent No. 1 (Courtesy of GRC)

Site Photo 4. Mujarrah Canal Bridge with VBIED damage to Span No. 1 (Courtesy of GRC)

Damage from the VBIED resulted in a shear failure[3] of the reinforced-concrete pier cap at Bent No. 1 and a collapse of Span No. 1. Abutment No. 1 was also damaged, most likely as secondary damage caused by the collapse of Span No. 1. The project file documentation also identified other damage:

- bearing pads damaged/destroyed
- reinforced-concrete deck slab destroyed
- sidewalks destroyed
- bridge rail destroyed
- asphalt pavement destroyed
- reinforced-concrete curbs destroyed

However, based on available documentation, the Bent No. 1 columns were not significantly damaged.

Statement of Work

The SOW for this project covered the design, construction, and repair of the Mujarrah Canal Bridge to restore it to its original condition by making the bridge a fully functional structure. Specifically, this required the supply and installation of concrete girders, pier cap, reinforced-concrete deck sidewalks, curbs, railing, and bridge deck covering.

Current Project Design and Specifications

The SOW required incorporating the design requirements of the original structures into the contractor's repair design. The contractor must coordinate with the appropriate ministry to obtain the original structure design documentation; however, if the original data is not available, the contractor can use similar bridge design data instead. In addition, the contractor must perform a full and accurate site survey and complete and submit 50% design drawings based on the original design or approved similar designs. The 50% design drawings were to include the following:

- site plan of all major structures, utilities, elevations, and points of connection
- structural drawings, such as sections and details to adequately describe dimensions and materials for the new girders, pier cap, and deck
- structural design calculations for the deck, pre-stressed concrete girders, and pier cap
- architectural drawings of each structure, showing plan, various elevations, and sections of each structure
- road, sidewalk, street light, conduit, and bridge rail
- details of concrete repairs to return damaged sections to original design requirements

The 50% design drawings are to be submitted to the GRC Falluja Resident Office and the appropriate ministry. The contractor must address or incorporate comments from both offices and then submit the 100% design. The SOW required that the 100% design package include detailed drawings and design calculations, detailed technical specifications, and a bill of quantities.

The GRC Falluja Resident Office provided SIGIR with the contractor's generated design package. The contractor's site survey identified all degrees of damage to the existing bridge (Figure 2).

[3] Shear failure is the failure of soil and beams under vertical loads.

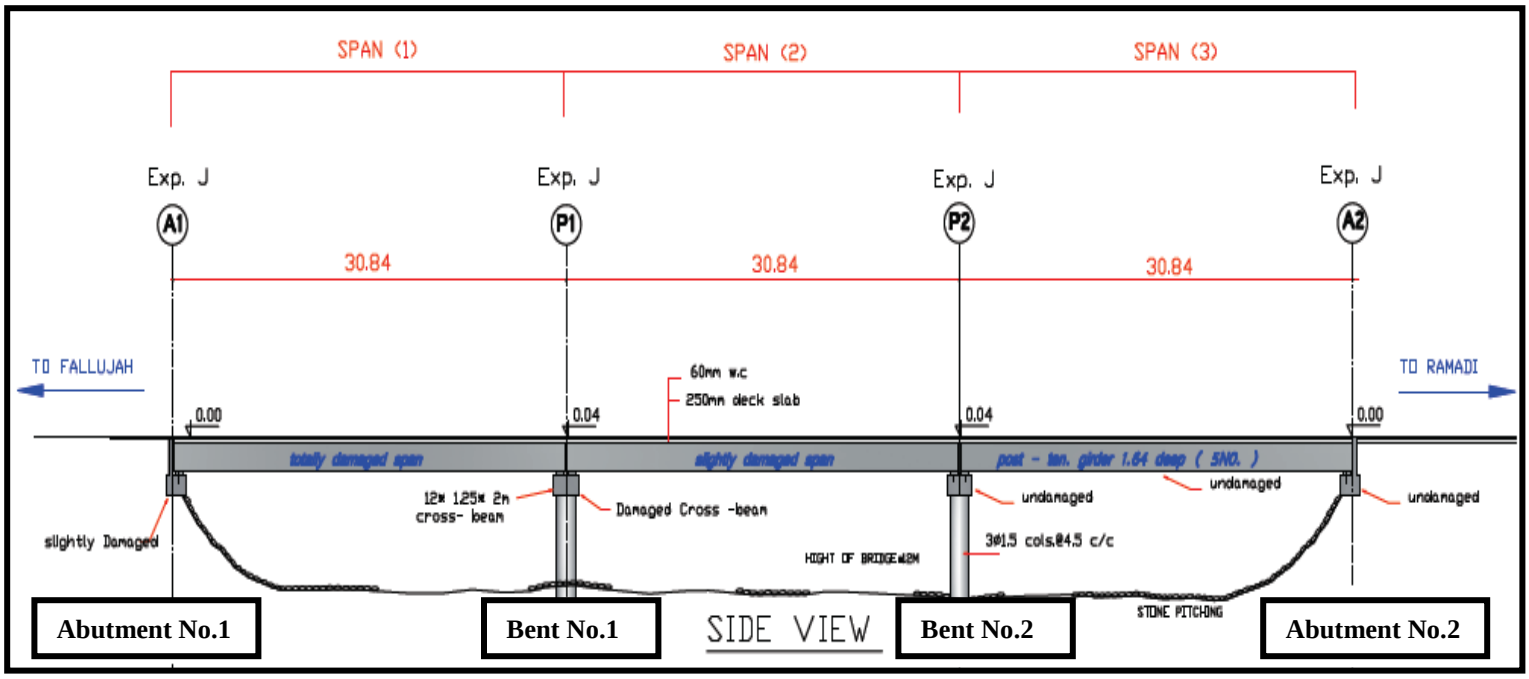


Figure 2. Bridge elevation view (Courtesy of GRC)

The contractor's generated drawings contained specific information about the temporary jacking and support of the existing structure, construction of the post-tensioned concrete beams and reinforced-concrete deck, and other project features (Figure 3).

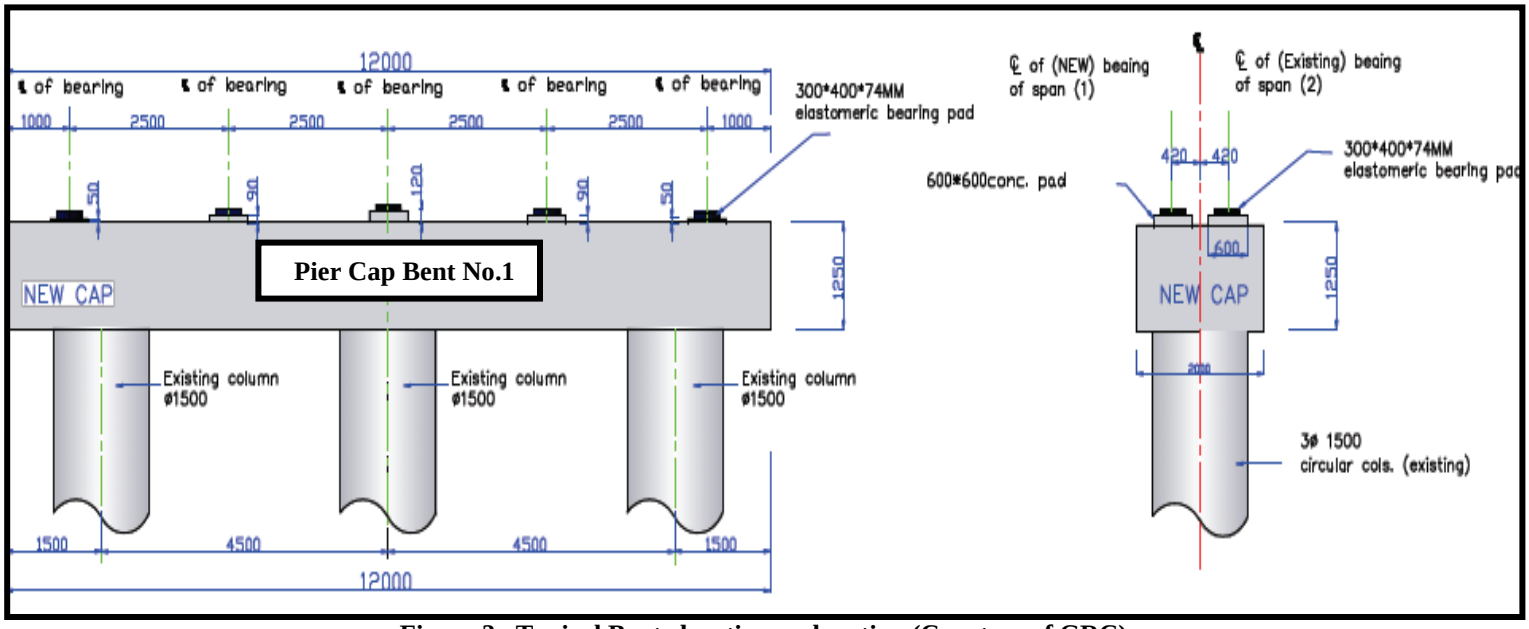


Figure 3. Typical Bent elevation and section (Courtesy of GRC)

The SOW required that "Construction specifications shall adhere to the current publication of the Republic of Iraq Standard Specification for Roads and Bridges or equal." During our review of the contractor's generated designs, SIGIR observed the drawings stating that this project was to be constructed in accordance with "Iraqi Standard Specifications For Roads and Bridges Unless Otherwise Noted." SIGIR noted

several instances in which alternate specifications were used for this project. For example, the following design standards were specified on the General Notes section of the design:

- British Standards
  - B.S 5400 / P_2 Loads & Load Combination Of Design
  - B.S 5400 / P_4 Reinforced Concrete Bridges
  - B.S 5400 / P_5 DESIGN OF COMPOSITE BRIDGES
  - CP[4] 110 & 114 Design Of Concrete Structure

- AASHTO Standard Specifications[5]

In addition, the design loading for the structure is a based on this combination of specifications:

- Post-Tensioned Girders and Pier Cap
  - Iraqi Standard Loading for Highway Bridges – Civil Loading
  - Iraqi Standard Loading for Highway Bridges – 90 Ton Tracked Vehicle
  - Iraqi Standard Loading for Highway Bridges – 104 Ton Wheeled Vehicle

- Reinforced Concrete Deck
  - AASHTO HS-20

In addition, the SOW stated that when repair and refurbishment are required, the standards of the original design will be used. Existing materials and equipment will be replaced with equipment that meets the original design intent of the facility if not specified in the SOW or bill of quantities section; however, if new material or equipment has been specified or if the original material or equipment is determined to be inadequate for the proposed service, new items will be specified to Iraqi or equivalent international codes and standards.

After reviewing the entire design package—including drawings and technical specifications—and including by reference other applicable codes and standards, SIGIR determined that there was adequate information to complete the final design and repair and construct the Mujarrah Canal Bridge.

Site Assessment

On 6 March 2009, SIGIR performed a limited on-site assessment of the Mujarrah Canal Bridge project. Two GRC Falluja Resident Office representatives accompanied SIGIR during the site visit. At the time of the site visit, construction had progressed through several significant milestones and was at a stage that permitted a fairly thorough assessment of the overall progress and condition of the project. However, due to security concerns, the time allotted for the site visit was approximately 60 minutes. Consequently, SIGIR performed an expedited assessment of the project; therefore, a complete review of all work completed was not possible. Because it was an Iraqi

[4] CP refers to British Standards "Code of Practice for structural use of concrete."

[5] The American Association of State Highway and Transportation Officials (AASHTO) is a nonprofit, nonpartisan association representing highway and transportation departments in the 50 states, the District of Columbia, and Puerto Rico. It represents all five transportation modes: air, highways, public transportation, rail, and water. Its primary goal is to foster the development, operation, and maintenance of an integrated national transportation system.

weekend day and a labor dispute was in progress, SIGIR did not observe any contractor personnel working at the site.

Project Status

At the time of the site visit, the project was significantly behind schedule. The contract required the contractor to complete the project within 240 days after receiving the NTP. The GRC issued the NTP on 12 February 2008; therefore, the contract required completion date was 9 October 2008.

On 19 December 2008, the GRC Falluja Resident Office, "concerned with the lack of progress" on this project, issued a letter of concern to the contractor. Specifically, the letter stated the following GRC concerns to the contractor:

1. "No work activity was performed since December 1st, 2008."

2. "The last progress payment was made on December 8th, 2008. Any proceeds from the payment due your subcontractor's [sic] must be paid timely in accordance with the terms of your subcontract. Your subcontractor has stated that he has not been paid as of this date."

3. "The updated time schedule that your firm has provided is showing critical activities that are slipping further behind, for example the updated schedule dated December 4th, 2008 indicates that the girder placement will be completed by December 14th, 2008. The most recent time schedule you have submitted, dated December 14th, 2008, now shows the completion for this activity on December 26th, 2008. In less than 2 weeks this critical activity has slipped nearly two weeks. Slipping of critical activities cannot continue to happen."

4. "Your latest schedule update dated December14th, 2008, indicates that concrete bridge deck installation will begin on December 21st, 2008. This critical activity can obviously not happen before the girders have been placed."

5. "The placement of the concrete on the bridge deck is of concern because it is large concrete placement. Proper placement of the deck, including placement methods, concrete design, delivery methods and curing, will be a critical path item as well."

SIGIR estimated that at the time of the site visit, the contractor had completed 75 percent of the bridge construction, including reconstruction of the reinforced-concrete bent cap, abutment repair, fabrication and placement of the post-tensioned concrete girders, and construction of falsework[6] for the reinforced-concrete bridge deck.

According to GRC Falluja Resident Office representatives, the estimated construction completion date was March 2009; however, including the time required to cure the concrete, the bridge is now estimated to be open to traffic on 1 June 2009.

[6] Falsework consists of temporary structures used in construction to support spanning or arched structures in order to hold the component in place until its construction is sufficiently advanced to support itself.

Approach Roadway

The approach roadway to the bridge follows the surrounding terrain and is level. There did not appear to be any significant horizontal or vertical curves in the approach alignment in the vicinity of the bridge, and the bridge crosses the canal with no apparent skew. The approach roadways appeared to be in fair condition; however, SIGIR observed that the northern approach is covered with dirt—apparently caused by the movement of construction equipment—which partially covered the pavement (Site Photo 5.)

SIGIR observed that roadway visibility at the bridge is very good due to the approach roadway geometry; however, due to the low profile of the bridge and the vertical walls of the canal, SIGIR is concerned that approaching traffic may have difficulty seeing the bridge itself. No permanent advance-warning signs for the bridge were posted, and there is no guiderail to prevent vehicles from leaving the cart way and entering the canal. The structure-mounted rail appeared to be intended to protect pedestrians only and did not appear to be strong enough to resist even a minor vehicle impact.

Site Photo 5. Northern approach roadway looking south across the bridge

Due to the long, straight approach, SIGIR is concerned that traffic could attain significant speeds along this section of roadway, increasing the distance required for traffic to be warned of the construction project. Under the SOW, the contractor is:

> "…responsible for [the] supply, installation and maintenance of road barricades, road detour signs, traffic flagmen, etc., during the contract performance. Barricades, signs, etc., shall be equipped with flashing red warning lights which will operate continuously from dusk to dawn. Contractor shall be responsible for operation and maintenance of these devices. Damaged and missing equipment will be replaced immediately by the Contractor."

SIGIR observed warning signs near the project with concrete or timber barricades across the roadway at either end of the project site (Site Photo 6); however, it is questionable

whether the distance from the signage to the structure is adequate for vehicles to perform a controlled stop.

The methods employed at the site to protect traffic and pedestrians do not meet the contract specifications, and they expose the traveling public to danger. Also, any collision with the structure will damage the work in progress, resulting in a serious setback to the contractor's completion schedule, which has already been significantly delayed.

Site Photo 6. Traffic control signs looking south across the bridge

Project Site

To provide a working platform in reach of the contractor's available equipment and scaffolding, the contractor placed a significant amount of fill extending from Abutment No. 1 to Bent No. 1. Access to the structure is provided by a temporary construction road around the eastern end of Abutment No. 1. According to GRC Fallujah Resident Office representatives, the original Span No. 1 was not removed from the site: it was buried beneath the fill. The existing columns for Bent No. 1 were encased in the fill so that the working platform could be extended beneath a portion of Span No. 2. This provided a level working area for jacking and replacing the pier cap.

Reinforced-concrete Deck

At the time of the site visit, the contractor had constructed the falsework for the reinforced-concrete deck and had started placement of the reinforcing steel (Site Photo 7). The contractor constructed the deck on precast reinforced-concrete deck pans[7] that were poured onsite and placed between the girders. The overhang formwork was

[7] A reinforced concrete deck structure particularly adaptable for bridge spans is made up of superimposed layers of concrete with a corrugated metal pan therebetween along with a plurality of reinforcing bars which extend transversely of and through the corrugations. Individual, partially completed slabs are precast and are then placed on a bridge span and covered with a second layer.

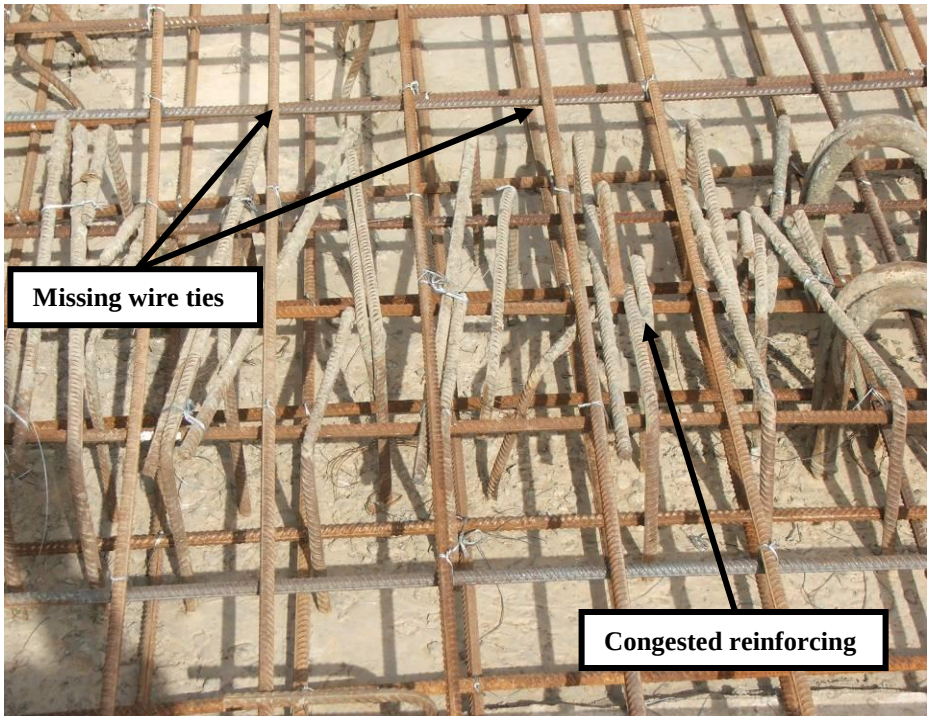
constructed on scaffolding, supported from the fill placed beneath the structure (Site Photo 8.)

Site Photo 7. Concrete deck reinforcing (prior to placing top mat, foreground)

Site Photo 8. Falsework for forming concrete deck overhang

SIGIR noted several issues with the placement of the reinforcing for the concrete deck. For example, near the ends of the girders, SIGIR found areas of severe reinforcing steel congestion (Site Photo 9.) SIGIR is concerned that this configuration of reinforcing steel may prevent homogeneous concrete placement, which would result in voids in the deck. Since the purpose of the reinforcing steel in this area is to create composite action

between the deck and the girders, voids beneath the reinforcing could reduce the capacity of the structure.



Site Photo 9. Reinforcing congestion and missing wire ties at girder ends

SIGIR also noted that the bottom mat of reinforcing steel was placed directly on the precast-concrete deck pans. To provide composite action between the reinforcing and the concrete deck, adequate cover needs to be obtained around the reinforcing to permit stress transfer. Inadequate cover may result in the reduced capacity of the deck. SIGIR understands that it is a common practice for contractors to place chairs under reinforcing steel immediately before concrete placement. This helps avoid bending the chairs or rebar when walking on the matting as shown in Site Photo 7. If the contractor placed adequate chairs under the reinforcing steel prior to concrete placement, this is not an issue.

In addition, any moisture penetrating the concrete deck will most likely gather between the poured concrete deck and the precast-concrete deck pans. Without adequate concrete cover, the reinforcing steel will be vulnerable to corrosion and deterioration, which would result in decreased load-carrying capacity and/or accelerated deterioration of the deck.

Further, SIGIR identified the apparent vertical offsets between the individual precast-concrete deck pans. In several areas, SIGIR noticed that the pans were offset from each other and from the post-tensioned concrete beams. It appeared that the contractor attempted to rectify this by placing grout between panels. SIGIR's primary concern with the deck pan placement is the potential impact on the overall thickness of the deck. If several panels are set too high, the deck may be constructed with a thinner section in these areas than the one specified in the design drawings, or the reinforcing steel may be placed too close to the concrete surface. A thinner deck section may result in a lower load-carrying capacity, and inadequate concrete cover may affect the long-term performance of the deck.

During the site visit, SIGIR reviewed the existing portion of the structure and determined that some areas of the wearing surface of the existing bridge deck are poor. Specifically, SIGIR observed holes that extended through the wearing surface to the top of the concrete deck. According to GRC Falluja Resident Office representatives, only the new section of the deck will receive a bituminous overlay; however, the SOW requires the contractor to "provide and install bituminous hot mix wearing course on full width of the new span and existing span as needed." In SIGIR's opinion, the entire structure requires a bituminous overlay.

Post-tensioned Concrete Girders

The post-tensioned concrete girders appeared to be constructed per the contractor's design drawings. SIGIR observed placement and uniform spacing aligned with the existing construction (Site Photo 10). Due to time constraints, SIGIR could not verify the sweep and chambers of the beams; however, GRC Falluja Resident Office representatives stated that the beams were within the tolerance of the design at the time of placement.

Site Photo 10. Post-tensioned concrete girders

SIGIR observed no exposed honeycombing[8] but did identify hairline cracking on the girders. Using squirt bottles, SIGIR sprayed water onto the concrete girders to wash away dirt and make any existing cracks more visible (Photo 11 and 12). Due to time limitations, SIGIR could not map the cracking or determine if the quantity and depth of the cracks are indicators of significant issues with the beams. Any visible cracking, specifically vertical and diagonal, are indicators of potentially serious issues with either post-tensioning or shear reinforcement.[9] In a draft of this report, SIGIR recommended that the GRC Fallujah Resident Office further investigate and determine the seriousness

[8] Honeycombing refers to voids in concrete that occur when mortar does not fill the spaces between the coarse aggregate particles.

[9] This relates to the reinforcement of concrete slabs in the vicinity of columns where the slabs are subjected to large bending movements and shearing forces.

of the cracks. A Fallujah Resident Office team conducted an on-site inspection on 20 May 2009. Their inspection revealed no structural cracking, only minor surface shrinkage cracks and cracks caused by form irregularities.

Site Photos 11 and 12. Cracking at girder ends

While reviewing the underside of the superstructure, SIGIR noted several misaligned interior diaphragms (Site Photo 13). Due to the secondary load-carrying nature of the diaphragms, this did not appear to be a serious issue; however, it is an indicator of quality issues relating to the contractor's ability to construct accurate formwork.

Site Photo 13. Misaligned diaphragms

SIGIR examined some of the existing bridge structure near Pier Cap No. 1. Several of the end diaphragms for Span No. 2 had been damaged in the VBIED detonation, and the panels show varying degrees of attempted repair.

The existing end-diaphragm panel near the center of the pier appeared to have been shattered (Site Photo 14). The horizontal and vertical cracking through the center of the panel indicated that the panel has completely failed and offered limited resistance as a diaphragm. An attempt appeared to have been made to patch some of the damaged areas of the panel; however, due to its complete failure, a more comprehensive repair or complete replacement of this panel should have been considered.

Site Photo 14. Existing damaged diaphragm at Bent No. 1

Sub-structure

According to project file documentation, the contractor was to repair the existing Bent No. 1. The initial assessment stated that the reinforced-concrete columns for the bent were not damaged from the blast and did not require significant repair or replacement. However, the reinforced-concrete pier cap for the bent was seriously damaged from the VBIED detonation and required replacement.

SIGIR noted that the new reinforced-concrete cap appeared to be well constructed. SIGIR did not observe any significant cracking or defects in the cap. The surface of the cap appeared smooth and properly formed (Site Photo 15), and the jointing of the cap to the columns was uniform with clean, consistent joints.

Site Photo 15. Bent cap at Pier No. 1

In addition, the contractor placed the beam bearings according to the design, and the elastomeric pads were square, with no bulging or skew.

Project Quality Management

Contractor's Quality Control Program

Department of the Army Engineering Regulation (ER) 1180-1-6, dated 30 September 1995, provides general policy and guidance for establishing quality management procedures in the execution of construction contracts. According to ER 1180-1-6, "…obtaining quality construction is a combined responsibility of the construction contractor and the government."

The SOW required the contractor to perform a three-phase quality control (QC) program—Preparatory, Initial, and Follow-Up—throughout the duration of the project. The *Preparatory Phase* is performed prior to beginning work on each definable feature of work and includes the review of contract drawings; ensuring that all materials and equipment have been tested, submitted, and approved; and examining the work area to assure that all required preliminary work has been completed and complies with the contract. The *Initial Phase* is accomplished at the beginning of each definable feature of work and includes a check of work to ensure that it fully complies with contract requirements, to establish a level of workmanship, and to verify that it meets the minimum acceptable workmanship standards. The *Follow-Up Phase* assures that control activities, including control testing, are providing continued compliance with the contract requirements, until completion of the particular feature of work. These checks are to be documented in the QC documentation.

The contractor submitted a QC plan, which the GRC Falluja Resident Office accepted as meeting the standards addressed in ER 1180-1-6.

The QC representatives monitored field activities and completed daily QC reports, which presented a brief background on the number of workers on site and the work activities performed. In addition, the QC representatives supplemented the daily QC reports with photographs reinforcing the information provided in the daily reports. Although the project file contained multiple test results (i.e., cube tests, steel rebar tests, etc.), the QC reports did not mention that any testing had been performed.

The daily QC reports did not have a section for construction deficiencies identified; consequently, the QC reports failed to document the construction deficiencies that SIGIR identified, such as missing wire ties, hairline cracks on the girders, and misaligned interior diaphragms.

Government Quality Assurance

The USACE ER 1110-1-12 specifies requirements for a government quality assurance (QA) program. Similar to the QC program, a crucial oversight technique is presence at the construction site. GRC Fallujah Resident Office, which is responsible for the construction of the Mujarrah Canal Bridge project, employs local national Iraqi engineers to serve as QA representatives, visiting the project site daily and writing daily QA reports.

Local national QA representatives monitored field activities and completed daily QA reports, which were reviewed by the GRC Falluja Resident Office project engineer. The reports documented the number of workers on site and the work performed for the day. Also, the QA representatives supplemented the daily QA reports with detailed photographs that reinforced the information provided in the reports.

Similar to the QC representatives, the QA representatives did not document the construction deficiencies that SIGIR identified, such as missing wire ties, hairline cracks on the girders, and misaligned interior diaphragms.

The QA representatives attempted to enforce proper safety procedures by writing weekly safety reports documenting the contractor's performance. The QA representatives identified unsafe practices, such as "personnel observed wearing non-approved protective footwear (sneakers) on the project site" or "the temporary wiring was not…isolated/guarded to prevent contact." The QA representative would re-visit each deficiency on the next weekly report; however, many safety procedure deficiencies still existed.

Project Sustainability

The SOW included sustainability elements to assist the Iraqi Ministry of Transportation in operating this project after turnover.

Operations and Maintenance Support

The SOW required the contractor to provide operations and maintenance support for all facilities and equipment installed, constructed, or rehabilitated in the scope of the project. This support will be provided during the construction, startup, and commissioning phases of the project.

Warranties

The contract required the contractor to provide and certify warranties in the name of the appropriate ministry of all materials or equipment—including any mechanical, electrical and/or electronic devices—and all operations for 12 months after the final acceptance of the project. In addition, the contractor must provide any other commonly offered extended warranties for material, equipment, and machinery purchased.

As-built Drawings

The SOW required the contractor, upon completion of each facility under this contract, to prepare and furnish as-built drawings to the GRC Fallujah Resident Office. The as-built drawings would record the construction as installed and completed by the contractor. The as-built drawings would include all information shown on the contract set of drawings. They would also include all deviations, modifications, or changes from those drawings, however minor, which were incorporated in the work—including all additional work not appearing on the contract drawings, and all changes made after any final inspection of the contract work.

According to GRC Fallujah Resident Office representatives, the contractor will provide the as-built drawings once construction has been completed.

Conclusions

Based on the results of the site visit, SIGIR reached the following conclusions related to the assessment objectives. Appendix A provides details about the scope and methodology of this assessment.

1. The Statement of Work required incorporating the design requirements of the original structures into the contractor's repair design. The contractor was required to coordinate with the appropriate ministry to obtain the original structure design documentation; however, if the original data was not available, the contractor could use similar bridge design data instead. The Statement of Work also required the contractor to submit 50% and 100% design packages to the Gulf Region Central (GRC) Falluja Resident Office for review and approval. SIGIR reviewed the contractor's generated design package, which contained specific information about the damage to the existing bridge, the temporary jacking and support of the existing structure, construction of the post-tensioned concrete beams and reinforced-concrete deck, and other project features. After reviewing the entire design package—including the drawings and technical specifications— and other applicable codes and standards, SIGIR determined that there was adequate information to complete the final design and to repair and construct the Mujarrah Canal Bridge.

2. During the 6 March 2009 site visit, SIGIR observed that the contractor had completed a significant portion of the bridge construction, including reconstruction of the reinforced-concrete bent cap, abutment repair, fabrication and placement of the post-tensioned concrete girders, and construction of false work for the reinforced-concrete bridge deck. SIGIR noted areas of concern with the placement of the reinforcing for the concrete deck, such as areas of severe reinforcing steel congestion near the ends of the girders. SIGIR also identified the apparent vertical offsets between the individual precast-concrete deck pans. In several areas, the pans were offset from each other and from the post-tensioned concrete beams. SIGIR also determined that some areas of the wearing surface of the existing bridge deck are poor, specifically noting holes that

extended through the wearing surface to the top of the concrete deck. The Statement of Work required the contractor to "install bituminous hot mix wearing course on full width of the new span and existing span as needed." In SIGIR's opinion, the entire structure requires a bituminous overlay. Also, SIGIR identified hairline cracking on the girders. Due to being limited to approximately 60 minutes on site, SIGIR could not map the cracking or determine if the quantity and depth of the cracks are indicators of significant issues with the beams.

Aside from these construction issues, SIGIR concluded that most of the construction work met the standards of the contractor's designs.

3. The contractor's quality control (QC) plan was sufficiently detailed to effectively guide the contractor's quality management program. The contractor submitted a QC plan, which the GRC Fallujah Resident Office accepted as meeting the standards addressed in Engineering Regulation 1180-1-6 (Construction Quality Management). The QC representatives monitored field activities and completed daily QC reports, which presented a brief background on the number of workers on site and the work activities performed. In addition, the QC representatives supplemented the daily QC reports with photographs reinforcing the information provided in the daily reports. Although the project file contained multiple test results—cube tests, steel rebar tests, etc.—the QC reports did not mention that any testing had been performed. In addition, the daily QC reports did not have a section for construction deficiencies identified; consequently, the QC reports failed to document the construction deficiencies that SIGIR identified, such as missing wire ties, hairline cracks on the girders, and misaligned interior diaphragms.

   The U.S. government quality assurance (QA) program has not been completely effective in monitoring the contractor's QC program. The GRC Falluja Resident Office, which is responsible for the construction of the Mujarrah Canal Bridge project, employs local national Iraqi engineers to serve as QA representatives to visit the project site daily and write daily QA reports for the project engineer's review. The reports documented the number of workers on site and the work performed for the day. Also, the QA representatives supplemented the daily QA reports with detailed photographs that reinforced the information provided in the reports. Like the QC representatives, the QA representatives did not document the construction deficiencies that SIGIR identified, such as missing wire ties, hairline cracks on the girders, and misaligned interior diaphragms.

4. Sustainability was addressed in the contract requirements. The Statement of Work included sustainability elements to assist the Iraqi Ministry of Transportation in operating this project after turnover, such as requiring the contractor to:
   - provide and certify warranties in the name of the appropriate ministry for all materials and equipment
   - provide operations and maintenance support for all facilities and equipment installed, constructed, or rehabilitated in the scope of the project
   - on completion of each facility, prepare and furnish as-built drawings, which will be a record of the construction as installed and completed

5. To date, the project results are consistent with the original project objectives to design, construct, and repair the Mujarrah Canal Bridge. However, the project results are not consistent with the contract requirement to complete the project within 240 days of the notice to proceed. The GRC issued the notice to proceed on 12 February 2008, which

required the contractor to complete the project by 9 October 2008. During the site visit, GRC Falluja Resident Office representatives estimated the construction completion as March 2009; the bridge opened on 8 June 2009.

Recommendations

SIGIR recommended that the Commanding General, Gulf Region Division of the U.S. Army Corps of Engineers investigate the hairline cracks on the girders and determine if the quantity and depth of the cracks are indicators of significant issues with the beams and take necessary corrective actions.

Management Comments

SIGIR received comments on the draft of this report from the Commanding General, GRD concurring with the recommendation and providing the results of an investigation by the Fallujah Resident Office team conducted on site on 20 May 2009. Their investigation revealed no structural cracking— only minor surface shrinkage cracks and cracks caused by form irregularities.

GRD did not concur with a second recommendation in the draft report to investigate the need to provide bituminous overlay over the entire structure. GRD noted that the contractor conducted a contract required assessment in March 2008 of the need to resurface the entire bridge. The contractor's assessment did not recommend resurfacing the entire bridge surface and the project manager agreed with the contractor's assessment.

GRD also provided additional information for clarity and accuracy of the final report.

Evaluation of Management Comments

SIGIR appreciates the prompt action taken by GRD to resolve Recommendation 1. While SIGIR continues to believe that the entire structure requires a bituminous overlay, SIGIR's review of the contractor required assessment made in March 2008 notes that bituminous overlay of the entire structure was not addressed. Because a fixed price contract is involved, it is not possible to require the contractor to provide bituminous overlay of the entire structure at this point. As a result, SIGIR eliminated the second recommendation.

SIGIR also revised the draft report as appropriate to include the additional clarifying information provided by GRD.

Appendix A. Scope and Methodology

SIGIR performed this project assessment from February 2009 through May 2009 in accordance with the Quality Standards for Inspections issued by the Council of the Inspectors General on Integrity and Efficiency. The assessment team comprised two engineers/inspectors and two auditors/inspectors.

In performing this project assessment, SIGIR:

- reviewed contract documentation, including Contract W917BG-08-C-0020, the Statement of Work, and other items;
- reviewed the available design packages (drawings and specifications), quality control reports, quality assurance reports, and photographs of construction progress;
- interviewed the U.S. Army Corps of Engineers Gulf Region Central personnel; and
- conducted an on-site assessment on 6 March 2009 and documented the results at the Mujarrah Canal Bridge project, in Ramadi, Iraq.

Scope Limitation. Due to security concerns, SIGIR performed only an expedited assessment. The time allotted for the Mujarrah Canal Bridge site visit was approximately 60 minutes; therefore, a complete review of all work completed was not possible.

Appendix B. Acronyms

ASR	Army Supply Route
GRC	Gulf Region Central
GRD	Gulf Region Division
m	Meter
NTP	Notice To Proceed
QA	Quality Assurance
QC	Quality Control
SIGIR	Special Inspector General for Iraq Reconstruction
SOW	Statement of Work
VBIED	Vehicle-borne Improvised Explosion Device

Appendix C. GRD Comments on Draft Report

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS
GULF REGION DIVISION
BAGHDAD, IRAQ
APO AE 09348

REPLY TO
ATTENTION OF

CEGRD-CG

2 June 2009

MEMORANDUM FOR Special Inspector General for Iraq Reconstruction, US Embassy Annex II, Room 1013, APO AE 09316:

SUBJECT: SIGIR Draft Report – Mujarrah Canal Bridge, Ramadi, Iraq (SIGIR PA-09-170)

1. The Gulf Region Division reviewed the subject draft report. GRD concurs with the first recommendation but non-concurs with the second recommendation based on information that resurfacing the entire bridge was not necessary. GRD provides additional comments for clarity and accuracy in the enclosure.

2. Thank you for the opportunity to review the draft report and provide our written comments for incorporation into the final report.

3. If you have any questions, please contact Mr. Robert Donner at (540) 665-5022 or via email at Robert.L.Donner@usace.army.mil.

Michael R. Eyre

MICHAEL R. EYRE
Major General, USA
Commanding

Encl
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Appendix C. GRD Comments on Draft Report

COMMAND REPLY
to
SIGIR Draft Audit Report – Mujarrah Canal Bridge,
Ramadi, Iraq
SIGIR Report Number PA-09-170

Overall Comment. The Gulf Region Division (GRD) reviewed the project assessment and generally agrees with the facts as presented in the study. While we appreciate the thoroughness of SIGIR's review and commend them on the details presented, we do not concur with recommendation 2.

Recommendations:

SIGIR recommends that the Gulf Region Division of the U.S. Army Corps of Engineers, take these actions:

1. Investigate the hairline cracks on the girders and determine if the quantity and depth of the cracks are indicators of significant issues with the beams and take necessary corrective actions.

Command Comment. Concur. GRD completed an on-site inspection to resolve the concerns raised in this recommendation.

On 20 May 2009, the Resident Office Officer in Charge, Project Engineer, and Quality Assurance Representative conducted an on-site visit in response to the cracks the SIGIR team reported. Their inspection revealed no structural cracking, only minor surface shrinkage cracks and cracks caused by form irregularities. The inspection team determined the crack and rough finish shown in the photos on page 15 of the report were probably caused by sand or dust accumulation in the form release agent on the girder casting. When the girder was separated from the form, the debris washed out or fell out causing the shallow voids and spider cracks shown in the photo. None of the cracks represents structural integrity issues.

2. Investigate the need to provide bituminous overlay over the entire structure.

Command Comment. Non-concur.

The contractor conducted a contract-required assessment in March 2008 as outlined in Appendix 3, Technical Requirements in the statement of work. The assessment results didn't identify the need or requirement to overlay the existing span.

The purpose of the assessment was, "to identify potential design or construction/rehabilitation problems and document deviations from estimated damages to minimize delays, rework, and changes during the design and construction periods."

The contractor's assessment did not recommend resurfacing the entire bridge surface. The project manager agreed with the contractor's assessment.

Appendix C. GRD Comments on Draft Report

GRD provides the following comments for clarity and accuracy.

Additional Comments

1. **Draft Report, page ii, first paragraph, third sentence.** In addition, SIGIR noted that the bottom mat of reinforcing steel was placed directly onto the precast-concrete deck pans.

Command Comment. SIGIR's concern with the reinforcing steel matting placed directly on the deck pan is valid. However, it is common practice for contractors to place chairs under reinforcing steel immediately before concrete placement. This helps avoid bending the chairs or rebar when walking on the matting as shown in photograph 7. If the contractor placed adequate chairs under the reinforcing steel prior to concrete placement, this is not an issue.

2. **Draft Report, page ii, first paragraph, eighth sentence.** In SIGIR's opinion, the entire structure requires a bituminous overlay.

Command Comment. The contractor's assessment did not recommend resurfacing the entire bridge surface. The project manager agreed with the contractor's assessment.

3. **Draft Report, page 9, first paragraph, first sentence.** SIGIR did not observe any contractor personnel working at the site.

Command Comment. Delete comment. Although the statement provides a reason why SIGIR did not comment on current working conditions, it is also a remark on current job status. When coupled with SIGIR's earlier references on project delays, the statement is unnecessarily prejudicial. There was a single ten day period during which contractor personnel abandoned the job site during a labor dispute. SIGIR's visit coincided with that ten day period.

4. **Draft Report, page 10, fourth paragraph, first sentence.** No advance-warning signs were posted at the project site.

Command Comment. The next sentence on page 10 and the photograph on page 11 include descriptions of warning signs on the approach to the bridge. GRD recommends SIGIR delete the sentence on page 10 stating that no advance warning signs were posted at the project site. We believe the warning signs were adequate notice for vehicles to perform a controlled stop.

5. **Draft Report, page 13, second paragraph, first sentence.** SIGIR also noted that the bottom mat of reinforcing steel was placed directly onto the precast-concrete deck pans.

Command Comment. SIGIR's concern with the reinforcing steel matting placed directly on the deck pan is valid. However, it is common practice for contractors to place chairs under reinforcing steel immediately before concrete placement. This helps avoid bending the chairs or rebar when walking on the matting as shown in photograph 7. If the contractor placed adequate chairs under the reinforcing steel prior to concrete placement, this is not an issue.

Appendix C. GRD Comments on Draft Report

6. **Draft Report, page 14, first paragraph, first sentence.** In SIGIR's opinion, the entire structure requires a bituminous overlay.

Command Comment. The contractor's assessment did not recommend resurfacing the entire bridge surface. The project manager agreed with the contractor's assessment.

7. **Draft Report, page 14, third paragraph, fifth sentence.** SIGIR believes that the GRD Fallujah Resident Office needs to further investigate and determine the seriousness of the cracks.

Command Comment. A resident office team conducted an on-site inspection on 20 May 2009. Their inspection revealed no structural cracking, only minor surface shrinkage cracks and cracks caused by form irregularities.

8. **Draft Report, page 18, fourth paragraph, first sentence.** The USACE ER 1110-1-12 and Project Contracting Office Standard Operating Procedure CN-100 specify requirements for a government quality assurance (QA) program.

Command Comment. Project Contracting Office Standard Operating Procedure CN-100 standard does not apply to GRD. Please delete this reference from the report.

9. **Draft Report, page 12 (Photo) and page 20, first paragraph, first sentence.** In addition, SIGIR noted that the bottom mat of reinforcing steel was placed directly onto the precast-concrete deck pans.

Command Comment. SIGIR's concern with the reinforcing steel matting placed directly on the deck pan is valid. However, it is common practice for contractors to place chairs under reinforcing steel immediately before concrete placement. This helps avoid bending the chairs or rebar when walking on the matting as shown in photograph 7. If the contractor placed adequate chairs under the reinforcing steel prior to concrete placement, this is not an issue.

10. **Draft Report, page 20, first paragraph, fifth sentence.** In SIGIR's opinion, the entire structure requires a bituminous overlay.

Command Comment. The contractor's assessment did not recommend resurfacing the entire bridge surface. The project manager agreed with the contractor's assessment.

Appendix D. Report Distribution

Department of State

Secretary of State
- Senior Advisor to the Secretary and Coordinator for Iraq
- Director of U.S. Foreign Assistance/Administrator, U.S. Agency for International Development
  - Director, Office of Iraq Reconstruction
- Assistant Secretary for Resource Management/Chief Financial Officer, Bureau of Resource Management

U.S. Ambassador to Iraq
- Director, Iraq Transition Assistance Office
- Mission Director-Iraq, U.S. Agency for International Development

Inspector General, Department of State

Department of Defense

Secretary of Defense
Deputy Secretary of Defense
Under Secretary of Defense (Comptroller)/Chief Financial Officer
- Deputy Chief Financial Officer
- Deputy Comptroller (Program/Budget)

Deputy Assistant Secretary of Defense-Middle East, Office of Policy/International Security Affairs
Inspector General, Department of Defense
Director, Defense Contract Audit Agency
Director, Defense Finance and Accounting Service
Director, Defense Contract Management Agency

Department of the Army

Assistant Secretary of the Army for Acquisition, Logistics, and Technology
- Principal Deputy to the Assistant Secretary of the Army for Acquisition, Logistics, and Technology
- Deputy Assistant Secretary of the Army (Policy and Procurement)
- Commanding General, Joint Contracting Command-Iraq/Afghanistan

Assistant Secretary of the Army for Financial Management and Comptroller
Chief of Engineers and Commander, U.S. Army Corps of Engineers
- Commanding General, Gulf Region Division
- Chief Financial Officer, U.S. Army Corps of Engineers

Auditor General of the Army

U.S. Central Command

Commanding General, Multi-National Force-Iraq
- Commanding General, Multi-National Corps-Iraq
- Commanding General, Multi-National Security Transition Command-Iraq
- Commander, Joint Area Support Group-Central

Other Federal Government Organizations

Director, Office of Management and Budget
Comptroller General of the United States
Inspector General, Department of the Treasury
Inspector General, Department of Commerce
Inspector General, Department of Health and Human Services
Inspector General, U.S. Agency for International Development
President, Overseas Private Investment Corporation
President, U.S. Institute of Peace

Congressional Committees

U.S. Senate

Senate Committee on Appropriations
Senate Committee on Armed Services
Senate Committee on Foreign Relations
Senate Committee on Homeland Security and Governmental Affairs

U.S. House of Representatives

House Committee on Appropriations
House Committee on Armed Services
House Committee on Oversight and Government Reform
House Committee on Foreign Affairs

Appendix E. Project 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 were:

Angelina Johnston

Kevin O'Connor

Shawn Sassaman, P.E.

Todd Criswell, P.E.