Technical Report Documentation Page

1. Report No. FHWA/TX-06/0-4661-2	2. Government Accession No.	3. Recipient's Catalog No.
4. Title and Subtitle 2005 Annual Interim Report on the Monitoring and Evaluation of SH 130 Project Construction		5. Report Date March 2006 6. Performing Organization Code
7. Author(s) James T. O'Connor, G. Edward Gibson, Jr., Giovanni C. Migliaccio, and Pramen P. Shrestha		8. Performing Organization Report No. 0-4661-2
9. Performing Organization Name and Address Center for Transportation Research The University of Texas at Austin 3208 Red River, Suite 200 Austin, TX 78705-2650		10. Work Unit No. (TRAIS) 11. Contract or Grant No. 0-4661
12. Sponsoring Agency Name and Address Texas Department of Transportation Research and Technology Implementation Office P.O. Box 5080 Austin, TX 78763-5080		13. Type of Report and Period Covered Technical Report November 2004 to March 2006 14. Sponsoring Agency Code
15. Supplementary Notes Project conducted in cooperation with the Federal Highway Administration and the Texas Department of Transportation. Project Title: Monitoring and Evaluation of SH 130 Project Construction		
16. Abstract This report includes a synthesis of the main findings from the investigations conducted during the first year of the research project.		
17. Key Words CDA Organizational and Communications Structure, CDA Benchmarking	18. Distribution Statement No restrictions. This document is available to the public through the National Technical Information Service, Springfield, Virginia 22161; www.ntis.gov	

19. Security Classif. (of report) Unclassified	20. Security Classif. (of this page) Unclassified	21. No. of pages 36	22. Price

Form DOT F 1700.7 (8-72) Reproduction of completed page authorized

2005 Annual Interim Report on the Monitoring and Evaluation of SH 130 Project Construction

James. T. O'Connor, P.E., Ph.D.
G. Edward Gibson Jr., P.E., Ph.D.
Giovanni C. Migliaccio,
Pramen P. Shrestha

CTR Technical Report:	0-4661-2
Report Date:	March 2006
Research Project:	0-4661
Research Project Title:	Monitoring and Evaluation of SH 130 Project Construction
Sponsoring Agency:	Texas Department of Transportation
Performing Agency:	Center for Transportation Research at The University of Texas at Austin

Project performed in cooperation with the Texas Department of Transportation and the Federal Highway Administration.

Center for Transportation Research
The University of Texas at Austin
3208 Red River
Austin, TX 78705

www.utexas.edu/research/ctr

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Project Engineer: James T. O'Connor
Professional Engineer License State and Number: Texas No. 64532
P. E. Designation: Research Supervisor

Acknowledgments

The authors express their deepest gratitude to the research committee, namely Timothy Weight, John Rantz, and German Claros. We also wish to thank the numerous interviewees from TxDOT, LSI, and FHWA. Without their willingness to participate, this research would not have been possible. The authors also gratefully acknowledge the sponsorship and assistance of the Texas Department of Transportation.

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1. Introduction

This report conveys significant findings from Research Project 0-4661 during the second year of investigation (September 2004 to September 2005). Information regarding project development is also provided.

During this second year, the following research products were produced:

- Research Product No. 3 - *Organizational Structures and Communications on the SH 130 Project* (Research Report 0-4661-P3)
- Research Product No. 5 - *Plan for Performance Benchmarking of SH 130* (Research Report 0-4661-P5)

This report is comprised of five chapters, including this introductory chapter. The succeeding sections of this report are structured in the following manner. Chapter 2 summarizes findings regarding Research Product No. 3, including an organizational chart that summarizes the relationships in place for the State Highway 130 (SH 130) project development. Chapter 3 lays out the key elements of the plan for benchmarking the SH 130 project extensively described in Research Product No. 5. Details on the status of Research Products 7 and 8 are offered in Chapter 4. Finally, Chapter 5 summarizes the status of the research project.

2. Organizational Structures and Communications

The first deliverable produced during the second year of research was a detailed analysis of the State Highway 130 Project organizational structure with a set of recommendations for improving project organization when using Design-Build (DB) delivery method under the Comprehensive Development Agreement (CDA) approach. During the investigation, the authors analyzed project documentation and conducted several interviews with project representatives, including the Texas Department of Transportation (TxDOT), HDR Inc., and Lone Star Infrastructure (LSI) representatives. The following subsections include some of the report findings. These findings were included in Product No. 3: *Organizational Structures and Communications on the SH 130 Project* - Research Report 0-4661-P3 (O'Connor, Gibson et al. 2005a). This chapter highlights observations made on the organizational and communications structures of the SH 130 Project. Report 0-4661-P3 includes a complete documentation of these observations.

2.1 SH 130 Project Organization

The SH 130 Project is managed by a detachment of TxDOT Austin District personnel in a project office based in Pflugerville, the Central Texas Turnpike Office. In this office, a small TxDOT staff is being supported by an engineering firm, HDR, Inc., in managing the Design-Build (DB) contract awarded in 2002 to LSI. The LSI team is also co-located in the same complex of buildings. In addition, LSI set up three segment area offices where personnel working on the execution phases are based.

Figure 2.1 represents the different entities involved in the SH 130 Project and the type of relationships among the project parties. Under the SH 130 contractual agreement, the Developer (LSI) functions as the single point of contact for TxDOT for all disciplines, including design, construction, right of way, utility, and environmental permitting. Monitoring of design and construction quality assurance and environmental compliance is performed by a group of independent firms that have a contractual relationship with the Developer. The independence of these firms is strengthened by the fact that they report directly to TxDOT (as well as to the Developer), and their functions cannot be substituted by the Developer without TxDOT approval.

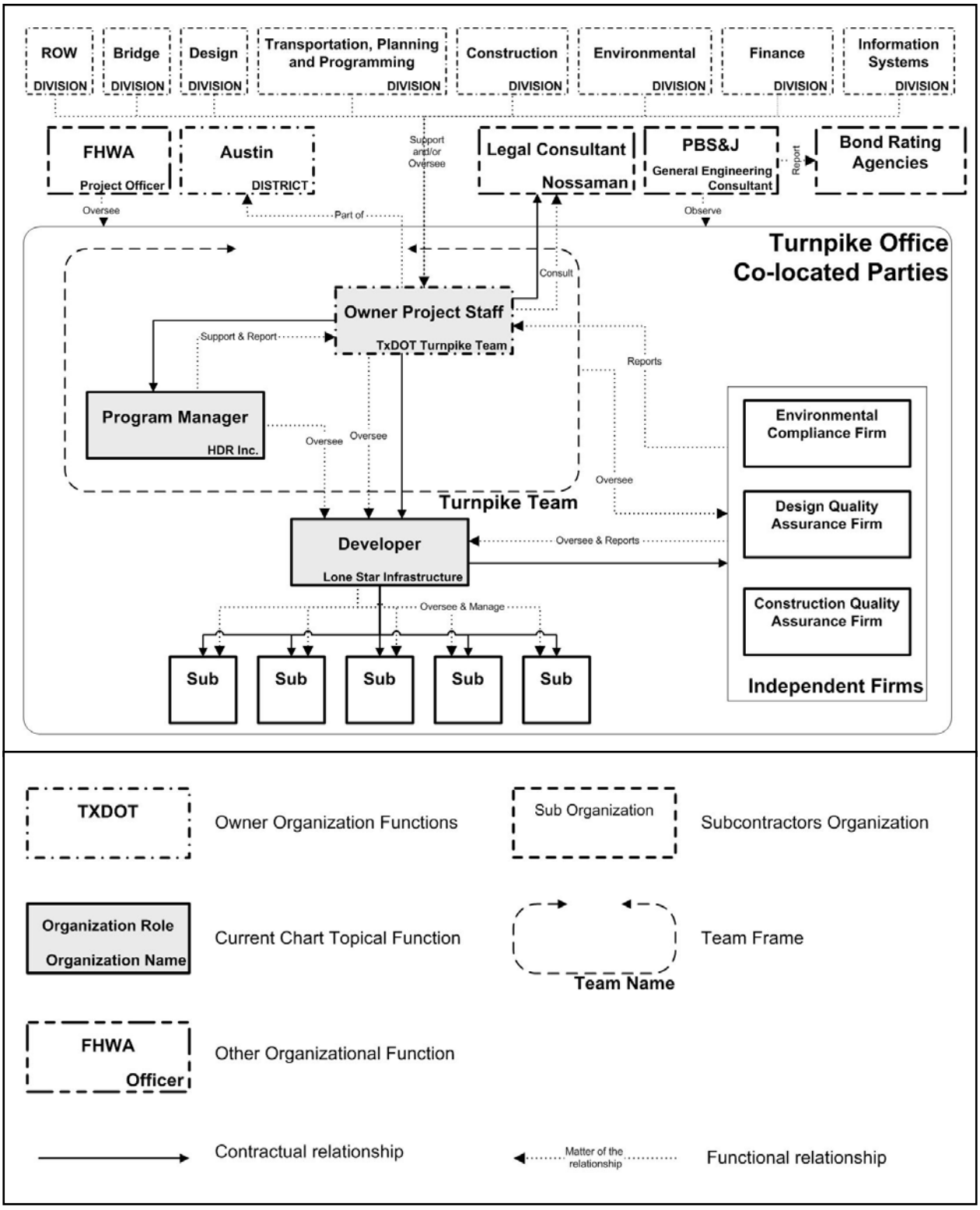

Figure 2.1 SH 130 Project Organization

2.2 SH 130 Communications

Common issues pertaining to communications of this DB project include the following:

- The co-located environment makes it possible to optimize communications through face-to-face meetings. It also reduces the effects of a bureaucracy (required for any mega-project) that could become a detriment to the pace of the process.
- The flexibility to change and improve communication structures and procedures is key to improving the communications on a project of this scope and complexity.
- Having the Developer serve as a single point of contact simplifies the contracting process by unifying the delivery of multiple services under one contract. It also allows a reduction of staff on the Owner side.
- The environment on the SH 130 Project makes communications between the Owner team and service providers (the Developer and its subcontractors) simpler than in a traditional DBB project of this magnitude.
- Making communications occur at the proper levels, as well as setting up the information management systems and the operating procedures needed to encourage communication exchange are major challenges on a project of this magnitude.
- A formal partnering approach is beneficial to overcoming many of these challenges and in regulating communication flows. Setting up issue escalation ladder and technical work groups is beneficial to regulate communications flows.

2.3 Selected Recommendations

In Research Report 0-4661-P3, the research team formulated a set of recommendations pertaining to team organization and communications improvement in future CDA-DB projects.

Highlights of these recommendations are repeated here:

- Develop a chart comparing allocation of responsibilities between traditional projects and the selected CDA-DB project (such as Figure 2.1).
- Organize a pre-project workshop between TxDOT and Program Manager to set up the process together and allocate responsibilities.

- Consider assigning quality assurance functions (e.g., design and construction) to a group in order to facilitate the implementation of constructability concepts and the coordination between the design and construction groups.
- Increase the size of the TxDOT component within the Owner team to expedite the learning curve of the CDA process within TxDOT and to facilitate the learning curve of out-of-state consultants.
- Continue to select individuals for the TxDOT component who are able to work under pressure, are flexible, and can multitask.
- Staff the Owner team (both TxDOT and Program Manager teams) with individuals who have high levels of expertise in their respective technical areas.
- Allow developer-sourced innovations through a flexible acceptance process (e.g., management of design manuals' "gray areas" through issuance of design task protocols).

3. Plan for Performance Benchmarking of SH 130

During this second year of the study, the research team also developed a plan for benchmarking the SH 130 Project performance. The corresponding report includes an overview of the benchmarking methodology and of the input and output parameters. This information is included in Product No. 5: *Plan for Performance Benchmarking of SH 130* - Research Report 0-4661-P5 (O'Connor, Gibson et al 2005b). The primary purpose of this research product was to develop a plan for benchmarking the SH 130 Project against other comparable design-build and design-bid-build projects. The following discussion highlights the plan. A copy of the questionnaire instrument is included in Appendix A.

Key issues of the benchmarking plan:

- The research methodology for the benchmarking of SH 130 is based on project "input" and "output" parameters.
- The input parameters are structured according to the highway project construction work areas.
- The output parameters, known as project performance metrics, are related to key performance measures of highway projects.
- SH 130 Project will be benchmarked with five comparable Out-of-State DB (FHWA) highway projects.
- SH 130 Project will be benchmarked with two ongoing In-State DB highway projects.
- SH 130 Project will be benchmarked with five large ongoing In-State DBB highway projects.
- The input and output parameters for the benchmarking of SH 130 will be adjusted according to data availability during the data collection phase.
- The detailed data collection for this benchmarking has started and the final findings will be presented in the final report.
- The effort has commenced and researchers are already receiving data from selected highway projects.

4. Summary

During these 2 years of investigations, Research Project 0-4661 delivered four research products (P1, P2, P3, and P5) with other two products (P7 and P8) currently in development.

The completed products are:

- Product Number 1: CDA Procurement Process Model (O'Connor, Gibson et al. 2004a)
- Product Number 2: Essential Elements of CDA Master Contract (O'Connor, Gibson et al. 2004b)
- (submitted and under review) Product Number 3: Organizational Structures and Communications on the SH 130 Project (O'Connor, Gibson et al. 2005a)
- (submitted and under review) Product Number 5: Plan for Performance Benchmarking of SH 130 (O'Connor, Gibson et al. 2005b)

Efforts are underway for two additional products:

- Product Number 6: Lessons-Learned Database
- Product Number 7: Annual SH 130 innovation workshop

5. References

J.T. O'Connor, G.E. Gibson Jr., G.C. Migliaccio (2004a). "Product No. 1 – CDA Procurement Process Model," Research Report Number 0-4661-P1, Center for Transportation Research, The University of Texas at Austin, Austin, Texas.

J.T. O'Connor, G.E. Gibson Jr., G.C. Migliaccio (2004b). "Product No. 2 – Essential Elements of CDA Master Contract," Research Report Number 0-4661-P2, Center for Transportation Research, The University of Texas at Austin, Austin, Texas.

J.T. O'Connor, G.E. Gibson Jr., G.C. Migliaccio, P. P. Shrestha (2005a). "Product No. 3 – Organizational Structures and Communications on the SH 130 Project," Research Report Number 0-4661-P3, Center for Transportation Research, The University of Texas at Austin, Austin, Texas.

J.T. O'Connor, G.E. Gibson Jr., P. P. Shrestha, G.C. Migliaccio (2005b). "Product No. 5 – Plan for Performance Benchmarking of SH 130," Research Report Number 0-4661-P5, Center for Transportation Research, The University of Texas at Austin, Austin, Texas.

Appendix A -
Benchmarking Questionnaire

Benchmarking SH 130 Project

Interview Guide

We would like to thank you in advance for the time and effort involved in your agency's participation in this research.

This interview guide is divided into four sections; Project General Information; Project Characteristics; Project Performances; and Stakeholders' Success. If not enough space is provided for the brief questions, please feel free to attach extra sheets to the document.

In the questions, we ask for detailed information on project characteristics and performance. Please do what you can to assemble this information as fully as possible. Your detailed responses will allow us to understand to what extent these project characteristics and performance measurements affect the benchmarking of highway projects.

The confidentiality of this interview will be maintained. This interview data will not be placed in any permanent record, and will be destroyed when no longer needed by the researchers. The identity of the person who provided all this information will remain anonymous. The data obtained during this interview will not be linked in any way to participants' names.

Please return this questionnaire via email, by fax, or by mail to the following address:

Pramen P. Shrestha
Graduate Research Assistant
The University of Texas at Austin
Civil Engineering Department ARE/CEPM/ICAR
University Station C1752
Austin, Texas 78712-0276
Email: pramen@mail.utexas.edu
Fax Number: 512-471-3191

Section 1:

1 Project General Information

1.1 Name of Owner Organization: _____

1.2 Name of Project: _____

1.3 Project ID: _____

1.4 Project Description: _____

1.5 Starting Location: _____

1.6 Ending Location: _____

1.7 Contact Person (Name of person filling this questionnaire): _____

1.8 Contact Person's Phone: _____

1.9 Contact Person's Fax: _____

1.10 Contact Person's Email Address: _____

1.11 Contact Person's Role / Title in this Project: _____

1.12 Project web address: _____

1.13 Date of Assessment: _____

Section 2:

2 Project Characteristics

2.1 Current State of Project

2.1.1 Describe current state of this highway project.

Completed on _____

Operational from _____

OR

% of completed _____

Current planned completion date _____

2.2 Type of Work and Location

2.2.1 Where is this highway project located?

☐ Urban ☐ Rural

☐ Other _____

2.2.2 Describe the nature of this project.

☐ New green field construction ☐ Rehabilitation

☐ Reconstruction ☐ Expansion

☐ Other _____

2.2.3 Was this highway project constructed while maintaining traffic flow?

☐ Yes ☐ No

2.3 Project Scope

Please provide following project data.

2.3.1 Total length of road _____ Miles

2.3.2 Total length of freeway main lanes _____ Lane miles

2.3.3 Total length of frontage roads – both side _____ Lane miles

2.3.4 Total length of HOV lanes _____ Lane miles

2.3.5 Total number of highway interchanges _____

2.3.6 Total number of frontage road intersections _____

2.3.7 Total number of freeway ramps _____

2.3.8 Total number of bridge spans _____

2.3.9 Total number of concrete bridge spans _____

2.3.10 Total number of steel bridge spans _____

2.3.11 Total area of bridge deck _____(SF)

2.3.12 Number of rail road crossings _____

2.3.13 Number of water crossings _____

2.3.14 Total length of roadway tunnels _____ Miles

2.3.15 Total length of drainage tunnels _____ Miles

2.3.16 Total length of box culvert _____ LF

2.3.17 Total length of pipe culvert _____ LF

2.3.18 Total number of toll plazas _____

2.3.19 Pavement types (concrete or asphalt or combination) _____

2.3.20 Total quantity of earthwork excavation _____ CY

2.3.21 Percentage of rock excavation _____ %

2.3.22 Total quantity of embankment filling _____ CY

2.4 Contract

2.4.1 What type of contract delivery method was used to deliver this project?

☐ Design-Bid-Build (DBB) ☐ Design-Build (DB)

☐ Design-Build-Operate-Maintain (DBOM)

☐ Finance-Design-Build-Operate-Maintain (FDBOM)

☐ Other _____

2.4.2 How many previous projects had been design-build (D-B)?

☐ One ☐ Two

☐ Three ☐ Three plus

2.4.3 How was the contractor (developer) selected?

☐ Based on unit prices ☐ Negotiation

☐ Best Value ☐ A+ B Bidding

☐ Other _____

2.4.4 What was the rate of liquidated damages in this contract?

☐ US $_____ per day or per month

☐ No liquidated damage provision in contract

2.4.5 Was there any schedule performance bonus in this contract? If yes, how much was it?

☐ Yes _____

_____

_____

(Total amount in US $; details of system)

☐ No

2.4.6 Were there any other disincentives for late completion? If yes, how much was it?

☐ Yes _____

_____

_____

($/day or $/month; details of system)

☐ No

2.4.7 Was there any lane rental provision in this contract? If yes, what was the fee assessed for each lane closure?

☐ Yes _____
(US $/lane-hour or $/lane-day)

☐ No

2.4.8 What approximate percentage of design was completed when construction contract was awarded?

_____
(% of design complete)

2.4.9 What types of specifications were used to construct this highway?

☐ Performance spec ☐ Prescriptive spec

☐ Blend of above ☐ Other _____

2.5 Organizational Approaches

2.5.1 Was there a partnering facilitator hired and used for this project?

☐ Yes ☐ No (Go to 2.5.3)

2.5.2 If yes, what was the frequency of partnering sessions (or progress evaluation)?

☐ _____
(Number of times per month or per year)

☐ None

2.5.3 How would you characterize environmental assessment done during pre-project planning of this project?

☐ High level ☐ Medium level

☐ Low level

2.5.4 How would you characterize ROW assessment done during pre-project planning of this project?

☐ High level ☐ Medium level

☐ Low level

2.5.5 How many different sub-contractors / consultants were involved in designing this project?

_____
(Total number of sub-contractors / consultants)

2.5.6 How many sub-contractors were involved in constructing this project?

_____
(Total number of sub-contractors)

2.5.7 Were different entities of the project (e.g., owner, contractor, program manager etc.) co-located in close proximity?

☐ Yes ☐ No

2.5.8 Was there a formal documented change management process used to address design and / or construction changes on this project?

☐ Yes ☐ No

2.5.9 Was formal Value Engineering used on this highway project? If yes, how much project cost was saved?

☐ Yes _____(US $)

☐ None

2.5.10 Was one or more constructability reviews carried out during the design phase of this project?

☐ Yes ☐ No

2.5.11 Please describe any unique approaches to Traffic Control Planning?

_____

_____

_____

☐ None

2.6 Work Processes

2.6.1 Please describe any new technologies being used to construct the project?

_____

_____

☐ None

2.6.2 Please describe any special information-sharing software used to transfer information between various project entities. (beyond email)

_____

_____

☐ None

2.7 Project Calendar

2.7.1 Please fill the start and end dates (month / year) of different phases of this project.

Project phases	**Date in months & years**
Total project	/ ——— /
Design	/ ——— /
ROW acquisition	/ ——— /
Utility adjustments	/ ——— /
Construction	/ ——— /

2.7.2 How many days (on average) did normally designers work per week on this project?

☐ 4 days a week ☐ 5 days a week

☐ 6 days a week ☐ 7 days a week

2.7.3 How many hours per day (on average) did designers work during the design of this project?

☐ 6 hours per day ☐ 7 hours per day

☐ 8 hours per day ☐ 9 hours per day

☐ 10 hours per day ☐ More than 10 hours

2.7.4 Please estimate the total design work hours needed to complete this project?

_____

2.7.5 How many days (on average) did construction workers normally work per week?

☐ 4 days a week ☐ 5 days a week

☐ 6 days a week ☐ 7 days a week

2.7.6 How many hours per day (on average) did construction workers work on this project?

☐ 6 hours per day ☐ 7 hours per day

☐ 8 hours per day ☐ 9 hours per day

☐ 10 hours per day ☐ More than 10 hours

2.7.7 What was the estimated peak number of construction workers?

_____

2.7.8 Please estimate the total construction work hours needed to complete this project?

_____

2.7.9 How many shifts did construction workers work per day?

☐ One ☐ Two ☐ Three

2.7.10 Please describe any major delays that occurred in the construction of this project?

_____

_____

_____

☐ None (Go to 2.7.12)

2.7.11 Approximately how many working days had been lost due to these major delays?

_____

(Total number of work days)

2.7.12 Please briefly describe the severity of winter weather on this project.

_____

_____

_____

2.7.13 How many winter seasons occurred during the construction phase of this project?

_____

2.7.14 Approximately how many working days were lost due to winter weather?

_____

(Total number of work days)

2.8 Environmental Issue

2.8.1 Please describe any unanticipated delays due to environmental issues?

_____

_____

2.8.2 Did this project involve any of the following:

Contaminated soil	☐ Yes	☐ No
Contaminated ground water	☐ Yes	☐ No
Endangered species	☐ Yes	☐ No
Historical sites/structures	☐ Yes	☐ No
Wet lands	☐ Yes	☐ No
Asbestos	☐ Yes	☐ No
Wildlife refugee	☐ Yes	☐ No
Archeological sites (incl. cemeteries)	☐ Yes	☐ No
Other environmental sensitive issues	☐ Yes	☐ No

2.9 Right-of-Way

2.9.1 Who was responsible for procurement of the right-of-way parcels for the construction of this project?

☐ Contractor ☐ Owner

☐ Other _____
(Name of entity)

2.9.2 How many total right-of-way parcels were procured for the construction of this project?

_____
(Total number of parcels)

2.9.3 How many right-of-way parcels or what % were acquired through eminent domain / condemnation for this project?

_____
(Total number of parcels or %)

☐ None

2.9.4 How many right-of-way parcels or what % were acquired through administrative settlement for this project?

_____
(Total number of parcels or %)

☐ None

2.9.5 How would you characterize ROW delays (if any) on this project?

☐ Severe ☐ Moderate / Typical ☐ Insignificant

2.10 Utility Adjustments

2.10.1 Approximately how many utilities were adjusted for the construction of this project?

_____
(Total number of utilities adjusted)

☐ None (Go to 2.10.3)

2.10.2 If any adjustments were delayed, approximately how many working days were lost as a result?

_____
(Total number of working days lost)

2.10.3 Approximately how much was the Subsurface Utility Engineering (SUE) budget for this project?

_____
(Total budget in US $)

☐ None

2.11 Owner Staffing

2.11.1 What is the total Full Time Equivalent (FTE) of Department of Transportation staff for this highway project?

_____
(Total FTE)

2.11.2 Was a program manager used to supplement the Department of Transportation personnel?

☐ Yes ☐ No (Go to 3.1)

2.11.3 If yes, what was the FTE's for this project?

_____

Section 3:

3 Project Performance:

3.1 Project Cost Related Performance:

Please provide the following cost related performance data of your project.

No.	Cost related project performance	Cost (US $)
1.	Owner estimated design and construction cost	
2.	Contractor's bid / negotiated amount	
3.	Contract amount	
4.	Total project completion cost	
5.	Owner estimated design cost	
6.	Final design cost	
7.	Final ROW cost	
8.	Final utility adjustment cost	
9.	Owner estimated construction cost	
10.	Final construction cost (including change orders)	

3.2 Project Schedule Related Performance:

Please provide the following schedule-related performance data of this project.

No.	Schedule related project performance	Duration (Days or Months)
1.	Owner estimated design and construction duration	
2.	Contractor's bid duration	
3.	Actual project completion duration	
4.	Owner estimated design duration	
5.	Final design duration	
6.	Owner estimated construction duration	
7.	Final construction duration	

3.3 Project Construction Safety Related Performance:

Please provide the following construction safety-related performance data of this project.

No.	Construction safety-related performance	
1.	Total number of fatalities	
2.	Total number of days away from work, restricted activity or transfer (DART)	
3.	Total number of work zone traffic accidents	

3.4 Project Quality Related Performance:

Please provide the following quality-related performance data of this project.

No.	Quality-related performance	
1.	Total number of Request for Information (RFI)	
2.	Total number of Non-Conformance Reports (NCR)	
NCR: NCR is a report submitted by the owner's verification team when the contractor does not meet the specification requirement.		

3.5 Project Change Order- Related Performance:

Please provide the following change order-related performance data of this project.

No.	Change order-related project performance	
1.	Total number of design change orders	
2.	Total cost of design change orders (US$)	
3.	Total number of construction change orders	
4.	Total cost of construction change orders (US$)	

3.6 Project Claim- Related Performance:

Please provide the following claims-related performance data of this project.

No.	Claims-related project performance	
1.	Total number of design claims	
2.	Total cost of design claims (US$)	
3.	Total number of construction claims	
4.	Total cost of construction claims (US$)	

Section 4:

4 Stakeholders' Success:

4.1 Who was the design-build contractor for this highway project? Please provide the following information.

Name of Contractor: _____

Address: _____

_____

_____

Website address (If any): _____

Email Address: _____

Phone Number: _____

4.2 How would you rate the overall performance of this project compared to other design-build (DB) projects?

☐ Excellent ☐ Good

☐ Fair ☐ Poor