

PARKS HIGHWAY MP 237
RILEY CREEK BRIDGE REPLACEMENT
CONSTRUCTION MANAGER GENERAL CONTRACTOR
PROJECT DELIVERY METHOD

Project Number: 63763/IM-BR-0A4-4(19)

FINAL DRAFT
SPECIAL EXPERIMENTAL PROJECT NO. 14
POST-CONSTRUCTION PHASE REPORT

Prepared for:



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ACRONYMS AND ABBREVIATIONS

ARRC	Alaska Railroad Corporation
CMGC	Construction Management General Contractor
CDOT	Colorado Department of Transportation
DOT&PF	Alaska Department of Transportation & Public Facilities
FHWA	Federal Highway Administration
GMP	Guaranteed Maximum Price
Hamilton	Hamilton Construction Company
ICE	Independent Cost Estimate
NPS	National Park Service
NTP	Notice to Proceed
RFP	Request for Proposals
ROW	Right-of-Way
SEP 14	Special Experimental Project 14
Stanton	Stanton Constructability Services, LLC
SWPPP	Storm Water Pollution Prevention Plan
USACE	U.S. Army Corps of Engineers



1. INTRODUCTION

This report summarizes tracking of project Construction Management General Contractor (CMGC) activities through the Post-Construction phase. Activities tracked include Risk Register, Innovation Matrix, Project Schedule, Project Cost, and Change Orders. Phases tracked include Initial, 50% design, 75% design, 100% design, Guaranteed Maximum Price (GMP), and Post-Construction. The tracking evaluated the progression of the activities and as the design development advanced, the construction contract was negotiated and construction was completed.

2. EXECUTIVE SUMMARY

2.1 SPECIAL EXPERIMENTAL PROJECT NO. 14 GOALS

The Special Experimental Project No. 14 (SEP-14) Work Plan (DOT&PF 2012) identified five goals for the project. Each goal was met as shown in Table 2-1 below.

Table 2-1: Project Goals

Goal	Description	Goal Met
Maximize Innovation & Efficiencies	14 innovations were incorporated into the project.	Yes
Maximize Constructability & Quality	The project was completed ahead of schedule and with no quality issues.	Yes
Maximize Project Value	Excepting one multi-project change order calling for night work, project costs decreased during construction.	Yes
Minimize Project Risk	40 risks were identified and mitigated so that only one added cost to the project.	Yes
Reduce Change Orders	DOT&PF issued six change orders during construction. Excepting one multi-project change order calling for night work, the change orders decreased project cost.	Yes

2.2 RISK REGISTER

The CMGC team identified 40 risks and developed mitigation strategies during preconstruction activities. Seven of the risks occurred during construction. Of the seven risks, three had impact to the work and one added cost to the project. The associated risks and costs are described in Table 2-2 below.



Table 2-2: Risk Register

Risk	Description	Cost to Project
Foundation Issues	The contractor encountered boulders making pile driving problematic.	\$0.00
Traffic Delays	Several projects were under construction on the Parks Highway in 2015. Consequently, the travelling public encountered multiple traffic control zones. DOT&PF issued change orders to all projects for night work to reduce traffic impacts.	\$1,195,500.00
Weather	Construction started in March of 2015. Production was impeded by sub-zero temperatures and frozen ground. Membrane installation was delayed due to rain in the fall of 2015. The work was scheduled for 3 days but required 12 to complete. However, the weather impacts were expected.	\$0.00

The CMGC process effectively managed and reduced risk. With exception of the traffic delay risk, all other risks were sufficiently mitigated resulting to no added cost to the project. Because the traffic delay risk and solution applied to multiple projects, the ability to mitigate it during preconstruction activities was beyond the scope of this Riley Creek project.

2.3 INNOVATIONS

The CMGC team identified 32 innovations during preconstruction and post-construction activities; 14 of which were incorporated into the project. While the exact change in project cost resulting from the innovations was not calculated, the innovations provided value to the project either by reducing construction cost or increasing the project functionality.

2.4 PROJECT SCHEDULE

The overall duration of the project including preconstruction, construction, and winter shut down was reduced by 11 months. The schedule reduction was accomplished by mobilizing and starting limited critical path construction in the fall of 2014 instead of the spring of 2015. This allowed the contractor to gain time that otherwise would have been lost to delays in mobilizing until after highway load restrictions had been lifted.

2.5 PROJECT COST

The final construction cost was \$12,123,770.77. The negotiated cost at the GMP phase was \$10,727,261.01. The cost difference includes \$1,204,933.71 in charge orders and \$191,576.05 in overruns for a total cost increase of \$1,396,509.77 or 12%.



2.6 CHANGE ORDERS

DOT&PF issued six change orders during construction. The total amount of the change orders was \$1,204,933.71. The change orders did not alter the calendar days or completion date. A change order for shifting operations from daytime to nighttime was the costliest at \$1,195,500.00.

3. RISK REGISTER

3.1 RISK REGISTER - INITIAL PHASE

During the initial phase, 37 risks were identified. A draft risk register was jointly prepared by Department of Transportation and Public Facilities (DOT&PF) and Hamilton Construction Company (Hamilton) in May 2013. Hamilton finalized the draft on July 29, 2013 and distributed it to the team. Risks were scored on a scale from 1 (low) to 5 (high) for Severity and Probability. Mitigation strategies and actions were developed for each risk and a responsible party was assigned to each action.

3.2 RISK REGISTER - 50% DESIGN PHASE UPDATE

The risk register was updated by the DOT&PF/Hamilton team on February 25, 2014 based on the 50% Design plan set. The results of the update included:

- Deletion of one duplicate risk
 - **Risk #21 Old Pier Snags.** This risk is a duplicate of Risk #7 Existing pier/steel buried onsite.
- Elimination of three risks
 - **Risk #6 Permafrost Stability.** Investigations revealed permafrost was only present at a small section of the Park road. The permafrost will be addressed in subsequent design packages.
 - **Risk #7 Existing Pier/Steel Buried Onsite.** Investigations indicate this risk is either not present or won't conflict with the proposed work.
 - **Risk #31 Bird Nesting Window.** The updated action is to perform clearing in the fall of 2014.
- Updated actions of eight risks
 - **Risk #12 Recreational User Injury.** The updated action is to mitigate this risk using the project Traffic Control Plans.
 - **Risk #13 Concrete Supply.** The updated action is to test the aggregate from the Healy supplier in the summer of 2014.
 - **Risk #15 Demolition Containment.** The updated action is to review the construction schedule to determine if this work can be performed in the winter when the work can be completed more easily.
 - **Risk #16 Bearing Pads.** The updated action is to check with at least two suppliers.
 - **Risk #22 Permit Delays.** The updated action is to submit the U.S. Army Corps of Engineers (USACE) permit before May 1, 2014.
 - **Risk #25 Staging Areas/Camps.** The updated action is to more precisely define this work at the 75% and 95% design phases.



- **Risk #32 Construction Schedule.** The updated action is to generate a more detailed construction schedule by March 31, 2014.
- **Risk #34 Right-of-Way (ROW) in the Park/Temporary Construction Permit.** The updated action is to address the Park ROW in the environmental document and a temporary construction permit is being applied for.
- Identification of one new risk
 - **Risk #38 Pre-Bore Piling.** This risk is associated with the potential need to pre-bore pilings. The action is to finalize the geotechnical investigation report, evaluate the probability of needing to pre-bore, and develop a contingent sum bid item (if needed).

3.3 RISK REGISTER - 75% DESIGN PHASE UPDATE

The risk register was updated by the DOT&PF/Hamilton team on May 30, 2014 based on the 75% Design plan set. The results of the update included:

- Elimination of one risk
 - **Risk #8 Existing Foam in Old Structure.** The current design does not conflict with the existing foam.
- Updated actions of eighteen risks
 - **Risk #2 Damaged Materials.** The risk probability was reduced from 5 to 2 due to the current materials being proposed, e.g., concrete instead of steel bridge girders.
 - **Risk #3 Foundation Issues (Accuracy of Geotechnical Data).** The severity was increased from 3 to 4 since the foundation design uncertainty remains.
 - **Risk #5 Material Escalation.** The severity was increased from 2 to 3.5 and the probability was changed from 5 to 3.5 because escalation changes will have a greater impact at this point, though the likelihood is lower.
 - **Risk #9 Traffic Delays (Unusual Delay to Traveling Public).** The probability was reduced from 5 to 2.5. The project won't use holiday lane closures, the design is mostly off alignment, the project will use night lane closures, and outreach will inform the traveling public of project activities.
 - **Risk #11 Settlement of Roadway or Bridge.** The probability was reduced from 5 to 2. The project design has advanced and mitigated potential issues.
 - **Risk #14 Environmental Incident.** The probability was reduced from 4 to 2. The plan for construction eliminates a work bridge, separates access from water, calls for relevant work during low water levels, and sequences the work to reduce the risk.
 - **Risk #15 Demolition Containment.** The probability was reduced from 4 to 2. Containment for incidentally removed lead-based paint will be provided under each span. The girders will not be abated on site.
 - **Risk #16 Bearing Pads (Cold Weather Spec).** The probability was reduced from 4 to 1. A new supplier has been providing bearing pads and this risk has not been an issue for DOT&PF in the past two years.
 - **Risk #17 Mobilization Material Load Limit Delays.** The severity was increased from 3 to 4. Hamilton wants to mobilize this fall. If a construction Notice to Proceed (NTP) isn't provided in time, Hamilton may be forced to delay mobilization until next summer after highway load restrictions have been lifted.



- **Risk #18 Weather Impact (Delay of Start, Early Snow).** The severity was increased from 2 to 4. The probability was reduced from 4 to 2. The team agreed the risk is more severe than probable at this point given the current construction schedule.
- **Risk #19 Scouring.** The probability was reduced from 4 to 1. The pile design mitigates this risk and soils investigations show surface soils that are better at resisting scour.
- **Risk #20 Lead Paint During Removals.** The probability was increased from 4 to 5. This risk is still a concern.
- **Risk #23 Material Shortage.** The probability was reduced from 3 to 1. On site borrow material is available via the planned excavation. Additionally, local borrow pits are available nearby.
- **Risk #24 Conflicting Projects Pulling from the Same Resources.** The probability was increase from 3 to 4. Several contracts have recently been or will be let along the Parks Highway.
- **Risk #25 Staging Areas/Camps.** The severity was reduced from 4 to 2 and the probability was reduced from 4 to 3. Hamilton now understands the site better and has a plan in place to accommodate the conditions.
- **Risk #33 Fish Windows/Spawning.** The severity was increased from 1 to 4 and the probability was increased from 2 to 3.5. The Alaska Department of Fish and Game permits are now in place. The permit stipulates no in-water work before June 1.
- **Risk #34 ROW in Park/Temporary Construction Permit.** The probability was reduced from 2 to 1. The permit has been submitted and approval is anticipated by June 2014.
- **Risk #37 Contract Conflicts with Negotiation Process (Independent Cost Estimate [ICE]/Contractor).** The severity was increased from 4 to 5. A prolonged negotiation would adversely impact the construction schedule.
- Identification of two new risks
 - **Risk #39 National Park Service (NPS) Landscaping.** This risk is associated with the potential for NPS landscaping-related scope creep. The action is for DOT&PF to clearly set expectations with the NPS early. Also, contingent sum equipment and labor items can be used to perform minor landscaping additions.
 - **Risk #40 Federal Highway Administration (FHWA) Approval Delays.** This risk is associated with the potential for delays to the construction NTP due to protracted reviews and approvals by FHWA. The action is for DOT&PF to coordinate early with FHWA and clearly communicate the project schedule.

3.4 RISK REGISTER - 100% DESIGN PHASE UPDATE

The risk register was not formally updated for the 100% design phase. Risk #40 FHWA Approval Delays, was the only risk that changed and it was mitigated by FHWA's agreeing to expedite authority to award. The change in other risk register items from the 75% design to the 100% design was assumed to be negligible.

3.5 RISK REGISTER - POST-CONSTRUCTION PHASE UPDATE

The DOT&PF/Hamilton team updated the risk register to its final disposition on November 16, 2015 based on the post-construction findings. The team identified a total of 40 risks; five of those risks were eliminated during preconstruction activities. Of the 35 risks remaining, only two presented an issue



during construction. These included: Risk #3 Foundation Issues (boulders were encountered) and Risk #9 Traffic Delays (the collective regional delays were onerous). Additional risks were not encountered during construction.

The results of the update included:

- **Risk #1 Material Delivery/Delay.** Girder delivery was delayed however there was no adverse impact to the schedule.
- **Risk #2 Damaged Materials.** One girder was damaged and repaired during manufacture.
- **Risk #3 Foundation Issues (Accuracy of Geotechnical Data).** Boulders were encountered making pile driving problematic. Geotechnical data was accurate.
- **Risk #4 Parking Locations for Recreational Access.** No issues.
- **Risk #5 Material Escalation.** Guardrail cost increased due to specification change.
- **Risk #6 Permafrost Stability.** Risk eliminated during design.
- **Risk #7 Existing Pier/Steel Buried Onsite.** Risk eliminated during design.
- **Risk #8 Existing Foam in Old Structure.** Risk eliminated during design.
- **Risk #9 Traffic Delays (Unusual Delay to Traveling Public).** Several projects were under construction on the Parks Highway in 2015. Consequently, the travelling public encountered an onerous number of traffic control zones. DOT&PF issued change orders to all projects for night work to reduce traffic impacts.
- **Risk #10 Fault Line.** No issues.
- **Risk #11 Settlement Roadway/Bridge.** No issues.
- **Risk #12 Recreational User Injury (River, Park, etc.).** Injury to pedestrian/ bicyclist. Emergency response. No issues.
- **Risk #13 Concrete Supply/Quality Issues.** No concrete was rejected and no problems with concrete supply. The supplier had an adequate number of trucks available to serve multiple projects in the area. Early coordination with the supplier mitigated the risk.
- **Risk #14 Environmental Incident.** For another project, a large quantity of the two parts of Methyl Methacrylate were mixed for disposal at the Riley Creek staging area. The resulting reaction produced abundant heat and smoke. The disposal barrel was cooled by watering and subsequent batches were mixed in smaller quantities.
- **Risk #15 Demolition Containment.** No issues. The work was subbed to Central Environmental Incorporated. They installed crane mats and performed lots of hand work.
- **Risk #16 Bearing Pads (Cold Weather Spec).** No issues. The pads passed tests. The D.S. Brown Company and Seismic Energy Products supply acceptable materials.
- **Risk #17 Mob/Material Load Limit Delays.** No issues since Hamilton was able to mobilize their heavy crane in the fall of 2014.
- **Risk #18 Weather Impact (Delay of Start, Early Snow).** Construction in 2015 started in March. Only 8 inches of snow on the ground at that time, but frost penetration was deep and the temperature was -30° F on the first day of work. Membrane installation was delayed due to rain in the fall of 2015 (the work was scheduled for three days but required 12 to complete). The weather impacts were not unexpected.
- **Risk #19 Scouring.** No issues.
- **Risk #20 Lead Paint during Removals.** No issues. See response to Risk # 15.
- **Risk #21 Old Pier Snags Rafts/Kayak use of River.** Risk eliminated during design.



- **Risk #22 Permit Delays (Notes: Owner Permits: USACE, Environmental Protection Agency, Contractor Permits: Dewatering, Material Pits, Water Use.** No issues. This risk was mitigated during preconstruction activities.
- **Risk #23 Material Shortage.** No issues.
- **Risk #24 Conflicting Projects Pulling from the Same Resources.** No issues. This risk was mitigated early in the construction phase through coordination.
- **Risk #25 Staging Areas/Camps.** No issues. This risk was mitigated during preconstruction activities.
- **Risk #26 Waste Water Disposal.** No issues. This risk was mitigated via the Storm Water Pollution Prevention Plan (SWPPP). Recommend having SWPPP in place before negotiation GMP. Not doing so is an unnecessary schedule risk.
- **Risk #27 Disadvantaged Business Enterprise Utilization/Participation.** No issues. Hamilton documented their good faith effort, but did not meet the goal.
- **Risk #28 Fire/Lightning/Health.** No issues.
- **Risk #29 Flooding.** No issues.
- **Risk #30 Earthquake.** Felt at least one. No issues.
- **Risk #31 Bird Nesting.** Risk eliminated during design.
- **Risk #32 Schedule (Summer/Winter/Shoulder).** No issues. Project completed ahead of schedule due to Fall 2014 construction start.
- **Risk #33 Fish Windows/Spawning.** No issues. This risk was mitigated during preconstruction activities.
- **Risk #34 ROW in Park/Temporary Construction Permit.** No issues. This risk was mitigated during preconstruction activities.
- **Risk #35 Bear Attacks.** No issues. Hamilton used bear proof dumpsters.
- **Risk #36 Archaeological Impacts.** No issues. This risk was mitigated during preconstruction activities.
- **Risk #37 Contract Conflicts with Negotiation Process (ICE/Contractor).** No issues. This risk was mitigated during GMP negotiation.
- **Risk #38 Pre-Bore.** Pre-boring the piles was required. The cost portion of the risk was mitigated through the use of a contingent sum item developed during preconstruction activities.
- **Risk #39 NPS Landscaping - Scope Creep.** No issues. The risk was mitigated during preconstruction activities and through the NPS relationship and coordination.
- **Risk #40 FHWA Approval Delays.** No issues. This risk was mitigated during preconstruction activities.

The initial phase, July 2013 update, 50% design phase, 75%/100% design phase, and post-construction phase risk registers are provided in Attachments A, B, C, D, and E respectively.

4. INNOVATIONS

4.1 INNOVATIONS - INITIAL PHASE

During the initial phase, 25 innovations were identified in May 2013; four of which were considered high priority. The innovations are listed below.



High Priority

1. Early work for grade lowering at the Alaska Railroad Corporation (ARRC) bridge
2. Early special use permits for staging/camps
3. Build project in one season versus two
4. Winter construction

Regular Priority

5. Single span bridge (Steel/precast/post tensioned/segmental, etc.)
6. Precast deck panels
7. Precast pile caps
8. Concrete supply (portable plant, dry batch in Fairbanks)
9. Gabion baskets instead of rip rap
10. Creating parking area with excess excavation
11. Trail head parking lot at McKinley Village (potential excess excavation area)
12. Separated pedestrian path (wider structure, pedestrian bridge/standalone or attached to new bridge)
13. Slope seeding or re-vegetation for stabilization (drainage swales)
14. Jump spans off main span
15. Sheet pile abutments
16. Drop profile grade and get abutments closer
17. Bridge demo in the winter (ice bridge)
18. Recycle/reuse of existing steel beams
19. Concrete rubble left onsite and incorporated into fill
20. Early work (access/foundation)
21. Early foundation report
22. Staging to reduce borrow, reduce unsuitable excavation, finalize alignment
23. Layback slope versus guardrail
24. Skewed abutments versus fault line
25. Colorado Department of Transportation (CDOT) model for impact panels (spread footings, joint end of impact panel)

4.2 INNOVATIONS - 50% DESIGN PHASE UPDATE

The innovations were updated as the project advanced to the 50% design phase. One new innovation (no. 26) was generated during the 50% design phase.

High Priority

1. Early work for grade lowering at the ARRC bridge
 - Not allowable per FHWA requirements
2. Early special use permits for staging/camps
3. Build project in one season versus two
 - Determined to not be feasible by Hamilton
4. Winter construction
 - Winter construction will be limited to existing girder removal



Regular Priority

5. Single span bridge (Steel/precast/post tensioned/segmental, etc.)
 - Bridge options were evaluated and priced; the precast concrete bulb-tee girder option was found to be the most cost-effective solution
6. Precast deck panels
 - Not cost effective. See response to #5 above
7. Precast pile caps
 - Not cost effective. See response to #5 above
8. Concrete supply (portable plant, dry batch in Fairbanks)
 - Concrete will be provided by Evans Industries located in Healy
9. Gabion baskets instead of rip rap
 - Rip rap will be used; it will tie into existing rip rap and be a more desirable solution
10. Creating parking area with unsuitable excavation
 - Insufficient quantity of unsuitable excavation to create a parking area
11. Trail head parking lot at McKinley Village (potential unsuitable excavation area)
 - Not yet evaluated
12. Separated pedestrian path (wider structure, pedestrian bridge/standalone or attached to new bridge)
 - Not considered due to funding limitations and provisions for accommodating non-motorized traffic on the proposed bridge
13. Slope seeding or re-vegetation for stabilization (drainage swales)
 - Disturbed areas will be reseeded. The roadway obliteration areas will be landscaped with input from NPS.
14. Jump spans off main span
 - Not cost effective or technically desirable. See response to #5 above
15. Sheet pile abutments
 - Not desirable due to seismic considerations
16. Drop profile grade and get abutments closer
 - Profile grade has been optimized to minimize bridge length while meeting design criteria.
17. Bridge demo in the winter (ice bridge)
 - Currently being considered
18. Recycle/reuse of existing steel beams
 - Because the existing girders have lead based paint, the most cost-effective solution is to ship them to the Lower 48 where they will be melted.
19. Concrete rubble left onsite and incorporated into fill
 - Allowable as long as the material meets specification requirements
20. Early work (access/foundation)
 - Not allowable per FHWA requirements
21. Early foundation report
 - The complexity of the foundation investigation precluded this from occurring
22. Staging to reduce borrow, reduce excess excavation, finalize alignment
 - The design has been optimized to reduce borrow and excess excavation
23. Layback slope versus guardrail
 - Guardrail length has been minimized



24. Skewed abutments versus fault line
 - The bridge abutments have been located to avoid the area of the main fault trace
25. CDOT model for impact panels (spread footings, joint end of impact panel)
 - Not technically desirable
26. Bridge waterproofing membrane
 - DOT&PF and Hamilton are currently evaluating a spray applied membrane in lieu of the rolled membrane commonly used by DOT&PF. The rolled membrane has not been performing well.

4.3 INNOVATIONS - 75% DESIGN PHASE UPDATE

The innovations were reviewed by the DOT&PF/Hamilton team on May 30, 2014 based on the 75% Design plan set. One innovation was added.

27. NPS Coordination
 - The design coordination and collaboration with the NPS staff has been a productive and valuable feature during design development.

4.4 INNOVATIONS - 100% DESIGN PHASE UPDATE

Two innovations were introduced between the 75% and 100% design phases.

28. Pile Pinning
 - The size and location of the bridge abutment piles helped retain the embankment. This was performed in lieu of other ground strengthening techniques.
29. Abutment Slope Riprap
 - Ground stabilizing riprap was placed above the scour riprap at the bridge abutments. This was performed in lieu of other ground strengthening techniques.

Of the 29 proposed innovations, 11 were incorporated into the final design:

2. Early special use permits for staging/camps
13. Slope seeding or re-vegetation for stabilization (drainage swales)
16. Drop profile grade and get abutments closer
19. Concrete rubble left onsite and incorporated into fill
22. Staging to reduce borrow, reduce excess excavation, and finalize alignment
23. Layback slope versus guardrail
24. Skewed abutments versus fault line
26. Bridge waterproofing membrane
27. NPS Coordination



28. Pile Pinning

29. Abutment Slope Riprap

4.5 INNOVATIONS - POST-CONSTRUCTION PHASE UPDATE

DOT&PF and Hamilton updated the innovation list to its final disposition on November 16, 2015 based on the post-construction findings. Three innovations were added during construction:

30. Fall 2014 Construction Start

- Completing GMP negotiations in August 2014 allowed Hamilton to mobilize heavy equipment and construct their access and bridge work pads in the fall of 2014. This allowed them to complete the project by the fall of 2015 instead of the fall of 2016 as originally planned.

31. Flexterra

- The rolled matting slope stabilization product originally planned for was deemed ineffective for gravel slopes. Flexterra, a spray applied stabilization product was successfully used instead.

32. Two-Stage Wing Wall Construction

- Hamilton constructed the wing walls in two phases. Doing so made the girders easier to place and allowed the top of the wing wall to better align with the bridge gutter.

Fourteen of the 32 innovations were incorporated into the project. Table 4-1 lists the proposed innovations and shows which were incorporated into the final design. The final innovation detailed summary is provided in Attachment F.



Table 4-1: Proposed Innovations

Innovation	Incorporated into Project?	
1. Early work for grade lowering at the ARRC bridge		No
2. Early special use permits for staging/camps	Yes	
3. Build project in one season versus two		No
4. Winter construction		No
5. Single span bridge (Steel/precast/post tensioned/segmental, etc.)		No
6. Precast deck panels		No
7. Precast pile caps		No
8. Concrete supply (portable plant, dry batch in Fairbanks)		No
9. Gabion baskets instead of rip rap		No
10. Creating parking area with excess excavation		No
11. Trail head parking lot at McKinley Village (potential excess excavation area)		No
12. Separated pedestrian path (wider structure, pedestrian bridge/standalone or attached to new bridge)		No
13. Slope seeding or re-vegetation for stabilization (drainage swales)	Yes	
14. Jump spans off main span		No
15. Sheet pile abutments		No
16. Drop profile grade and get abutments closer	Yes	
17. Bridge demo in the winter (ice bridge)		No
18. Recycle/reuse of existing steel beams		No
19. Concrete rubble left onsite and incorporated into fill	Yes	
20. Early work (access/foundation)		No
21. Early foundation report		No
22. Staging to reduce borrow, reduce excess excavation, finalize alignment	Yes	
23. Layback slope versus guardrail	Yes	
24. Skewed abutments versus fault line	Yes	
25. CDOT model for impact panels (spread footings, joint end of impact panel)		No
26. Bridge waterproofing membrane	Yes	
27. NPS Coordination	Yes	
28. Pile Pinning	Yes	
29. Abutment Slope Riprap	Yes	
30. Fall 2014 Construction Start	Yes	
31. Flexterra	Yes	
32. Two-Stage Wing Wall Construction	Yes	



5. CMGC PROJECT SCHEDULE

5.1 SCHEDULE - INITIAL PHASE

The DOT&PF/Hamilton team created a concept development schedule in May 2013. The schedule called for design and preconstruction activities to occur from June 2013 through July 2014. Construction activities were scheduled to run from August 2014 through July 2016.

5.2 SCHEDULE - 50% DESIGN PHASE UPDATE

DOT&PF updated the design and preconstruction schedule in February 2014 and again in April 2014. The update shows design and preconstruction activities being complete by the end of September 2014, two months later than anticipated at the initial phase. Hamilton prepared a detailed construction schedule in April 2014. The schedule shows construction running from October 2014 through October 2015, nine months earlier than anticipated at the initial phase.

The schedule revisions are attributed to the following:

- Design phases are progressing more slowly than initially anticipated
- The bridge foundation report has taken longer to generate than expected
- The construction schedule has been refined and developed in greater detail

5.3 SCHEDULE - 75% DESIGN PHASE UPDATE

DOT&PF updated the design and preconstruction schedule in May 2014. Hamilton did not need to update their construction schedule for the 75% design phase. Other than relatively minor task adjustments, the design schedule did not change between the 50% and 75% phases.

5.4 SCHEDULE - 100% DESIGN PHASE UPDATE

DOT&PF updated the design and preconstruction schedule in June 2014. The design activities remained virtually the same as shown in the 75% phase schedule. However, the "Construction NTP" activity finish date moved up from October 1, 2014 to September 8, 2014. This was a result of FHWA's expediting their Authority to Award process, thereby providing Hamilton with additional time to perform mobilization and access work in fall 2014. Overall, the design schedule changes from the initial design phase to the 100% design phase consisted of extending the design and preconstruction activities completion by two months from July 2014 to September 2014.

Hamilton's construction schedule was updated in September 2014. Their update was limited to starting and finishing the fall 2014 work one week earlier. Hamilton's construction schedule changes between the initial and final design phases included moving the construction start date to September 2014 instead of August, and their completion date to October 2015 instead of July. The construction schedule duration increased by two months from the initial to the 100% design phase. The schedule changes resulted from increased scope definition and refinement of the schedule.



5.5 SCHEDULE - POST-CONSTRUCTION PHASE UPDATE

Hamilton completed the work ahead of schedule. Their original completion date was October 31, 2015 and they were substantially complete on September 28, 2015. Preconstruction and actual post-construction milestones for major activities are shown in Table 5-1.

Table 5-1: Preconstruction and Post-Construction Milestones

Activity	Preconstruction	Post-Construction	Duration Change
Notice to Proceed	September 15, 2014	September 15, 2014	0 days
Access/Winter Shutdown	November 1, 2014	October 1, 2014	-31 days
Pile Driving Start	April 27, 2015	March 23, 2015	-35 days
Girder Setting Start	July 6, 2015	June 7, 2015	-29 days
Paving Start	August 27, 2015	August 31, 2015	-4 days
Substantial Completion	October 31, 2015	September 28, 2015	-33 days

Preconstruction activities were originally expected to last 13 months. The activities actually required an additional two months for 15 months total duration. Construction activities were originally expected to last 23 months. The activities only required 12 months, a reduction of 11 months. The overall schedule duration decreased by 9 months from the initial phase to the post-construction phase. Table 5-2 shows the start and finish dates for design/preconstruction and construction schedules from the initial phase through the post-construction phase.

Table 5-2: Preconstruction and Post-Construction Schedule

	Initial	50% Design	75% Design	100% Design	Post-Construction	Duration Change from Initial to Post-Construction
Design/Preconstruction Phase	Jun 2013 to July 2014	Jun 2013 to Sep 2014	+2 months			
Construction Phase	Aug 2014 to Jul 2016	Sep 2014 to Oct 2015	Sep 2014 to Oct 2015	Sep 2014 to Oct 2015	Sep 2014 to Sep 2015	-11 months
Overall						-9 months

The initial, 50%, and 75%-100% design phase project schedules are included in Attachments G, H, and I respectively. Hamilton's 50% and 75% design phase construction schedule is included in Attachment J. Their 100% design phase and post-construction construction schedules are included in Attachments K and L, respectively.



6. CMGC PROJECT COST

6.1 PRECONSTRUCTION COST

The initial funding for Phase 2 Design, i.e. preconstruction, activities totaled \$2,700,000. The final total cost for preconstruction activities was \$1,678,243. Preconstruction activity costs included design by DOT&PF, Hamilton's participation in design reviews and cost estimating, Michael Baker International's outreach and CMGC process facilitation efforts, and Stanton's Independent Cost Estimating. Table 6-1 summarizes the initial and final costs for each organization.

Table 6-1: Preconstruction Activity Costs

Organization	Initial Budget	Final Cost
DOT&PF	\$1,944,410	\$1,194,040
Hamilton	\$395,806	\$124,419
Michael Baker	\$252,814	\$252,814
Stanton	\$106,970	\$106,970
Phase 2 Total	\$2,700,000	\$1,678,243

6.2 CONSTRUCTION COST - INITIAL PHASE

The February 9, 2012 State Transportation Improvement Program indicated \$15M was available for construction of the project. The CMGC Request for Proposals (RFP) Package estimated the construction cost between \$10M and \$20M. The Engineer's Estimate dated January 25, 2012 estimated the construction cost at \$14,768,485.

Hamilton included initial bid item pricing for four items as part of the CMGC RFP process. Their prices, dated January 31, 2013, are shown in Table 6-2.

Table 6-2: Initial Bid Item Pricing

Item No. and Description	Quantity	Proposal Unit Price
202(13) Removal of Existing Bridge No. 695	1	\$266,500.00
203(3) Unclassified Excavation	45,200	\$7.05
203(6) Borrow	75,000	\$8.10
501(7) Precast Concrete Member (54" Decked Bulb Tee Girder)	18	\$76,500.00
Total Proposed Price	-	\$2,569,660.00

6.3 CONSTRUCTION COST - 50% DESIGN PHASE UPDATE

DOT&PF prepared an Engineer's Estimate for the 50% design phase. Hamilton prepared a construction cost estimate dated February 24, 2014 based on DOT&PF bid items. Stanton Constructability Services, LLC (Stanton), in their project role as the ICE, also prepared an independent estimate dated February 24, 2014.



Table 6-3 compares the prices of the four RFP bid items from Hamilton’s initial, i.e., proposal, phase to the 50% design phase.

Table 6-3: 50% Design Phase Bid Item Price Comparison

Item No. and Description	Quantity	Proposal Unit Price	50% Design Unit Price	% Change
202(13) Removal of Existing Bridge No. 695	1	\$266,500.00	\$284,637.38	+7%
203(3) Unclassified Excavation	45,200	\$7.05	\$8.66	+23%
203(6) Borrow	75,000	\$8.10	\$9.90	+22%
501(7) Precast Concrete Member (54” Decked Bulb Tee Girder)	18	\$76,500.00	\$92,812.50	+21%
Total Proposed Price	-	\$2,569,660.00	\$3,089,194.38	+20%

Hamilton attributed the change in prices to escalation in labor, equipment, and materials costs from 2013 to 2014.

Table 6-4 compares the 50% Design Phase total basic bid for the three estimates.

Table 6-4: 50% Design Phase Total Basic Bid

Organization	Total Basic Bid at 50% Design Phase
DOT&PF (Engineer’s Estimate)	\$11,946,036
Hamilton Construction Company	\$13,622,225
Stanton (ICE)	\$17,321,540

The estimate discrepancy is not a concern at this stage of the project. Most of the discrepancy is in subcontract items. The estimates are expected to converge with subsequent design phases. An analysis of the discrepancies between large cost items follows:

- **201(3A) Clearing and Grubbing**
 - Quantity is too high and will be revised
- **202(13) Removal of Existing Bridge No. 695**
 - Hamilton scope:
 - Removing piles to 1 foot below mudline
 - No girder abatement on site; Haul to smelter
 - DOT&PF will verify any environmental commitments relating to scope of removal.
- **205(1) Excavation for Structures**
 - Hamilton scope:
 - DOT&PF payment based on neat line quantity
 - Hamilton price based on actual quantity, which will be higher
- **401 Asphalt Items**
 - Hamilton scope:
 - Small quantities
 - Oil prices are unknown
- **501(7) Precast Concrete Member (54” Decked Bulb Tee Girder)**
 - Per DOT&PF, prices have been consistent the last five years. Approximately \$75,000/girder (for this length).



- Hamilton's scope:
 - Girder materials
 - Incidental materials (pads, etc.)
 - Second crane
 - Access cost included in Pile Driving item
 - Only 3 girders per day can be delivered from Anchorage, resulting in increased crane cost
- **505(6A) Drive Structural Steel Piles (2'-0" Dia. x 1/2" Pipe)**
 - Hamilton scope:
 - Larger foundation likely
 - Concrete filled
 - Still some unknowns
- **640(1) Mobilization**
 - Hamilton scope:
 - Includes indirect costs
 - Prime & Sub
 - Sub bonds
 - Hamilton is using 10% indirect for now; they will generate a more precise line item cost later
 - May change as they get sub quotes
 - Subcontractor quotes are expected by mid-March after Broad Pass bid submitted
- **640(4) Worker Meals & Lodging**
 - Hamilton scope:
 - Conservative number currently
 - Crew size is unknown
 - Will refine for next estimate
- **641(3) Temporary Erosion Control**
 - Hamilton believes contingent sum amount is too high
 - Scope is not well defined
- **Indirect Cost Assignment**
 - Hamilton:
 - 10% shown was a placeholder at 50% estimate
 - 75% estimate will provide breakdown of cost and won't be assigned as percentage; it will be largely placed in the mobilization item.
 - Stanton:
 - Indirect costs all in mobilization item at 50% estimate

6.4 CONSTRUCTION COST - 75% DESIGN PHASE UPDATE

DOT&PF prepared an Engineer's Estimate for the 75% design phase. Hamilton prepared a construction cost estimate dated May 21, 2014 based on DOT&PF bid items. Stanton also prepared an independent estimate dated May 21, 2014.

Table 6-5 compares the prices of the four RFP bid items from Hamilton's initial, i.e., proposal, phase to the 50% and 75% design phases.



Table 6-5: 75% Design Phase Bid Item Price Comparison

Item No. and Description	Qty	Proposal Unit Price	50% Design Unit Price	75% Design Unit Price	% Change Initial to 75%
202(13) Removal of Existing Bridge No. 695	1	\$266,500.00	\$284,637.38	\$266,500.00	0%
203(3) Unclassified Excavation	45,200	\$7.05	\$8.66	\$7.05	0%
203(6) Borrow	75,000	\$8.10	\$9.90	n/a ¹	n/a
501(7) Precast Concrete Member (54" Decked Bulb Tee Girder)	18	\$76,500.00	\$92,812.50	\$80,000.00	+5%
Total Proposed Price	-	\$2,569,660.00	\$3,089,194.38	\$2,025,160.00	+3% ²

1. The 203(6) Borrow item was eliminated by the 75% design phase.
2. The % change does not include the Borrow item cost.

Hamilton attributed the increased girder price to escalation in labor, equipment, and materials costs from 2013 to 2014.

Table 6-6 compares the 75% Design Phase total basic bid for the three estimates.

Table 6-6: 75% Design Phase Total Basic Bid

Organization	Total Basic Bid at 75% Design Phase
DOT&PF (Engineer's Estimate)	\$10,380,355
Hamilton Construction Company	\$10,543,432
Stanton (ICE)	\$11,063,780

The estimate discrepancy was not a concern at this stage of the project. Most of the discrepancy was in subcontract items. The estimates were expected to converge by the final design phase. An analysis of the discrepancies between large cost items follows.

- **202(13) Removal of Existing Bridge No. 695**
 - Hamilton scope:
 - Hamilton is now using their CMGC proposal unit price.
- **203(3) Unclassified Excavation**
 - Hamilton scope:
 - Hamilton is now using their CMGC proposal unit price.
- **304(2) Subbase, Grading B**
 - Hamilton scope:
 - This item is not used much by DOT&PF, meaning actual experience installing it by the contracting community is limited. The material will be difficult to finish due to the 2" minus gradation.
- **306 ATB & 401 Asphalt Concrete**
 - Hamilton scope:



- Hamilton indicated these are approximate costs as provided by Great Northwest Incorporated. The 52-40 oil is not used much and may be more readily available which may reduce the price.
- **501(1) Class A Concrete**
 - Hamilton scope:
 - No comments regarding this item.
- **501(7) Precast Concrete Member**
 - Hamilton scope:
 - The girder price went up mostly due to escalation from 2013 to 2014 prices.
- **503(1) Reinforcing Steel**
 - Hamilton scope:
 - No comments regarding this item.
- **505(5A) & (5B) Furnish Structural Steel Piles**
 - Hamilton scope:
 - Hamilton indicated availability not a concern and the pricing is from Dominion (supplier). Hamilton has not solicited a quote from Skyline (supplier) yet. Hamilton confirmed they are /will be getting quotes for domestic, non-spiral pile. Hamilton needs the detailed foundation design to produce a tighter price.
- **505(6A) & (6B) Drive Structural Steel Piles**
 - Hamilton scope:
 - Hamilton's price assumes no pre-bore is required. Hamilton's price includes auguring piles, setting cage rebar, and access.
- **611(1B) Riprap, Class III**
 - Hamilton scope:
 - Hamilton indicated it is a "casual" quote provided by Great North West. The unit cost was about \$100/cy (cubic yard) for the Broad Pass project which also had a much higher quantity.
- **640(1) Mobilization and Demobilization**
 - Hamilton scope:
 - Hamilton explained this is a high cost item because they will mobilize equipment this fall that will sit over winter. This item also captures the high mobilization cost for dirt/paving subcontractor and their hot plant. About half of Hamilton's cost is subcontractor mobilization. Hamilton may be able to change hot plant mobilization cost depending on the Parks Highway Passing Lanes Phase 3 Project. Hamilton's price reflects uncertainty.
- **640(4) Worker Meals and Lodging, or Per Diem**
 - Hamilton scope:
 - Hamilton explained the crew size is unknown. Hamilton can update based on their current Parks Highway job. Hamilton noted the current job cost and subcontractor cost is high.
- **643(2) Traffic Maintenance**
 - Hamilton scope:
 - Hamilton explained this item still has some unknowns. Some 643(23) costs may also be included in this item. The scope includes traffic control supervisor pickup, traffic control plans, and costs for new traffic control devices.



6.5 CONSTRUCTION COST - 100% DESIGN PHASE UPDATE

DOT&PF prepared an Engineer’s Estimate for the 100% design phase. Hamilton prepared a construction cost estimate dated August 7, 2014 based on DOT&PF bid items. Stanton also prepared an independent estimate dated August 7, 2014.

Table 6-7 compares the prices of the four RFP bid items from Hamilton’s initial, i.e., proposal, phase to the 50%, 75%, and 100% design phases.

Table 6-7: 100% Design Phase Price Comparison

Item No. and Description	Qty	Proposal Unit Price	50% Design Unit Price	75% Design Unit Price	100% Design Unit Price	% Change Initial to 100%
202(13) Removal of Existing Bridge No. 695	1	\$266,500	\$284,637	\$266,500	\$266,500	0%
203(3) Unclassified Excavation	45,200	\$7.05	\$8.66	\$7.05	\$8.00	+12%
203(6) Borrow	75,000	\$8.10	\$9.90	n/a ¹	n/a ¹	n/a
501(7) Precast Concrete Member (54” Decked Bulb Tee Girder)	18	\$76,500	\$92,812	\$80,000	\$80,000	+4%
Total Proposed Price	-	\$2,569,660	\$3,089,194	\$2,025,160	\$2,068,100	+5% ²

1. The 203(6) Borrow item was eliminated by the 75% design phase.
2. The % change does not include the Borrow item cost.

Hamilton attributed the change in prices to escalation in labor, equipment, and materials costs from 2013 to 2014.

Table 6-8 compares the 100% Design Phase total basic bid for the three estimates. The values represent the estimated costs at the beginning of the GMP negotiations.

Table 6-8: 100% Design Phase Total Basic Bids Comparison

Organization	Total Basic Bid at 100% Design Phase
DOT&PF (Engineer’s Estimate)	\$11,714,376
Hamilton Construction Company	\$11,183,230
Stanton (ICE)	\$ 9,019,069

6.6 CONSTRUCTION COST - GMP PHASE UPDATE

The Hamilton and Stanton cost estimates were updated as part of the GMP negotiations held on August 13 and 14, 2014. The Engineer’s Estimate was not updated by DOT&PF as part of the GMP negotiation.

Table 6-9 compares the prices of the four RFP bid items from Hamilton’s initial, i.e., proposal, phase to the 50%, 75%, and 100% design phases and the GMP phase.



Table 6-9: RFP Bid Item Price Comparison

Item No. and Description	Qty.	Proposal Unit Price	50% Design Unit Price	75% Design Unit Price	100% Design Unit Price	GMP Unit Price	% Change Initial to GMP
202(13) Removal of Existing Bridge No. 695	1	\$266,500	\$284,637	\$266,500	\$266,500	\$275,117	+3%
203(3) Unclassified Excavation	45,200	\$7.05	\$8.66	\$7.05	\$8.00	\$9.00	+22%
203(6) Borrow	75,000	\$8.10	\$9.90	n/a ¹	n/a ¹	n/a ¹	n/a
501(7) Precast Concrete Member (54" Decked Bulb Tee Girder)	18	\$76,500	\$92,812	\$80,000	\$80,000	\$78,576	+3%
Total Proposed Price	-	\$2,569,660	\$3,089,194	\$2,025,160	\$2,068,100	\$2,096,291	+6% ²

1. The 203(6) Borrow item was eliminated by the 75% design phase.

2. The % change does not include the Borrow item cost.

Table 6-10 compares the GMP Phase total basic bid for the three estimates. These are the values that were submitted as part of the formal bid.

Table 6-10: GMP Phase Total Basic Bid Price Comparison

Organization	Total Basic Bid at GMP Phase
DOT&PF (Engineer's Estimate)	\$11,714,376
Hamilton Construction Company	\$10,727,261
Stanton (ICE)	\$10,110,029

Table 6-11 summarizes the three estimates from 50% design through GMP phases. Hamilton Construction Company's cost estimate decreased by 21% and the ICE's cost estimate decreased by 42%. The reductions can be attributed to refined project scope as the design advanced to completion and to managing, reducing, and eliminating risk.

Table 6-11: 50% Design Phase through GMP Phases Price Comparison - Total Basic Bid

Organization	50% Design	75% Design	100% Design	GMP	Percent Change from 50% Design to GMP
DOT&PF (Engineer's Estimate)	\$11,946,036	\$10,380,355	\$11,714,376	\$11,714,376	-2%
Hamilton Construction Company	\$13,622,225	\$10,543,432	\$11,183,230	\$10,727,261	-21%
Stanton (ICE)	\$17,321,540	\$11,063,780	\$9,019,069	\$10,110,029	-42%



6.7 CONSTRUCTION COST - POST-CONSTRUCTION PHASE

The final construction cost was \$12,123,770.77. The cost is \$1,498,454.23 or 12% less than Hamilton’s initial basic bid at the 50% design phase and is \$1,396,509.77 or 12% more than negotiated at the GMP phase. The increase over the GMP phase can be attributed to \$1,204,933.71 in change orders and \$191,576.05 in overruns.

The 50%, 75%, and 100% Engineer’s Estimates are included in attachments M, N, and O, respectively. The Hamilton 50%, 75%, 100%, and GMP cost estimates are included in Attachments P, Q, R, and S, respectively. The ICE 50%, 75%, 100%, and GMP cost estimates are included in Attachments T, U, V, and W, respectively. Detailed minutes of the GMP negotiation is included in Attachment X. The final construction progress estimate (#0018) is included in Attachment Y.

7. CHANGE ORDERS

DOT&PF issued 11 change orders during construction. The total amount of the change orders was \$1,204,933.71. The change orders did not alter the number of calendar days or completion date. Change Order No. 4 for shifting operations from daytime to nighttime was the costliest at \$1,195,500.00. Excluding this change order which was systematically applied along Parks Highway corridor projects to alleviate traveling public frustration, the cost of change orders was \$9,433.71. Change orders increased the contract amount by 11.2%. Excluding change order No. 4, the contract amount increase was 0.1%. The change orders are summarized in Table 7-1. Change order documentation is included in Attachment Z.

Table 7-1: Change Order Documentation

	Change Order and Description	Amount	Calendar Days (+/-)
1.	Modify Bid Schedule	\$0.00	n/a
2.	Delete Field Laboratory, Curing Shed and Nuclear Testing Equipment Storage Shed Pay Items	(\$31,909.61)	n/a
3.	Modify Subbase Gradation	(\$2,580.20)	n/a
4.	Change from Day Work to Night Work	\$1,195,500.00	n/a
5.	Modify Guardrail, Topsoil, Membrane, Culverts, Soil Stabilization, Thaw Pipe and Removal of Structures and Obstructions Pay Items	(\$37,235.96)	n/a
6.	Modify Concrete Barrier Item and establish new Pay Item Vehicle Changes	\$4,140.04	n/a
7.	Additional painted traffic markings	\$13,443.75	n/a
8.	Credit for out of spec 501(001) Class A Concrete	(\$3,500.00)	n/a
9.	Parks Hwy & Park Road intersection striping and sign changes	\$21,335.63	n/a
10.	Soil stabilization changes	\$45,740.06	n/a
11.	Ditch lining and riprap spec changes	\$0.00	n/a
	Total	\$1,204,933.71	n/a



8. REFERENCE

Department of Transportation and Public Facilities (DOT&PF) Special Experimental Project No. 14 (SEP-14), April 24, 2012.