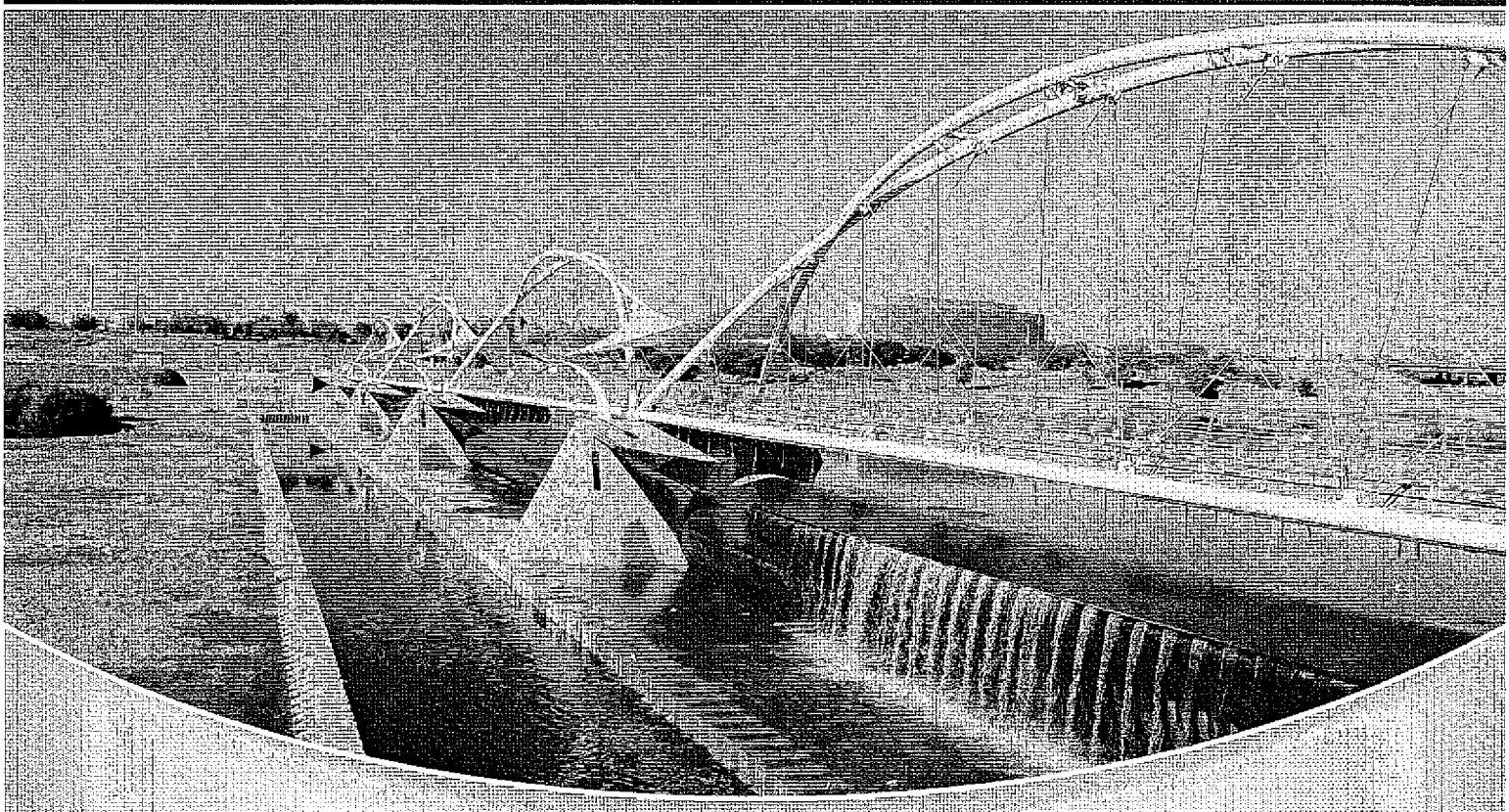
Submitted to:

EXHIBIT A

City of Tempe

Tempe Town Lake Downstream Dam Replacement

Final Design Scope of Work



Submitted by:

Gannett Fleming

*Excellence Delivered **As Promised***

February 22, 2012

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February 27, 2012

Mr. Chris Kabala, P.E.
Senior Civil Engineer
Engineering Division
31 E. Fifth Street
Tempe, AZ 85281

RE: Scope of Work – Final Design and Permitting of Selected Dam Replacement Alternative
Tempe Town Lake Downstream Dam Replacement, Project No. 6504221

Dear Mr. Kabala:

Gannett Fleming, Inc. (Gannett Fleming) is pleased to present the attached Scope of Work and Cost Estimate for Final Design of the Tempe Town Lake Downstream Dam Replacement Project. Our Team will be lead by Dean B. Durkee, Ph.D., P.E., of our Phoenix office, who will serve as the primary contact and Principal in Charge. Dean will manage the Project Team Resources and be available to coordinate and communicate with the City. Dean will be assisted by Frances Ackerman, P.E., who will serve as Project Manager; and Paul G. Schweiger, P.E. will serve as the Lead Design Engineer on the project and will lead the design team through the project. Also attached (Exhibit A) is an organization chart and resumes for the key personnel and a summary milestone-task schedule (Exhibit B) for design.

The attached scope of work and schedule outlines the activities required for meeting the project objective of designing the hydraulically operated steel gate for replacement of the downstream dam at Tempe Town Lake. Upon award of the contract, we will work closely with the City to develop a detailed schedule and address the primary objectives of the project as discussed in the attached scope of work.

Please do not hesitate to call me at 602-553-8817, ext. 8228 if you have any questions regarding our scope of work.

Sincerely,
GANNETT FLEMING, INC.

Dean B. Durkee

Dean B. Durkee, Ph.D., P.E.
Vice President

TEMPE TOWN LAKE DOWNSTREAM DAM REPLACEMENT
PROJECT NO. 6504221

FINAL DESIGN OF SELECTED DAM REPLACMENT ALTERNATIVE SCOPE OF WORK

1.0 BACKGROUND

Tempe Town Lake (TTL) is an urban lake located in the Salt River, in the City of Tempe, Arizona. Groundbreaking for the lake was August 8, 1997, and Tempe Town Lake was officially opened to the public in November 1999. The lake is formed by two Bridgestone inflatable rubber dams constructed across the Salt River Bed at the upstream and downstream ends of the Lake. The downstream dam consists of four air-inflated rubber bladders, each approximately 240 feet long anchored to a concrete foundation slab. The upstream dam consists of four air-inflated rubber bladders. The foundation slabs were constructed of roller-compacted concrete overlain with a reinforced concrete slab at the riverbed level to allow the passage of water while the rubber dams are deflated.

The City of Tempe (City) owns and operates the dams. On July 20, 2010 the one of the four downstream Tempe Town Lake inflatable dams failed. Since that time the four bladders forming the downstream dam have been replaced. The replacement bladders are under a five-year lease agreement and are scheduled to be decommissioned at the end of the lease. This current project will provide design and construction of a replacement downstream dam. The project will be performed in phases and this scope of work is for Phase 2 – Final Design of the Selected Dam Replacement Alternative.

The City of Tempe has initiated this Project to select, design and construct the "best-value" solution for replacement of the Town Lake downstream dam, based on the viable technologies available, location, environmental and social considerations, and cost, including upfront cost as well as life cycle costs.

Phase 1 of the Project included validating the concept and selecting appropriate dam technology for the replacement. The City assembled a Project team including City Staff, Gannett Fleming, Inc., the Arizona Department of Water Resources, the Flood Control District of Maricopa County, the Salt River Project and the U.S. Army Corps of Engineers, with the goal to provide a safe, cost-effective and aesthetically pleasing replacement for the downstream dam rubber bladders. The replacement dam selection process included a rigorous review of possible technologies and comparison of each technology to a defined set of criteria considered to be necessary for success of the Project. Three viable dam replacement alternatives were identified. Because safety and reliability are paramount concerns for the City of Tempe, and given the recent experience with failure of the rubber bladder, construction of a hydraulically operated steel gate at a location approximately 100 feet downstream from the existing dam was recommended and accepted by the City Council. This dam replacement alternative will provide a high degree of certainty with respect to reliability and value and will provide

the City with a successful long-term solution without negatively impacting Town Lake users.

2.0 PROJECT DESCRIPTION

The purpose of the Tempe Town Lake Downstream Dam Replacement Project is to construct the "best-value" solution for replacement of the Town Lake downstream dam. Significant consideration should be given to public safety, state of practice and viable technologies, location, environmental and social considerations, and cost, including upfront cost as well as life cycle costs. As such the constructed replacement dam will comprise a reliable and redundant system that will be capable of managing normal (day-to-day) flows in the Salt River, as well as nuisance flows, and the Standard Project Flood (SPF). Specifically the replacement dam must be constructed in such that the upstream water level during the SPF is not greater than what it would be with the current dam.

The City has selected a hydraulically operated steel gate located approximately 100 feet downstream from the existing rubber dam to replace the Town Lake Downstream Dam. The purpose of this *Phase 2 – Final Design and Permitting of Selected Alternative* is to perform investigation, engineering analyses and design for the hydraulically operated steel gate (hydraulic gate), to prepare construction bid documents and obtain necessary permits for construction of the gates.

The hydraulic gate alternative will consist of a series of fabricated steel plates anchored to the downstream end of the foundation slab operated by hydraulic cylinders attached to each end of the steel plates to raise and lower each plate. The hydraulic gate will be anchored to a new foundation, between seven new reinforced concrete piers. New cutoff walls and a stilling basin will be constructed and the South Bank Interceptor outfall will be relocated.

3.0 AGENCIES

The following agencies are identified as Stakeholders for this project:

- Salt River Project (SRP)
- Arizona Department of Water Resources (ADWR)
- Flood Control District of Maricopa County (FCDMC)
- US Army Corps of Engineers (USACE) Los Angeles District
- Federal Emergency Management Agency (FEMA)
- City of Tempe Departments
    - Community Development
    - Public Works/Engineering

4.0 DESIGN WORK TASKS

The following primary design phase tasks are for completion of *Phase 2 – Final Design of Selected Alternative*:

Task 1 – Project Coordination and Management
Task 2 –Stakeholder Coordination
Task 3 – Owner/Operator Meetings and Site Visits
Task 4 – Concept Review Workshop
Task 5 – Geotechnical Field Investigation
Task 6 – Foundation Analysis and Design
Task 7 – Structural Analysis and Design
Task 8 – Hydraulic Analysis and Design
Task 9 – Control Systems Analysis and Design
Task 10 – Engineering Design Report
Task 11 – Failure Modes and Effects Analysis Workshop
Task 12 – Construction Plans
Task 13 – Construction Specifications
Task 14 – Construction Cost Estimate, Schedule and Constructability Review
Task 15 – Storm Water Pollution Prevention Plan
Task 16 – Construction Quality Assurance Plan
Task 17 – Updated Emergency Action Plan
Task 18 – Operation and Maintenance Plan
Task 19 – Instrumentation Plan
Task 20 – Permitting

Allowances

Public Involvement (Allowance)
Supplemental Survey (Allowance)
Control Building Architect (Allowance)
Gate System Aesthetics Artist (Allowance)

Task 1: Project Coordination and Management

This task includes developing and maintaining a project design and permitting schedule, organizing and participating in project progress meetings, attending community meetings, and providing overall management of the project team for the duration of Phase 2, through October 2013. Specific Project Coordination and Management activities for Phase 2 include:

1.1 Prepare and Update Schedule

1.2 Progress Meetings (One per month for a total of 18)

1.3 Project Coordination and Management (Eighteen Months)

Task 2: Stakeholder Coordination

2.1 This task includes coordinating with project stakeholders (ADWR, FCDMC, USACE, City of Tempe, and FEMA) to keep them informed on the direction of the project and to request information and input for the purposes of permitting.

2.2 For the purposes of scoping we have assumed that 12 meetings with individual stakeholders would occur over the eighteen month design period.

Task 3: Owner/Operator Meetings and Site Visits

3.1 This task includes conference calls with other owners of similar types of dams at other locations particularly where hydraulic gates are used.

3.2 In addition, this task includes provision to travel to one of those sites for a site tour and interview with operators of the System. We anticipate sending up to four of our engineers (Durkee, Schweiger, Ackerman, and Bower) and four City Staff on the site visit and have accounted for that in the project travel budget.

Task 4: Concept Review Meeting

4.1 This task includes conducting a one-half day Concept Review Meeting to review the major design components.

4.2 The Concept Review Meeting will be documented in a Technical Memorandum that will be attached to the Design Report.

Deliverable: Concept Review Technical Memorandum

Task 5: Geotechnical Field Investigation

This task includes performing a design phase geotechnical field investigation of the dam site. The geotechnical field investigation will provide data for foundation design and will include the following activities:

5.1 Pre-field coordination includes scheduling clearances and permits, locating utilities, safety meetings with the driller, coordination with designers for any specific sampling needs, scheduling the driller, and obtaining any special equipment necessary for the investigation and sampling.

5.2 Drilling and sampling 17 borings to evaluate the subsurface conditions and collect soil and rock samples for laboratory testing. Seven (7) borings are proposed along the new dam alignment, one at each pier location; three (3) borings are proposed along the proposed South Bank Interceptor (SBI) realignment; two (2) borings are proposed along the abutment retaining wall alignments; and two (2) borings are proposed at the new abutments where levee modifications may be required. The remaining three (3) borings will be performed between the existing rubber dam and the proposed new gate to allow

piezometer installations. The dam borings are planned to extend at least 15 feet into competent bedrock; the SBI borings are planned to extend to a depth of 40 feet; the retaining wall borings are planned to extend to a depth of 30 feet; the piezometer borings are planned to extend to a depth of 30 feet. Borings are proposed to be advanced using the Rotosonic™ drilling method to allow adequate sample recovery for laboratory testing. It is anticipated that bedrock will be encountered in all of the dam alignment borings. At least 15 feet of competent rock core will be recovered prior to terminating the boring. A total of 600 feet of soil drilling and 150 feet of rock coring have been assumed for the purpose of cost estimating. In addition, in-situ permeability tests will be performed in each of the pier borings to evaluate the site-specific hydraulic conductivity of the subsurface materials. Permeability tests will be performed within the soil above bedrock at each pier location and within the bedrock.

5.3 Performing a seismic refraction survey and a seismic refraction microtremor (ReMi) survey. The surveys will be performed using a series of survey lines at 100 foot spacing to assess the bedrock profile beneath the dam site and obtain engineering properties of the bedrock.

5.4 Laboratory testing will be performed on soil and rock samples obtained from the borings to assess the engineering characteristics of the subsurface materials. A summary of the type and estimated number of laboratory tests is provided in Table 1 below.

Summary of geotechnical testing

Index and classification		Method	Number of tests
Grain size	Soil	ASTM C136 and C117	25
Plasticity indices	Soil	ASTM D4318	16
Moisture content	Soil	ASTM D2216	16
Dry density	Soil	ASTM D2937	25
Unit weight	Rock	ASTM C567	12
Unconfined compression	Soil	ASTM D2166	12
Consolidation	Soil	ASTM D2435	6
Engineering properties			
Triaxial shear	Soil	ASTM D4767	8
Direct shear	Soil (fine grained)	ASTM D3080	6
Compaction	Soil	ASTM D698	4
Unconfined compression	Rock	ASTM D2166	12

5.5 Boring logs will be developed based on the results of the field investigation and supplemented with the results of the laboratory tests.

Deliverables: A Geotechnical Investigation Report. A Draft Geotechnical Investigation Report will be included with the 30% submittal. A Final Geotechnical Investigation Report will be included with the 60% submittal.

Task 6: Foundation Analysis and Design

This task includes performing geotechnical engineering analyses to support the design of the new foundation for the dam. Analysis and design will be performed in accordance with the ADWR Dam Safety regulations (Arizona Administrative Code (AAC) Title 12, Chapter 15, Article 12 Dam Safety Procedures). Specific activities will include:

6.1 Compiling pertinent geotechnical information from previous investigations.

6.2 Comprehensive interpretation of the subsurface conditions based on the geotechnical investigations performed for the original dam design and the investigations performed under Task 4 above. This task includes preparation of detailed subsurface profile and section views along the dam centerline.

6.3 Evaluating the properties of foundation materials based on the geotechnical investigations performed for the original dam design and the investigation performed under Task 4 above.

6.4 A geologic hazard evaluation will be performed at and around the dam site to characterize active faults, collapsible soils, dispersive soils, sink holes, ground subsidence, and earth fissures.

6.5 Seepage characteristics of the foundation will be evaluated, including calculating seepage quantities through the foundation and abutments and uplift pressures beneath the foundation. This task includes design of seepage mitigation measures, including upstream cutoff wall and drainage layer.

6.6 Dewatering analyses will be performed to evaluate dewatering requirements for construction of the foundation within the immediate downstream area (approximately 100ft).

6.7 Evaluating the static stability of the foundation and abutments. The stability analyses will be performed using appropriate loading, safety factors and foundation strength properties for both short-term (construction) and long-term loading conditions and to satisfy the requirements of the State Dam Safety.

6.8 Reviewing the earthquake history to identify active or potentially active faults that have experienced Holocene or Late Pleistocene displacement within a radius of 100 miles of the dam site. This information is used to determine the maximum credible earthquake at the dam site and identifying seismic coefficients.

6.9 The results from Task 6.8 will be used to evaluate pseudo-static stability of the foundation and abutments.

6.10 In addition to pseudo-static stability the potential for liquefaction of the alluvial Salt River deposit will be evaluated.

6.11 Design of the cut-off wall to reduce seepage under the foundation and improving stability of the dam.

6.12 Perform an assessment of available RCC materials in the vicinity of the project and prepare a preliminary RCC mix design.

6.13 Perform global stability analysis of the structure and develop recommendations for the RCC foundation, drainage system(s), RCC template, and RCC strength properties including requirement for the abutment treatment and lift joints.

6.14 Perform analyses and evaluations to determine the appropriate facing system, lift joint treatments, and contraction joint spacing for the RCC structure.

6.15 Prepare plan sheets, details, specification sections, and cost estimates related to the RCC work as appropriate for the various design submittal stages.

Deliverables: A Foundation Analysis and Design Report. A Draft Foundation Analysis and Design Report will be included with the 60% submittal. A Final Foundation Analysis and Design Report will be included with the Final submittal.

Task 7: Structural Analysis and Design

This task includes performing engineering analyses and final design for structural components of the dam replacement. This is a comprehensive process that begins with deciding the required geotechnical and seismic parameters for analysis and ends with production of construction drawings and contract documents required for construction. Along that process, other activities such as evaluation of constructability and economic efficiency of design will be performed and their results implemented in the design. Coordination with other disciplines is a vital component of the process. Specific activities will include.

7.1 Compile geotechnical parameters required for design of foundation supporting the dam. Coordinate with the geotechnical and hydrology disciplines to set the parameters that form the basis of design.

7.2 Analyze the forces imposed by the gates on the piers and select spacing, number, and shape of the piers that will be aesthetically pleasing, hydraulically efficient, and cost effective. This phase must account for the fact that the new dam will only be a short distance from the bridge over the piers of the existing dam. Thus it is imperative that the overall aesthetics of the area must play an important role in the selection.

7.3 Design a reinforced concrete foundation slab to support the dam and the piers. Also, design the anchorage for the hinge gates to the foundation. This includes

coordinating with gate manufacturers to understand the magnitude and location of the forces imposed by the gates on the foundation and the piers. The design of the dam must be able to accommodate the forces from gates produced by a range of manufacturers. Size piers to facilitate the support and anchorage of different types of gates with minimal revisions to design intent.

7.4 Design the reinforced concrete interceptor to replace the existing interceptor.

7.5 Design abutments and retaining walls at the north and south end of the dam. This will involve interfacing with the existing walls at the rubber dam ends, and, if necessary, extending them. Design the upstream, downstream and shoreline cutoff walls to channel the flow when the gates are in the open/ lowered position.

7.6 Designing of a cofferdam system near the upstream end of the piers that will allow servicing, maintaining, or replacing metal gates without draining the lake.

7.7 Structural design of the new control building for the steel hinged gate.

Task 8: Hydraulic Analysis and Design

This task includes preparing hydraulic analyses for final design of the selected dam alternative and associated appurtenances. Hydraulic analyses will be based on refinements to the hydraulic modeling completed for Phase 1. The hydraulic analyses will comply with the U.S. Army Corps of Engineers design guidelines and the current ADWR design criteria for Significant hazard potential dams (AAC Title 12, Chapter 15, Article 12 Dam Safety Procedures), the Flood Control District of Maricopa County and City of Tempe floodplain and hydraulic analysis/design requirements. Specific activities for Phase 2 will include:

8.1 Site visits (2) to verify hydraulic parameters for the HEC-RAS modeling and other hydraulic analyses.

8.2 Perform hydraulic analyses to finalize the appropriate downstream location and pier configuration for the gates and the requirements for channel widening. Analyses will be performed to understand the dam's hydraulic response and operational requirements for normal operation, nuisance flows, and the standard project design flood. Calculations will be performed and a summary data table will be prepared for inclusion in the Engineering Design Report.

8.3 Performing scour analyses for design of the downstream energy dissipation structure comprising a concrete structure and riprap and the depth for a downstream cutoff. Modeling from this task also will be used to estimate the safe distance for the buoy system upstream of the dam.

8.4 Perform hydraulic analyses and design for the South Bank Interceptor outfall relocation.

8.5 Bridgestone's evaluation and recommendation for the location of the buoy line upstream of the Tempe Town Downstream Dam was reviewed. Based on our

review, it appears that an exclusion zone that extends a distance of 400 meters upstream of the inflatable dam was conservatively selected by Bridgestone. Additional analyses will be performed to determine the dynamic hydraulic conditions immediately upstream of the dam during a sudden dam failure through complete emptying of the reservoir. This information can then be qualitatively assessed to reassess the location of the existing buoy line. The hydraulic analysis would consist of a 2D hydraulic model of the reach upstream and downstream of the dam. The upstream reach would include the entire reservoir confined by the upstream and downstream inflatable dams to accurately account for the released water, assuming the rupture of one of the downstream bladders (worst case scenario). The breach of each rubber dam will be simulated to fully characterize the upstream flow conditions in terms of flow depths and velocities from a full lake to complete emptying of the lake. Output from the 2D model for these four scenarios will be used as the basis for selecting the recommended location for the buoy line. The 2D model will also be updated following design of the new downstream dam to establish a new recommended buoy line for the dam configuration.

Deliverables: A Hydraulic Analysis Report. A Draft Hydraulic Analysis Report will be included with the 30% submittal. A Final Hydraulic Analysis Report will be included with the Final submittal. The Hydraulic Analysis Report will include a narrative description, tables, figures including channel plan-profile with 100-year and standard project flood (210,000 cfs) water surface elevations, backup calculations including HEC-RAS output within appendices; appendices will also document how the 100-year and standard project flood were obtained.

Task 9: Control Systems Analysis and Design

This task includes performing engineering analysis and design for the gate monitoring and control system and electrical power systems. Specific activities will include:

9.1 Designing monitoring and control systems for the new hydraulic gate, including control system interface, geotechnical instrumentation system, remote monitoring and control systems and communications, and control concepts.

9.2 Designing electrical power system for the facility, including CCTV, intrusion and access control systems, lighting system and controls, and lighting protection system.

9.3 Performing short circuit and protective device coordination study.

9.4 Performing utility coordination.

9.5 Provide (surveillance) communications design, installation details, and electrical design required to connect to and power additional CCTV cameras to cover entire dam area

9.6 Prepare plan sheets, details, specification sections, and cost estimates support related to the control system work as appropriate for the various design submittal stages.

Task 10: Engineering Design Report

This task includes preparation of an Engineering Design Report documenting the design criteria, assumptions and supporting analyses developed under Tasks 6, 7, 8 and 9 above for elements of the dam replacement design included in the construction plans and specifications. The Engineering Design Report will be prepared in accordance with ADWR dam safety requirements (Arizona Administrative Code Title 12 Chapter 15 Article 12 Dam Safety Procedures (AAC R12-15-1215).

Deliverables: The Engineering Design Report. An outline of the Design Report will be included with the 30% submittal. A Draft Design Report will be included with the 90% submittal. A Final Design Report will be included with the Final submittal.

Task 11: Failure Modes and Effects Analysis Workshop

This task includes conducting a one-day Failure Modes and Effects Analysis workshop to evaluate possible failure modes and consequences of the replacement dam.

11.1 The workshop FMEA will be conducted to evaluate the design and the potential failure modes associated with this particular structure type and location.

11.2 The workshop will be documented in an FMEA Report.

Deliverables: The Failure Modes and Effects Analysis Report.

Task 12: Construction Plans

This task includes preparation of 30%, 60%, 90% and Final construction plans for the dam replacement. The construction plans will be prepared in accordance with the City of Tempe CADD standards and ADWR requirements (AAC R12-15-1215) and will clearly present details and dimensions to construct the dam in accordance with the design. The anticipated sheets for the Final construction plans are listed below (assumed number of sheets in parentheses). The 30%, 60% and 90% plan sets will be progress sets including selected sheets.

12.1 For the 30% submittal we will prepare the base mapping for the project include the project plan, dam plan and profile, a preliminary geologic profile, foundation plan and profile, and typical sections at the abutments.

12.2 For the 60% submittal we will include updated plans from the 30% submittal as well as the excavation and grading plans, foundation plan and profile with associated details related to the cutoff and RCC foundation, cutoff wall plan and profile, concrete slab and pier plans and profiles, stilling basin plan and profile, south bank interceptor plan and profile, and the hinged crest gate plan and

profile. The 60% plans will also include tie-in grading and drainage design associated with the north and south abutments, the access ramp modifications, and the control building.

12.3 The 90% submittal will include a full set of plans.

12.4 Final plans will include any changes from the 90% review and will be packaged for inclusion in the Dam Safety Permit Application.

Estimated Final Sheet Count:

1. Cover (1)
2. General Notes and Abbreviations (1)
3. Civil and Structural Legends (1)
4. Instrumentations and Controls Legend (1)
5. Electrical Legend (1)
6. Systems Legend (1)
7. Project Plan and Survey Control (1)
8. Geologic Conditions (1)
9. Dam Plan and Profile (2)
10. Excavation and Grading Plan (2)
11. Grading Sections and Details (2)
12. Erosion Control Plan (1)
13. Foundation Plan and Profile (2)
14. Foundation Concrete Plan and Sections (2)
15. Foundation Concrete Reinforcement Plan (2)
16. Foundation Concrete Reinforcement Sections (2)
17. Foundation Concrete Details (1)
18. Pier Concrete Plan and Sections (1)
19. Pier Concrete Reinforcement Elevation and Sections (2)
20. Pier Concrete Details (1)
21. Upstream Cutoff Wall Plan and Section (1)
22. Upstream Cutoff Wall Details (1)
23. Shoreline Cutoff Walls Plan and Sections (2)
24. Shoreline Cutoff Wall Details (2)
25. North Abutment Plan (1)
26. North Abutment Section (2)
27. North Abutment Retaining Walls Plan and Sections (2)
28. North Abutment Low Flow Drain Removal Plan and Section (2)
29. North Abutment Details (1)
30. South Abutment Plan (1)
31. South Abutment Sections (2)
32. South Abutment Retaining Walls Plan and Sections (2)
33. South Abutment Details (1)
34. Stilling Basin Plan Profile (2)

35. Stilling Basin Details (1)
36. Stilling Basin and Downstream Cutoff Wall Sections (1)
37. South Bank Interceptor Plan and Profile (1)
38. South Bank Interceptor Sections (2)
39. South Bank Interceptor Details (1)
40. Hinged Crest Gate Plan and Section (2)
41. Hinged Crest Gate Details (2)
42. Instrumentation and Controls System Architecture (1)
43. Instrumentation and Controls P&ID Hydraulic Gates (2)
44. Instrumentation and Controls P&ID Fluid Power Systems (2)
45. Instrumentation and Controls P&ID Compressor Systems (1)
46. Instrumentation and Controls P&ID Other Systems (1)
47. Instrumentation and Controls P&ID Geotechnical Instrumentation (2)
48. Instrumentation and Controls Panel Layouts (1)
49. Instrumentation and Controls Wiring Diagrams (2)
50. Instrumentation and Controls Installation Details (3)
51. Instrumentation and Controls Schedules (1)
52. Electrical Key Plan (1)
53. Power and Lighting Site Plans (2)
54. Room Power Plans (3)
55. Room Lighting Plans (3)
56. Fire Alarm and Intrusion Alarm Riser Diagrams (1)
57. Power One Line Diagram (1)
58. MCC Diagrams (1)
59. Electrical Schedules (1)
60. Duct Riser Diagrams (2)
61. Installation Details (3)
62. Grounding Plan (1)
63. Lighting Protection System Details (1)
64. Electrical and Systems Demo Plans (2)
65. Electrical and Systems Construction Phasing Plans (1)
66. Telecommunications and Security Systems Architectures (2)
67. System Key Plan (1)
68. Telecommunications and Security Systems Site Plans (10)
69. Systems Schedules (1)
70. Patch Panel Layouts (1)
71. Systems Installation Details (2)

Deliverables: The 30%, 60%, 90% and Final plans will be submitted to the City for review. Ten (10) sets of ½ size plans (11x17 inch) and a PDF electronic copy will be submitted to the City for review and comment at each design phase. Review comments will be logged and responded to. Applicable resolutions will be incorporated into subsequent plans and six (6) full size sets (24x36 inch) of the Final plans and a PDF electronic copy will be provided.

Task 13: Construction Specifications

This task includes preparation of the technical construction specifications for the dam replacement not described in Tasks 6, 7 and 9, in addition to formatting and assembling the entire technical specifications. The technical construction specifications will be prepared in accordance with the ADWR requirements (AAC R12-15-1215(2)) and in general conformance with the 2012 CSI MasterFormat specification format. The 2012 Maricopa Association of Governments (MAG) Uniform Standard Specifications and 2012 Uniform Standard Details for Public Works Construction and the Tempe Supplement to the MAG Uniform Standard Specifications will be used and/or referenced where applicable. The specifications will include a detailed description of the work to be performed, responsibilities for performing the work, and a statement of the requirements for the various types of material and installation techniques required for the construction.

13.1 For the 30% submittal we will develop an outline based on the table of contents for the Construction Specifications. We will also include readily available and relevant specifications.

13.2 Draft Construction Specifications will be developed for inclusion in the 60% submittal. These will comprise most of the major technical specifications and responsibilities for performing the work.

13.3 Updated Draft Construction Specifications will be included with the 90% submittal are comprise a full set of specifications for the project, consistent with the 90% plans.

13.4 Final Construction Specifications will be included with the Final submittal.

Deliverable: A table of Contents for the Construction Specifications and readily available and relevant specifications will be included with the 30% submittal. Draft Construction Specifications will be included with the 60% and 90% submittal and final Construction Specifications will be included with the Final submittal. Ten (10) sets of specifications (8.5x11 inch) and a PDF electronic copy will be submitted to the City for review and comment at each design phase.

Task 14: Construction Cost Estimate, Schedule and Constructability Review

Work under this task will be performed by Engineering Solutions, LLC (Dan Hertel) with coordination and input from GF. This task includes preparation of estimates of construction costs and performing constructability reviews. Specific activities will include:

14.1 Developing a list of construction cost estimate items for the dam replacement alternative.

14.2 Develop Draft Cost Estimate and Schedule, including developing a project CPM construction schedule, calculating burdened wage rates and assembling regional

equipment rates, contacting vendors and specialty contractors as needed to verify associated costs, and assembling summary of vendor pricing information. Cost estimates will include complete line item details, key assumptions, production rates, unit price calculations, and cost summaries, in addition to preparing a written Basis of Cost Summary and comments.

14.3 Final Construction Cost Estimate and Schedule. This will include refining the cost estimate as needed for final design.

Deliverable: A draft list of construction items and activities will be included with the 30% submittal. Preliminary Draft construction items will be included with the 60% submittal. Draft construction item quantities will be calculated and draft engineer's estimate of probable cost and preliminary construction schedule will be included in the 90% submittal. Final construction cost estimate and schedule will be included with the Final submittal.

Task 15: Storm Water Pollution Prevention Plan

This task includes preparation of a Storm Water Pollution Prevention Plan in accordance with appropriate sections of the Arizona Department of Environmental Quality (ADEQ) 2008 Construction General Permit (CGP) # AZG2008-001. Specific activities will include:

- Identifying operators at the project site.
- Describing the site and the nature of the construction activity.
- Preparing a site map.
- Identifying the nearest receiving waters.
- Describing Best Management Practices.
- Summarizing the Potential Pollutant Sources.

Deliverables:

15.2 Final SWPPP

- 1 hard copy of the SWPPP (8.5x11 report and 24x36 plans)
- 1 electronic copy of the SWPPP (PDF)

Task 16: Construction Quality Assurance Plan

This task includes preparation of a Construction Quality Assurance (CQA) plan describing aspects of construction supervision in accordance with ADWR requirements (AAC R12-15-1208). The CQA plan will include a statement of the designer's requirements with regard to construction testing frequencies, foundation preparation guidelines, etc., to facilitate the construction according to the plans and specifications. As a minimum, the CQA plan will include the following sections:

- Delineation of responsibilities and authority

- Third party testing responsibilities
- Statement of personnel qualifications
- Inspection and testing activities
- Acceptance and rejection criteria
- Documentation requirements

Deliverables:

16.1 Draft Construction Quality Assurance (CQA) Plan
- 1 electronic copy of the CQA Plan (PDF)

16.2 Final Construction Quality Assurance (CQA) Plan
- 2 hard copies of the CQA Plan
- 1 electronic copy of the CQA Plan (PDF)

Task 17: Updated Emergency Action Plan

This task includes updating the existing Emergency Action Plan (EAP) in accordance with ADWR requirements (AAC R12-15-1221). The updated EAP will address any needed revisions to the inundation map, based on the new dam and revisions to the following elements as appropriate:

- Notification flow chart
- Statement of purpose
- Emergency detection, evaluation and action
- Responsibilities
- Notification procedures
- Preparedness
- Inundation map

Deliverables:

17.1 Draft Updated Emergency Action Plan (EAP)
- 1 electronic copy of the Updated EAP (PDF)

17.2 Final Updated Emergency Action Plan (EAP)
- 2 hard copies of the EAP
- 1 electronic copy of the Updated EAP (PDF)

Task 18: Operation and Maintenance Plan

This task includes preparation of an Operation and Maintenance (O&M) plan describing the aspects of operation and maintenance that will be required for the new dam in accordance with ADWR requirements (AAC R12-15-1205). The O&M Plan will specify the frequency of inspections and maintenance of the dam and appurtenant structures

and the frequency for exercising mechanical and electrical equipment and systems. The O&M Plan will specifically address the following:

- Concrete and masonry structures
- Metal surfaces
- Spillway and energy dissipator
- Downstream channel areas
- Site security
- Instrumentation
- Log book
- Annual report
- Photographic record

Deliverables:

18.1 Draft Operation and Maintenance (O&M) Plan
- 1 electronic copy of the O&M Plan (PDF)

18.2 Final Operation and Maintenance (O&M) Plan
- 2 hard copies of the O&M Plan
- 1 electronic copy of the O&M Plan (PDF)

Task 19: Instrumentation Plan

This task includes preparation of an Instrumentation Plan describing instrumentation required to monitor and evaluate the safety and performance of the dam in accordance with ADWR requirements (AAC R12-15-1215). The Plan will include material descriptions, placement criteria, and construction requirements, monitoring frequency and data recording format.

Deliverables:

19.1 Draft Instrumentation Plan
- 1 electronic copy of the O&M Plan (PDF)

19.2 Final Instrumentation Plan
- 2 hard copies of the Instrumentation Plan
- 1 electronic copy of the O&M Plan (PDF)

Task 20: Permitting

This task includes researching permit requirements and obtaining permits for construction of the replacement dam; these may include Flood Control District of Maricopa County permits, Arizona Department of Water Resources permits, 404 permit

modifications, City of Tempe building permits, biological, cultural, and environmental permits, AZPDES construction general permit authorization (CGP) and others unidentified clearances. We have assumed a level of effort for cost estimating purposes based on our experience with similar projects. We have assumed that the construction of a hinged gate approximately 100 feet downstream from the existing rubber bladders will be permitted as a dam replacement rather than construction of a new dam and that there will not be permitting requirements related to cultural or environmental impacts. The following activities are anticipated under this task:

20.1 Research permit requirements with Flood Control District of Maricopa County permits, Arizona Department of Water Resources permits, 404 permit modifications, City of Tempe building permits, biological, cultural, and environmental permits, AZPDES construction general permit authorization (CGP) and others unidentified clearances.

20.2 Prepare permit applications and supporting material

20.3 Meeting and coordination with agency representatives for permit reviews and responses.

TEMPE TOWN LAKE DOWNSTREAM DAM REPLACEMENT PROJECT - PHASE 2 FINAL DESIGN AND PERMITTING

CITY OF TEMPE PROJECT NUMBER: 6504221

EXHIBIT A - FEE MATRIX

GANNETT FLEMING

TASK	TASK DESCRIPTION	Principal In Charge	Lead Design Engineer	Project Manager	Principal Engineer	Senior Engineer	Project Engineer	Engineer	Sr. GIS/CADD Designer	GIS/CADD Drafter	Project Admin	Total Man Hours	Total Fee
	Engineering Staff	Durkee	Schweiger	Ackerman	Nabar Bower Raza Kline	Saber Kline Stanley Niedzielski	Vaghti Rababah Roarabaugh Hess	Lynch Selp					
	Total Hours	658	906	1428	590	1172	5484	3380	2418	712	251	16999	
	Rate	$189.00	$185.00	$140.00	$175.00	$165.00	$135.00	$95.00	$115.00	$75.00	$75.00		
Task 1.0 Project Coordination and Management													
1.1	Prepare and Update Schedule	16		40								56	$8,624.00
1.2	Progress Meetings (One per month for total of 18)	54	18	54							16	142	$22,296.00
1.3	Project Coordination and Management (18 months)	240		90							40	370	$60,960.00
	LABOR SUBTOTAL	310	18	184	0	184	0	0	0	0	56	568	$91,880.00
	SUBTOTAL	$58,590	$3,330	$25,760	$0	$30,360	$0	$0	$0	$0	$4,200		
Task 2.0 Stakeholder Coordination													
2.1	Coordination with stakeholders	48		24								72	$12,432.00
2.2	Meetings (Assume 12 stakeholder meetings)	48		24					16	24		112	$16,072.00
	LABOR SUBTOTAL	96	0	48	0	0	0	0	16	24	0	184	$28,504.00
	SUBTOTAL	$18,144	$0	$6,720	$0	$0	$0	$0	$1,840	$1,800	$0		
Task 3.0 Owner/Operator Meetings and Site Visits													
3.1	Dam Owner/Operator teleconferences	16	16	12	12	12						68	$11,744.00
3.2	Site Visit (4 GF People)	24	24	24	24							96	$16,536.00
	LABOR SUBTOTAL	24	24	24	24	0	0	0	0	0	0	96	$28,280.00
	SUBTOTAL	$4,536	$4,440	$3,360	$4,200	$0	$0	$0	$0	$0	$0		
Task 4.0 Concept Review Meeting													
4.1	1/2 Day Concept Review Meeting	12	8	6	6		6		6	6	2	52	$7,738.00
4.2	Documentation	4		12			8		2		4	30	$4,046.00
	LABOR SUBTOTAL	16	8	18	6	0	14	0	8	6	6	82	$11,784.00
	SUBTOTAL	$3,024	$1,480	$2,520	$1,050	$0	$1,890	$0	$920	$450	$450		
Task 5.0 Geotechnical Field Investigation													
5.1	Pre-field coordination			8			20	40			8	76	$8,220.00
5.2	Drilling and logging			80			160					240	$32,800.00
5.3	Seismic refraction survey			16				40				56	$6,040.00
5.4	Laboratory testing						8	12			4	24	$2,520.00
5.5	Boring logs			8			12	40				60	$6,540.00
5.6	Geotechnical Investigation Report	24		40		24	120	60			24	292	$37,796.00
	LABOR SUBTOTAL	24	0	152	0	24	320	192	0	0	36	748	$93,916.00
	SUBTOTAL	$4,536	$0	$21,280	$0	$3,960	$43,200	$18,240	$0	$0	$2,700		
Task 6.0 Foundation Analysis and Design													
6.1	Data compilation			16			32	40			8	96	$10,960.00
6.2	Subsurface interpretation			16			16		4			36	$4,860.00
6.3	Material property evaluation			16			30					46	$6,290.00
6.4	Geologic hazard evaluation			40			60	60				160	$19,400.00
6.5	Seepage analyses			60			120	80				260	$32,200.00
6.6	Dewatering evaluation			40			60	40				140	$17,500.00
6.7	Static stability analyses			80			180	60				320	$41,200.00

TEMPE TOWN LAKE DOWNSTREAM DAM REPLACEMENT PROJECT - PHASE 2 FINAL DESIGN AND PERMITTING

CITY OF TEMPE PROJECT NUMBER: 6504221

EXHIBIT A - FEE MATRIX

GANNETT FLEMING

TASK	TASK DESCRIPTION	Principal In Charge	Lead Design Engineer	Project Manager	Principal Engineer	Senior Engineer	Project Engineer	Engineer	Sr. GIS/CADD Designer	GIS/CADD Drafter	Project Admin	Total Man Hours	Total Fee
	Engineering Staff	Durkee	Schweiger	Ackerman	Nabar Bower Raza Kline	Saber Kline Stanley Niedzielski	Vaghti Rababah Roarabaugh Hess	Lynch Seip					
	Total Hours	556	966	1428	890	1172	5484	3380	2416	712	25	16999	
	Rate	$189.00	$185.00	$140.00	$175.00	$165.00	$135.00	$95.00	$115.00	$75.00	$75.00		
6.8	Seismic evaluation			40			20					60	$8,300.00
6.9	Pseudo-static stability analyses			20			60	120				200	$22,300.00
6.10	Liquefaction evaluation			40			40	60				140	$16,700.00
6.11	Cutoff wall design			100			120	240	40			500	$57,600.00
6.12	RCC materials assessment and mix design		10	40		80	120					250	$36,850.00
6.13	RCC global analyses		80	40		160	240					520	$79,200.00
6.14	RCC structure design		80			80	240					400	$60,400.00
6.15	RCC plans, specs and cost estimate		50			120	240		300			710	$95,950.00
6.16	Foundation Analysis and Design Report	40	12	24		36	80	60		80	24	356	$43,380.00
	LABOR SUBTOTAL	40	232	572	0	476	1658	760	344	80	32	4194	$553,090.00
	SUBTOTAL	$7,560	$42,920	$80,080	$0	$78,540	$223,830	$72,200	$39,560	$6,000	$2,400		
Task 7.0	**Structural Analysis and Design**												
7.1	Parameter selection and compilation		4		24	80	80	80	16	36		320	$41,080.00
7.2	Develop loading conditons for structural slab, piers, & walls		8		16	60	240	240	16	40		620	$74,220.00
7.3	Design of reinforced concrete foundation slab and stilling basin		16		24	60	240	240	24	24		628	$76,820.00
7.4	Design of reinforced concrete relocated interceptor		12		24	60	160	240	24	24		544	$65,280.00
7.5	Design of abutments, retaining walls, and cutoff walls		16		16	40	80	120	24	24		300	$36,420.00
7.6	Design of upstream cofferdam system		8		24	60	120	120	24	24		380	$47,740.00
7.7	Control building structural design		8		12	20	80	80	24	24		248	$29,840.00
	LABOR SUBTOTAL	0	72		140	380	980	1120	152	196	0	3040	$371,400.00
	SUBTOTAL	$0	$13,320		$24,500	$62,700	$132,300	$106,400	$17,480	$14,700	$0		
Task 8.0	**Hydraulic Analysis and Design**												
8.1	Site visits				8			8				16	$2,160.00
8.2	Hydraulic analyses		24		40		40	140				244	$30,140.00
8.3	Scour and energy dissipator analysis		24		40		80	180				324	$39,340.00
8.4	South Bank Interceptor analysis				24		60	60				144	$18,000.00
8.5	Upstream buoy analysis				24		40					64	$9,600.00
8.6	Hydraulic analysis and design report (draft and final)		24		80		120	40			16	280	$39,640.00
	LABOR SUBTOTAL	0	72		216	0	340	428	0	0	16	1072	$138,880.00
	SUBTOTAL	$0	$13,320		$37,800	$0	$45,900	$40,660	$0	$0	$1,200		
Task 9.0	**Control System Analysis and Design**												
9.1	Monitoring and Control System Design		4		24		300		120			448	$59,240.00
9.2	Electrical Power System Design		4		16		120		160			300	$38,140.00
9.3	Short circuit and protective devise coordination study		4		8		80		24			116	$15,700.00
9.4	Utility coordination		4		8		40		60			112	$14,440.00
9.5	Design surveillance system		4		12		40		60			116	$15,140.00
9.6	Plans and specifications		4		60	60	240		600			964	$122,540.00
	LABOR SUBTOTAL	0	24		128	60	820	0	1024	0	0	2056	$265,200.00
	SUBTOTAL	$0	$4,440		$22,400	$9,900	$110,700	$0	$117,760	$0	$0		

TEMPE TOWN LAKE DOWNSTREAM DAM REPLACEMENT PROJECT - PHASE 2 FINAL DESIGN AND PERMITTING

CITY OF TEMPE PROJECT NUMBER: 6504221

EXHIBIT A - FEE MATRIX

GANNETT FLEMING

TASK	TASK DESCRIPTION	Engineering Staff	Principal In Charge	Lead Design Engineer	Project Manager	Principal Engineer	Senior Engineer	Project Engineer	Engineer	Sr. GIS/CADD Designer	GIS/CADD Drafter	Project Admin	Total Man Hours	Total Fee
			Durkee	Schweiger	Ackerman	Nabar Bower Raza Kline	Saber Kline Stanley Niedzielski	Vaghti Rababah Roarabaugh Hess	Lynch Seip					
		Total Hours	653	906	1428	590	1172	5484	3380	2418	712	251	16999	
		Rate	$189.00	$185.00	$140.00	$175.00	$165.00	$135.00	$95.00	$115.00	$75.00	$75.00		
Task 10.0 Engineering Design Report														
10.1	Design Report outline		2	8	16	8		16					50	$7,658.00
10.2	Draft Design Report		16	40	120	8		40			24	24	272	$37,624.00
10.3	Final Design Report		16	24	100	4		40			8	16	208	$29,364.00
		LABOR SUBTOTAL	34	72	236	20	0	96	0	0	32	40	530	$74,646.00
		SUBTOTAL	$6,426	$13,320	$33,040	$3,500	$0	$12,960	$0	$0	$2,400	$3,000		
Task 11.0 Failure Modes and Effects Analysis Workshop														
11.1	1-Day FMEA Workshop		12	24	12	24	24	24	12		12	4	148	$22,128.00
11.2	FMEA Report		8		12						8	8	36	$4,392.00
		LABOR SUBTOTAL	20	24	24	24	24	24	12	0	20	12	184	$26,520.00
		SUBTOTAL	$3,780	$4,440	$3,360	$4,200	$3,960	$3,240	$1,140	$0	$1,500	$900		
Task 12.0 Construction Plans														
12.1	30% Plans			40				108	80	128	28		384	$46,400.00
12.2	60% Plans			40				190	120	220	70		640	$75,000.00
12.3	90% Plans			40				284	168	326	116		934	$107,890.00
12.4	Final Plans			40				142	84	184	116		566	$64,410.00
		LABOR SUBTOTAL	0	160		0	0	724	452	858	330	0	2524	$293,700.00
		SUBTOTAL	$0	$29,600		$0	$0	$97,740	$42,940	$98,670	$24,750	$0		
Task 13.0 Construction Specifications														
13.1	TOC and available specifications (30%)			24				40	16			1	81	$11,435.00
13.2	Draft specifications (60%)			24				60	40			4	128	$16,640.00
13.3	Draft specifications (90%)			24				60	80			4	168	$20,440.00
13.4	Final specifications (Final)			24				24	20			4	72	$9,880.00
		LABOR SUBTOTAL	0	96		0	0	184	156	0	0	13	449	$58,395.00
		SUBTOTAL	$0	$17,760		$0	$0	$24,840	$14,820	$0	$0	$975		
Task 14.0 Construction Cost Estimate, Schedule and Constructability Review														
14.1	List of construction items			4	24			36					64	$8,960.00
14.2	Draft quantities, cost estimate, and schedule			4	16			16					36	$5,140.00
14.3	Final quantities, cost estimate, and schedule			4	8			12					24	$3,480.00
		LABOR SUBTOTAL	0	12	48	0	0	64	0	0	0	0	124	$17,580.00
		SUBTOTAL	$0	$2,220	$6,720	$0	$0	$8,640	$0	$0	$0	$0		
Task 15.0 - Storm Water Pollution Prevention Plan														
15.2	Final SWPPP							40		16	24	4	84	$9,340.00
		LABOR SUBTOTAL	0	0		0	0	40	0	16	24	4	84	$9,340.00
		SUBTOTAL	$0	$0		$0	$0	$5,400	$0	$1,840	$1,800	$300		
Task 16.0 – Construction Quality Assurance Plan														
16.1	Draft CQA Plan		2	4	16	4		16				4	46	$6,518.00

TEMPE TOWN LAKE DOWNSTREAM DAM REPLACEMENT PROJECT - PHASE 2 FINAL DESIGN AND PERMITTING

CITY OF TEMPE PROJECT NUMBER: 6504221

EXHIBIT A - FEE MATRIX

GANNETT FLEMING

TASK	TASK DESCRIPTION	Engineering Staff	Principal In Charge	Lead Design Engineer	Project Manager	Principal Engineer	Senior Engineer	Project Engineer	Engineer	Sr. GIS/CADD Designer	GIS/CADD Drafter	Project Admin	Total Man Hours	Total Fee
			Durkee	Schweiger	Ackerman	Nabar Bower Raza Kline	Saber Kline Stanley Niedzielski	Vaghti Rababah Roarabaugh Hess	Lynch Seip					
		Total Hours	658	906	1428	590	1172	5484	3380	2418	712	251	16999	
		Rate	$189.00	$185.00	$140.00	$175.00	$165.00	$135.00	$95.00	$115.00	$75.00	$75.00		
	16.2 Final CQA Plan		2	2	2	2		12				2	22	$3,148.00
		LABOR SUBTOTAL	4	6	18	6	0	28	0	0	0	6	68	$9,666.00
		SUBTOTAL	$756	$1,110	$2,520	$1,050	$0	$3,780	$0	$0	$0	$450		
	Task 17.0 - Updated Emergency Action Plan													
	17.1 Draft Updated EAP			4		4		16	24			4	52	$6,180.00
	17.2 Final Updated EAP			2		2		4	16			2	26	$2,930.00
		LABOR SUBTOTAL	0	6	0	6	0	20	40	0	0	6	78	$9,110.00
		SUBTOTAL	$0	$1,110	$0	$1,050	$0	$2,700	$3,800	$0	$0	$450		
	Task 18.0 – Operation and Maintenance Plan													
	18.1 Draft O&M Plan		16	16	32	4		24				4	96	$14,704.00
	18.2 Final O&M Plan		12	12	16	4		12				2	58	$9,198.00
		LABOR SUBTOTAL	28	28	48	8	0	36	0	0	0	6	154	$23,902.00
		SUBTOTAL	$5,292	$5,180	$6,720	$1,400	$0	$4,860	$0	$0	$0	$450		
	Task 19.0 – Instrumentation Plan													
	19.1 Draft Instrumentation Plan		4	12		8	16	24	40			4	108	$14,356.00
	19.2 Final Instrumentation Plan		2	8		4	8	12	20			2	56	$7,548.00
		LABOR SUBTOTAL	6	20	0	12	24	36	60	0	0	6	164	$21,904.00
		SUBTOTAL	$1,134	$3,700	$0	$2,100	$3,960	$4,860	$5,700	$0	$0	$450		
	Task 20.0 – Permitting													
	20.1 Research permitting requirements		8	8	16			40	80			4	156	$18,532.00
	20.2 Permit applications		8	8	16			40	80			8	160	$18,832.00
	20.3 Agency coordination		40	16	24			20					100	$16,580.00
		LABOR SUBTOTAL	56	32	56	0	0	100	160	0	0	12	416	$53,944.00
		SUBTOTAL	$10,584	$5,920	$7,840	$0	$0	$13,500	$15,200	$0	$0	$900		
		Total Hours	658	906	1428	590	1172	5484	3380	2418	712	251	Labor	$2,181,641.00
		% total hours by category	4	5	8	3	7	32	20	14	4	1		

TEMPE TOWN LAKE DOWNSTREAM DAM REPLACEMENT PROJECT - PHASE 2 FINAL DESIGN AND PERMITTING

CITY OF TEMPE PROJECT NUMBER: 6504221
EXHIBIT A - DIRECTS AND SUBCONSULTANTS

Allowances

DIRECT EXPENSES

	Total	
Fieldwork Direct Expenses	$1,000.00	Task 5
Geotechnical Drilling Subcontractor	$103,000.00	Task 5
Geotechnical Laboratory Testing	$27,100.00	Task 5
Geophysical Survey	$45,000.00	Task 5
Travel to project sites (includes $4000 for City Personnel)	$8,000.00	Task 3
Subtotal	$184,100.00	

ALLOWANCES

	Total
Public Involvement (Allowance)	$12,000.00
Supplemental Survey (Allowance)	$10,000.00
Control Building Architect (Allowance)	$20,000.00
Gate System Aesthetics Artist (Allowance)	$20,000.00
Subtotal	$62,000.00

SUBCONSULTANTS

Dan Hertel (Cost Estimating, Constructability Expert)	$23,000.00
Deb Miller (FMEA Facilitator)	$12,000.00
Don Brennan (Hydraulic Actuator Expert)	$25,000.00
Ralph Weeks (Geologic Hazards Expert)	$20,000.00
Subtotal	$80,000.00

TOTAL DESIGN FEE

Total Labor	$2,181,641.00	for	Phase 2 Final Design
Direct Expenses and Subconsultants	$264,100.00	for	Phase 2 Final Design Expenses
Allowance	$62,000.00	for	Phase 2 Final Design Allowances
Total Design Fee	$2,507,741.00	Total Phase 2 Design Contract Amount	

Exhibit B

Milestone Schedule

Milestone Schedule

Tempe Town Lake Downstream Dam Replacement	Milestone Date	Comments
Oklahoma City Site Visit	04/11/12	
Concept Review Meeting	04/18/12	
Confirm Downstream Dam Location	05/02/12	
Hydraulic analysis and design report	08/27/12	Draft report with 60% submittal
Geotechnical Investigation Report	08/27/12	Final report with 60% submittal
Foundation Analysis and Design Report	08/27/12	Draft report with 60% submittal
Engineering Design Report	11/30/12	
Failure Modes and Effects Analysis Workshop	06/20/12	
30% Plans	06/18/12	
60% Plans	08/27/12	
90% Plans	10/19/12	
Final Plans	11/30/12	
Stormwater Pollution Prevention Plan	10/19/12	
Construction Quality Assurance Plan	10/19/12	
Updated Emergency Action Plan	10/19/12	
Operation and Maintenance Plan	10/19/12	
Instrumentation Plan	10/19/12	
Dam Safety Permit	04/04/13	Begin process at 90% submittal

Exhibit A

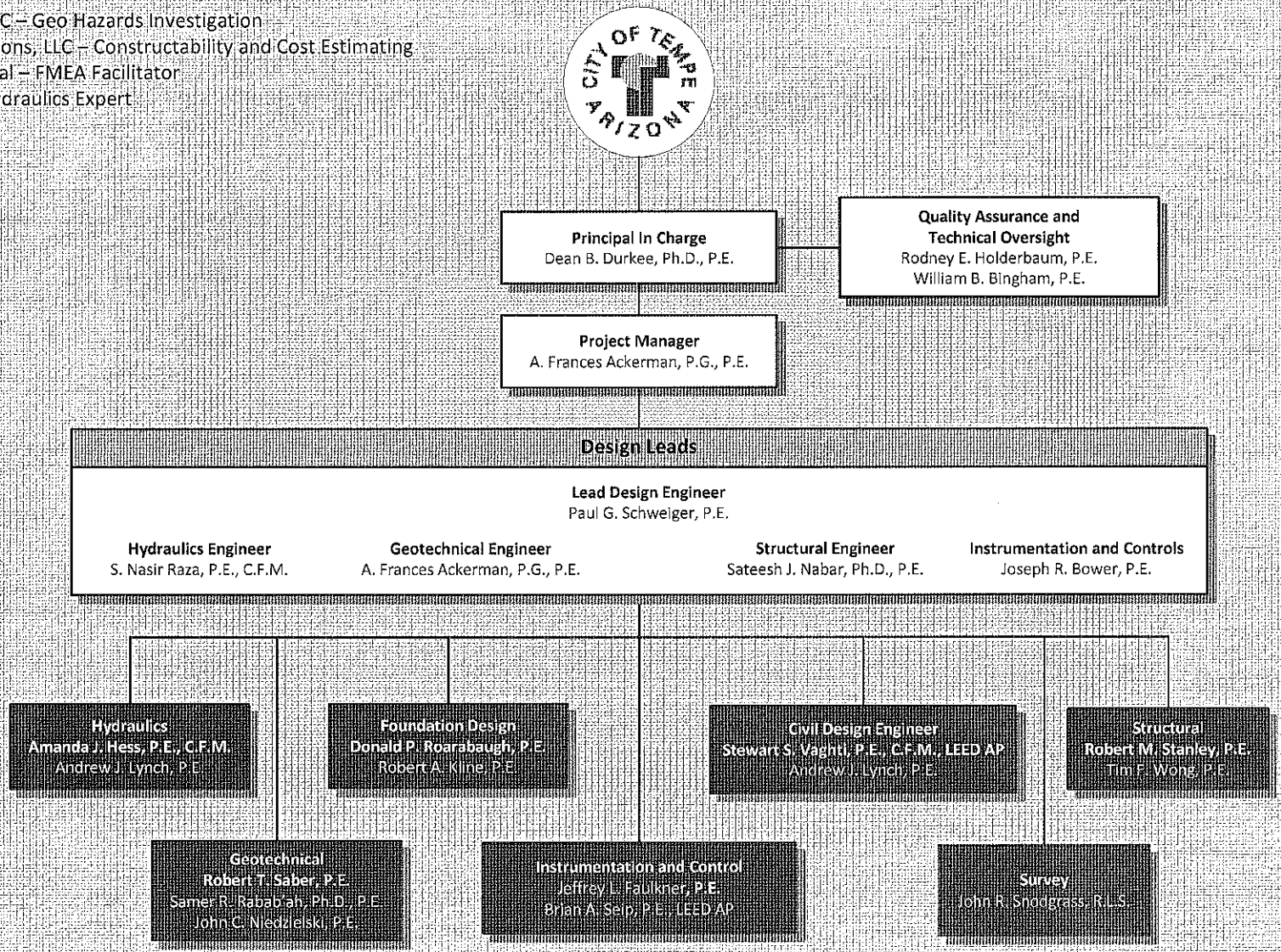
Organization Chart and Resumes

Exhibit A-1 Organization Chart

Engineering Design Services for Tempe Town Lake Downstream Dam Replacement

Project No. 6504221

Legend:
GeoSouthwest, LLC – Geo Hazards Investigation
Engineering Solutions, LLC – Constructability and Cost Estimating
Miller Geotechnical – FMEA Facilitator
Don Brennan – Hydraulics Expert



Gannett Fleming

Project Assignment: *Principal In Charge*

Years Experience with Current Firm: *10*

Years Experience with Other Firms: *12*

Education:

B.S., Civil Engineering, Colorado State University, 1990

M.S., Geotechnical Engineering, University of Rhode Island, 1992

Ph.D., Geotechnical Engineering, Colorado State University, 2000

Professional Registrations:

P.E.: California - No. 58457 (1998); Arizona - No. 35654 (2000); New Mexico - No. 16788 (2004); Texas - No. 97828 (2006); Wyoming - No. PE 11031 (2006); Hawaii - No. PE-12616 (2007); Nevada - No. 019350 (2008); Montana - No. 18868 (2008); Oklahoma - No. 3709 (2011)

Current Responsibilities:

Vice President/Regional Director of Earth Science and Hydraulics responsible for project management and technical direction of Gannett Fleming's geotechnical, dam and hydraulics, and flood control work in the western United States. He is a Geotechnical Engineer, who works primarily on dam, levee, and flood control projects, and his experience includes assessment, planning, design, and construction services for dam projects. In the last seven years, Dr. Durkee has worked on 13 dam projects in Arizona and is currently Project Manager on design of repairs at the Flood Control District of Maricopa County's Saddleback Dam. He is also currently assisting the State of Hawaii with revision to the State's Rules and Regulations for Jurisdictional Dams and Dam Safety Permit reviews and recently served as Gannett Fleming's Internal Technical Reviewer for the U.S. Army Corps of Engineers (USACE), Jacksonville District, Herbert Hoover Dike Project.

Summary of Experience:

White Tanks Flood-Retarding Structure (FRS) No. 4, Planning Phase, Maricopa County, AZ, *Flood Control District of Maricopa County.* Project Manager for a Natural Resources Conservation Service (NRCS) planning-phase study for the rehabilitation of White Tanks FRS No. 4. The project included the preparation of an NRCS work plan and environmental assessment. This included developing alternatives for no action and ones involving the decommissioning, replacement, and rehabilitation of the dam to meet current criteria, as well as developing a national economic development alternative. Our firm was also responsible for providing overall project management, geotechnical engineering, and environmental analysis services.

White Tanks FRS No. 4, Preliminary Design, Maricopa County, AZ, *Flood Control District of Maricopa County.* Project Manager for the preliminary design to rehabilitate White Tanks FRS No. 4. The preliminary design included the development of an upstream rehabilitation section (filter) to protect against internal erosion; the modification of the emergency spillways to safely pass the probable maximum flood and protect against surface erosion; the design of three new principal spillways, two gated and one NRCS riser; the design of downstream radial flow control structures for the principal spillways; and the development of the inflow design flood based on a 100-year, 10-day event.

Saddleback Dam Mitigation, Maricopa County, AZ, *Flood Control District of Maricopa County.* Project Manager for the rehabilitation of a compacted earthfill dam. The project includes the development of alternatives for rehabilitation of an approximately 5.1-mile-long dam that has experienced the formation of numerous erosion holes and longitudinal cracking along the dam crest, beginning approximately two years after construction was completed. Responsibilities include technical direction and management of geotechnical investigations; evaluation of filter, foundation, and embankment deficiencies; detailed design of the rehabilitation improvements; preparation of plans and project specifications; and project

coordination. Future services will also include the preparation of final bid documents and bid and construction-phase services.

Alternatives Analysis and Preliminary Design, Fredonia, AZ, *Town of Fredonia.* Project Manager/Principal Geotechnical Engineer for an alternatives analysis and a preliminary design related to a Natural Resources Conservation Service planning phase for a flood control structure rehabilitation. Responsibilities include performing geotechnical engineering analyses related to an evaluation of rehabilitation alternatives. Our firm was responsible for developing parameters for the evaluation of the rehabilitation alternatives. Alternatives included installing an upstream cutoff, either geomembrane or soil cement/roller-compacted concrete (RCC), and converting the dam to a levee/floodway. Also participated in an alternatives analysis workshop and the selection process for the recommended alternative.

Phase I Structure Assessments, Maricopa County, AZ, *Flood Control District of Maricopa County.* Subconsultant Project Manager/ Geotechnical Task Manager for Phase I structure assessments of five flood control dams and one levee. The structures included the Sunset FRS, the Sunnycove FRS, and the Casandro Wash Dam in the town of Wickenburg, as well as the Harquahala FRS, the Saddleback FRS, and the Centennial Levee in northwest Maricopa County. Responsible for providing support for the individual structure assessments, including reviewing all pertinent data on the structures, performing detailed site inspections, preparing detailed site inspection reports, and participating in failure modes and effects analyses. Individual structure assessment reports included recommendations for follow-up actions, such as field investigations and repairs, engineering studies and analyses, and improvements to operations and maintenance procedures. Also participated in an alternatives analysis study by developing conceptual-level structural solutions to address dam/levee safety issues, including the potential for increased levels of flood protection.

Herbert Hoover Dike Rehabilitation, Lake Okeechobee, Palm Beach County, FL, *USACE, Jacksonville District.* Senior Geotechnical Engineer/Internal Technical Reviewer for the analysis and design of rehabilitation measures for Phase 2A of a dike rehabilitation. Our firm is responsible for providing seepage and stability analysis and design services for a cutoff and toe drain/ buttress concept previously developed by the Jacksonville District. Evaluated alternatives for the berm length, cutoff depth, and drainage trench/relief well concepts.

Hawi No. 3 Reservoir Maintenance and Remediation Improvements, Hawi, HI, *Hawaii Department of Land and Natural Resources (DLNR).* Project Principal/Manager for the rehabilitation of an earth-embankment dam located on the island of Hawaii and classified as a small dam. The project included the development of alternatives for removal, rehabilitation, and operational reduction of the reservoir system. The modifications included spillway reconstruction, embankment regrading, replacement of the intake structure for the outlet works, replacement of the inflow diversion gate valve, and access road improvements. Future services will also include providing bidding and construction-phase services and developing an operation and maintenance manual.

Design Review, Opaeula No. 2 Dam, Oahu, HI, *Hawaii DLNR.* Principal Reviewer/Geotechnical Engineer responsible for the review of remediation analyses and designs for modifications to a dam on the island of Oahu. The project includes the design of a spillway and a downstream buttress system to mitigate dam safety deficiencies associated with an undersized spillway and embankment instability. Reviewed the geotechnical report, the design report, 90 percent design drawings, and construction specifications.

Project Assignment: *Quality Assurance and Technical Oversight*

Years Experience with Current Firm: *44*

Years Experience with Other Firms: *0*

Education:

B.S., Civil Engineering, Lafayette College, 1966

Professional Registrations:

P.E.: Pennsylvania - No. PE018001E (1971); South Carolina - No. 15025 (1992); Connecticut - No. PEN.0018226 (1994)

Current Responsibilities:

Vice President/Corporate Practice Leader for Earth Science and Hydraulics with overall responsibility for developing, coordinating, and overseeing services for governmental water resource agencies nationwide, as well as identifying and developing new technologies. Also serves as the firm's national representative for the Dams and Flood Control Practice. Specializes in the areas of dam and flood control engineering with involvement as Project Principal, Project Manager, Project Engineer, or Quality Team Leader on more than 15 flood control projects, 30 new dam projects, 70 dam rehabilitation projects, 120 annual dam safety inspections, 30 Phase I dam safety inspections, and numerous dam feasibility investigations and reports. Experienced in studies, designs, cost estimates, specifications, and public meetings on diverse assignments such as new dam and dam rehabilitation designs; basin-wide flood control studies; water supply alternative studies; flood control investigation and reports; existing flood control project rehabilitation design; field surveys; water needs assessments; and flood damage assessments. Has authored more than 20 technical papers and articles. Received the "President's Award" in 1994 and the "Award of Merit" in 1991 from the Association of State Dam Safety Officials (ASDSO). Selected by "Engineering News Record" as one of the top 25 newsmakers in the construction industry for 1996. Named Engineer of the Year in Pennsylvania in 2000 by the Pennsylvania Society of Professional Engineers. Appointed to the National Dam Safety Review Board by the Federal Emergency Management Agency, now under the U.S. Department of Homeland Security. Serves as Chair of the ASDSO's Peer Review Program, which has performed peer reviews of 24 state dam safety programs and dam safety programs of the U.S. Army Corps of Engineers, the Department of the Interior, the Mine Safety and Health Administration, BC Hydro, and Ontario Power Generation. Elected to the Board of Directors (1998-2004) of the United States Society on Dams (the U.S. member of the International Commission on Large Dams); elected President (2001-2003).

Summary of Experience:

Design of Fish Passage Facility for Sunbury Inflatable Dam, Sunbury, PA, *Pennsylvania Department of General Services (PA DGS).* Project Principal responsible for the design of a fishway at the east abutment of the inflatable dam on the Susquehanna River in Sunbury, Pennsylvania. This project involved evaluating fishway alternatives and performing a physical hydraulic model study of the selected alternative. An 11-pool serpentine vertical-slot fishway with a fish-counting facility was designed for this 8-foot-high dam using state-of-the-art operating features including automated inflatable-type gates and real-time web camera viewing of the fish passage.

Design Services for the Reconstruction of the Catskill Watershed Dams and Associated Facilities, New York, NY, *New York City Department of Environmental Protection.* Deputy Project Director with overall corporate responsibility for the analysis, design, and construction-phase services for the rehabilitation and improvement of the City's 100-year-old historic Catskill Water System including Gilboa Dam, Ashokan Reservoir Dams, and the Shandaken Intake that involves upgrading spillways, gates, screen chambers, and miscellaneous structures. The project includes a construction-phase instrumentation

program to monitor performance, and the final rehabilitation will include extensive instrumentation for monitoring the performance of the embankment, the concrete gravity spillway section, the post-tensioned anchors, and the new tunnel outlet works system.

Forest Park Raw Water Intake and Diversion Dam, Chalfont, PA, *North Penn/North Wales Water Authorities.* Project Principal responsible for overall management and direction of preliminary/final design and for preparation of construction contract documents for a moveable crest gate structure. The Forest Park Diversion Dam is a 4.5-foot-high by 84-foot-long inflatable rubber dam across the North Branch of Neshaminy Creek located in a northern suburb of Philadelphia. The rubber dam diverts up to 40 Mgal of raw water daily to a bank-side concrete intake serving the Forest Park Water Treatment Plant. A constant upstream pool level can be maintained by automatically and incrementally adjusting the gate's crest position through an interface with the treatment plant's computer-automated operating system. The rubber dam can be automatically lowered to match the natural streambed's cross-sectional geometry during significant storm events (e.g., the 100-year flood), thereby eliminating any adverse impacts on flood stages upstream.

Rehabilitation of Codorus Creek Local Flood Protection, York, PA, *U.S. Army Corps of Engineers, Baltimore District.* Section Manager responsible for technical and quality review for investigation and report on remedial measures, final design, plans and specifications, and construction services. This 5-mile-long project was constructed in the 1940s and was in need of repair. Work included removing silt deposits; repairing walls and riprap failure areas; and adding new retaining walls, stoplog closure structures, control manholes, and flap gates.

Bascule Dam and Boat Basin, Codorus Creek, York, PA, *City of York.* Project Manager responsible for preliminary design, final design, and general inspection for construction of a bascule dam and boat basin on Codorus Creek. Performed hydrologic and hydraulic investigations related to encroachments and stream channel improvements.

Wyoming Valley Levee Raising Project, Inflatable Dam Feasibility Study, Wilkes-Barre, PA, *Luzerne County Flood Protection Authority.* Project Principal responsible for project direction and quality assurance review of a comprehensive study to evaluate the feasibility of an inflatable dam across the Susquehanna River at Wilkes-Barre. The study included a detailed evaluation of the total project costs and benefits. Performed a rigorous evaluation of engineering, environmental, economic, and financial issues to identify the optimum project configuration. Evaluated many complex interrelated issues including water quality, fish passage, recreation, economic development potential, existing infrastructure modifications, construction costs, and operation and maintenance costs. The study also involved extensive regulatory agency coordination.

Replacement of Bear Creek Dam, Bear Creek, PA, *Bear Creek Historical Society.* Project Principal responsible for the design, permitting, and construction-phase services for the replacement of a historic timber crib dam. The 360-foot-long, 18-foot-high dam was replaced with a new 4,600-cubic-yard, roller-compacted concrete (RCC) dam with a timber facing to preserve the historic appearance.

Penn Forest Dam Replacement Project, Bethlehem, PA, *City of Bethlehem.* Project Principal with overall responsibility for analysis, design, and construction-phase services for a new 180-foot-high by 2,000-foot-long RCC gravity dam with an estimated project cost of $65 million. Provided overall direction on design issues, schedule, financing, coordination with public, permitting, and construction.

Project Assignment: *Quality Assurance and Technical Review*

Years Experience with Current Firm: *30*

Years Experience with Other Firms: *7*

Education:

B.S., Civil Engineering, The Pennsylvania State University, 1976

Graduate courses in Hydraulics and Economics, University of Pittsburgh and The Pennsylvania State University

Professional Registrations:

P.E.: Pennsylvania - No. PE029116E (1980); Ohio - No. PE.65722 (2001); West Virginia - No. 014862 (2001); Colorado - No. PE-36895 (2002); New York - No. 080839 (2003); Georgia - No. PE029930 (2004); Iowa - No. 16866 (2003); P.L.S.: Pennsylvania - No. SU026155E (1977); P.S.: Ohio - No. PS.6581 (1978)

Current Responsibilities:

Manager, Dams and Hydraulics Section responsible for many areas of water resources engineering including dam design and inspection, flood control and flood insurance studies, stormwater management, navigation studies, inspection of port and harbor facilities, water intake structure design, pipeline design, permitting, cost estimating, and construction technical support. Has provided engineering services on approximately 100 dams and flood control projects of various types and sizes. A special area of expertise is the design and construction of roller-compacted concrete (RCC) dams, including materials investigations and testing.

Summary of Experience:

Catskill Watershed Dams, Upstate NY, *New York City Department of Environmental Protection.* Joint Venture Project Manager responsible for overall management of dam inspections, condition assessments, preliminary and final design, and construction plans and specifications for repairs and upgrades to two New York City reservoirs, impounding dams (Gilboa and Ashokan), and appurtenant structures located in the Catskill Mountain region approximately 100 miles north of Manhattan. Provides overall management of the design team, interaction with client and regulators, and quality assurance reviews of completed work products for more than $500 million in ongoing construction improvements.

Penn Forest Dam Replacement Project, Bethlehem, PA, *City of Bethlehem.* Chief Engineer and Project Manager responsible for design and construction-phase services for the 180-foot-high, 2,050-foot-long, replacement dam, which contains approximately 370,000 cubic yards of RCC and is the third largest RCC dam constructed in the United States. Supervised construction inspection; assisted owner with project financing; managed site surveys and mapping; supervised preparation of reservoir refilling, operation and maintenance, and emergency action plans; and managed RCC materials investigations and mix designs. Coordinated project tasks among geotechnical, structural, civil/site, mechanical, electrical, and hydraulic design disciplines; supervised preparation of required permits; and liaisoned with the owner, construction manager, and board of consultants.

Codorus Creek Bascule Dam, York, PA, City of York. Project Engineer assigned to work on the final design and general inspection for construction of a bascule dam and boat basin on Codorus Creek. Performed hydrologic and hydraulic investigations related to encroachments and stream channel improvements. The 110-foot-long, 6-foot-high dam is a gate-type run-of-river structure.

Design of Lyman Run Dam, Potter County, PA, *Pennsylvania Department of General Services.* Project Principal responsible for managing design for replacement of Lyman Run Dam, a 52-foot-high, 900-foot-long, earthfill embankment dam with a 225-foot-wide labyrinth principal spillway. The project included supplemental site surveys and featured a subsurface exploration plan, borrow area investigations, laboratory testing,

hydrologic and hydraulic analyses, foundation evaluation and design, spillway and outlet works layout and design, and development of stream diversion concepts. Tasks also involved preparation of plans, specifications, and cost estimates (PS&E).

Ryerson Station Dam Final Design, Greene County, PA, *Pennsylvania Department of Conservation and Natural Resources.* Project Principal and Senior Engineer for design of the planned reconstruction of an existing concrete gravity dam. Responsibilities include providing technical oversight, meeting with the client and regulators, and allocating resources to the project.

Dam Engineering Services, Nationwide, *U.S. Department of Agriculture (USDA), Natural Resources Conservation Service (NRCS).* Project Administrator and Senior Engineer responsible for technical oversight and quality reviews for dam assessments, dam design, and design reviews for dam projects located in West Virginia, New Hampshire, New Mexico, Wisconsin, North Dakota, and Texas.

Rehabilitation of Lake Natalie Dam, Gouldsboro, PA, *Big Bass Lake Community Association.* Engineering Manager responsible for technical review of plans and specifications for rehabilitation of Lake Natalie Dam, which includes stabilizing the existing timber-crib structure, addressing seepage and sinkholes in the dam, improving site access, and increasing discharge capacity to safely pass the probable maximum flood.

Final Design for Rehabilitation of Martin Lake Dam, Austin, TX, *U.S. Department of the Interior, U.S. Fish and Wildlife Service.* Engineering Manager for technical oversight and review of conceptual and final designs for modifications to rehabilitate Martin Lake Dam; a 24-foot-high, high-hazard embankment dam with inadequate spillway capacity and seepage issues. The final design included converting the embankment to an RCC drop structure with overtopping protection and new outlet works.

Conceptual Design of Wekiva Falls Dam, Wekiva Falls Resort, Palatka, FL, *St. Johns River Watershed Management District.* Project Principal responsible for managing the development of alternative dam concepts and developing conceptual-level cost estimates for a 13-foot-high dam to control flows from an existing groundwater source.

Conceptual Design of Bone Run Dam Spillway, Warren, PA, *U.S. Army Corps of Engineers, Pittsburgh District.* Senior Engineer responsible for technical review and quality control for conceptual layout and design of a principal spillway and outlet works facilities for a small earthfill embankment dam on a tributary to the Allegheny Reservoir. The project included hydrologic and hydraulic analyses, review of available geotechnical information, preliminary spillway layout, construction cost estimating, and preparation of a report documenting the findings.

Design of Elkwater Fork Dam, Randolph County, WV, *USDA, NRCS.* Project Principal responsible for the overall coordination and management of investigations and design of a 130-foot-high, 700-foot-long, RCC gravity dam with an estimated construction cost of $14.5 million. Services included ground surveys and aerial mapping of the dam and reservoir area; subsurface exploration and testing of soil and rock materials; hydrologic and hydraulic analyses; preliminary design and layout; final design; preparation of PS&E; and preparation of a construction schedule.

Project Assignment: *Lead Design Engineer*

Years Experience with Current Firm: *24*

Years Experience with Other Firms: *3*

Education:

B.S., Civil Engineering - Water Resources Engineering, University of New Brunswick, 1983

M.S., Civil Engineering - Hydrology/Hydraulics, University of New Brunswick, 1986

Unsteady Flow Modeling Using DAMBRK and DWOPER, University of Texas at Austin, 1986

Automated Local Flood Warning Systems, River Systems, Inc., Rockville, MD, 1989

HEC-RAS Short Course, The Pennsylvania State University, 1995

RCC Dam and Dam Rehabilitation Short Course, PCA, Atlanta, GA, 1993; Springfield, VA, 1996; Bethlehem, PA, 1998

Workshop on Risk Assessment, USCOLD, Buffalo, NY, 1998

Seepage for Earth Dams, ASDSO Advanced Technical Seminar, Tampa, FL, 2005

NRCS SITES Training Seminar, Richmond, VA, 2006, 2007

Embankment Overtopping Seminar, Rowan University, New Jersey, 2008

Approved FERC FMA Facilitator

USBR Dam Safety Risk Analysis Workshop, 2010

Professional Registrations:

P.E.: Pennsylvania - No. PE040000E (1990); New Jersey - No. 24GE03637400 (1991); New York - No. 087043 (2009); West Virginia - No. 18419 (2009); North Dakota – No. PE-6634 (2010); Illinois – No. 062062959 (2010)

Current Responsibilities:

Engineering Manager in the Dams and Hydraulics Section responsible for many areas of water resources engineering including managing project investigations, dam assessments, designs, design reviews, reports, construction drawings, and specifications as well as providing construction contract administration for dam and flood control projects, hydrologic and hydraulic studies for dams and bridges, dam rehabilitation, and new hydraulic structures. Has provided engineering services on more than 300 dams of various types and sizes. Technical specialties include inflatable dam projects, performing risk assessments, designing fish passage facilities, conducting hydraulic analyses of natural and man-made waterways using steady and unsteady flow modeling techniques, performing water supply and safe-yield investigations for complex water supply systems, and preparing bridge scour and spillway erodibility investigations. Possesses proficiency with DAMS2/SITES, WSP2, HEC-1, HEC-HMS, HEC-2, HEC-RAS, HEC-4, NWS DAMBRK, MAPS, HY-8, HMR52, and AutoCAD. Has provided expert testimony and litigation support as a Hydraulic Engineer in the area of riverine flooding, water supply system operation, and public safety at low-head dams. Approved Federal Energy Regulatory Commission facilitator for performing failure modes analysis exercises for dams and an Association of State Dam Safety Officials instructor for conducting Dam Owner Workshops.

Summary of Experience:

Design of Fish Passage Facilities for East Abutment of Sunbury Inflatable Dam, Sunbury, PA, *PA DGS/PA DCNR.* Project Manager responsible for designing a fishway at the east and west abutments of the inflatable dam on the Susquehanna River in Sunbury. This project involved evaluating fishway alternatives and performing a physical hydraulic model study of the fishway and the modifications to the inflatable dam. An 11-pool serpentine vertical-slot fishway with a fish-counting facility was designed at the east abutment of this 8-foot-high inflatable dam using state-of-the-art operating features, including automated Obermeyer inflatable-type gates and real-time web camera viewing of fish passage.

Design of Nature-Like Fishway (Bypass Channel) for West Abutment of Sunbury Inflatable Dam, Sunbury, PA, *Pennsylvania Department of General Services (PA*

DGS)/Department of Conservation and Natural Resources (PA DCNR). Project Manager responsible for designing a nature-like fishway/bypass channel at the west abutment of the inflatable dam on the Susquehanna River in Sunbury, Pennsylvania. This project involved evaluating fishway alternatives and performing a conceptual design study and final design of the selected nature-like fishway alternative. A 13-pool serpentine natural bypass is being designed for this 8-foot-high, inflatable dam using state-of-the-art fishway design technology. The project included detailed bathymetric surveys, site surveys, geophysical surveys, an environmental assessment, and hydraulic modeling

Gilboa Dam Improvements, Schoharie County, NY, *New York City Department of Environmental Protection.* Senior Engineer responsible for technical support for structural stability analyses for the overflow portion of Gilboa Dam, the downstream discharge channel, and associated project features. The project involves the reconstruction of the 180-foot-high, 2,000-foot-long composite cyclopean-concrete gravity and earthfill embankment structure originally built in 1927. The project also involves the reconstruction of the 1,324-foot-long stair-stepped cyclopean-concrete gravity overflow section and associated training walls, as well as new low-level outlets works and a Obermeyer Hydro crest gate.

Wyoming Valley Levee Raising Project, Inflatable Dam Feasibility Study, Wilkes-Barre, PA, *Luzerne County Flood Protection Authority.* Project Manager responsible for a comprehensive study to evaluate the feasibility of an inflatable dam. The inflatable dam and associated recreational facilities were part of the mitigation plan for the Wyoming Valley Levee Raising Project. The U.S. Army Corps of Engineers (USACE) had studied concepts for an inflatable dam on the Susquehanna River in the Wyoming Valley. The USACE reconnaissance study concluded that an inflatable dam project was economically justified. Since the reconnaissance study resulted in favorable technical findings for the project, a second-phase feasibility study was commissioned by the Luzerne County Flood Protection Authority to further investigate engineering, environmental, and economic issues and public acceptance of the project. This second-phase study included a detailed evaluation of the total project costs and benefits and preparation of permit applications.

Codorus Creek Local Flood Protection Project, York, PA, *USACE, Baltimore District.* Project Engineer responsible for a feasibility study, preliminary conceptual design, and general inspection for rehabilitation of a local flood protection project, including metal bascule gate/dam.

Design of Inflatable Gate for Kimball Creek Dam Spillway, Calistoga, CA, *City of Calistoga.* Senior Project Engineer responsible for providing technical guidance for preliminary and final design services to the prime design consultant for modifications to an existing ogee-shaped concrete spillway. Performed an alternatives analysis for a new 4-foot-high by 58-foot-long inflatable gate system to be installed on the existing spillway crest and prepared drawings and specifications for the selected alternative. The alternatives analysis included evaluating spillway hydraulics, cost, and suitability with existing site geometry for each alternate.

White Tanks Flood-Retarding Structure (FRS) No. 4, Maricopa County, AZ, *Flood Control District of Maricopa County.* Senior Project Manager responsible for a Natural Resources Conservation Service (NRCS) planning-phase study for the rehabilitation of White Tanks FRS No. 4. The project included the preparation of an NRCS work plan/environmental assessment, which involved developing alternatives for no action, the decommissioning/removal of the dam, and the rehabilitation of the dam to meet current criteria, as well as developing a national economic development alternative.

Project Assignment: *Project Manager & Geotechnical Engineer*

Years Experience with Current Firm: *5*

Years Experience with Other Firms: *15*

Education:

B.S., Geology and Environmental Health, Illinois State University, 1991

M.S.E., Civil (Geotechnical) Engineering, Arizona State University, 2004

40-Hour OSHA Hazardous Waste Operations and Emergency Response (HAZWOPER) Training, University of Wisconsin, 1991

8-Hour OSHA HAZWOPER Refresher Training, Workplace Safety Specialists, 2010

Principals of Groundwater Hydrology, National Ground Water Association, 1992

IBM Personal Computer Applications in Risk Assessment, Remediation, and Modeling, National Ground Water Association, 1996

Natural Attenuation of Chlorinated Solvents in Groundwater, Remediation Technology Development Forum and the Interstate Technology and Regulatory Cooperation Work Group, 1998

3-D Groundwater Flow and Transport Using Visual MODFLOW, Waterloo Hydrogeologic, Inc., 1999

Groundwater Modeling II, Waterloo Hydrogeologic, Inc., 2001

Geotechnical Modeling Workshop, GEO-SLOPE International, Ltd., 2005

Interactive Preparedness: Emergency Action Planning for Dam Safety, Association of State Dam Safety Officials, 2006

Computational Geotechnics, Plaxis B.V., 2007

Best Practices in Dam Safety Risk Analysis, U.S. Department of the Interior, Bureau of Reclamation, 2010

Professional Registrations:

P.G.: Arizona - No. 40473 (2004); P.E.: Colorado - No. PE-40659 (2007); Wisconsin - No. 39346-6 (2007); Illinois - No. 062060586 (2008)

Current Responsibilities:

Project Geotechnical Engineer/Senior Hydrogeologist/Project Manager responsible for performing hydrogeological and geotechnical engineering analyses and numerical modeling in support of a wide variety of projects. Responsibilities include project management, research, engineering analyses, and report preparation for transportation, dam, flood control, water resource, and environmental projects. Has broad technical experience in geotechnical engineering and contaminant hydrogeology, including geotechnical design for transportation and water resource projects, dam siting and rehabilitation studies, dam safety assessments, seepage, groundwater flow and contaminant transport modeling, dewatering evaluations, management and performance of multi-site Phase I environmental site assessments, and remedial investigation/feasibility studies.

Summary of Experience:

Saddleback Dam Mitigation, Maricopa County, AZ, *Flood Control District of Maricopa County.* Project Manager and Project Geotechnical Engineer for the rehabilitation of an embankment dam. The project includes the development of alternatives for the rehabilitation of an approximately 5.1-mile-long dam that has experienced the formation of numerous erosion holes and longitudinal cracking along the dam crest, beginning approximately two years after construction was completed. Responsibilities included reviewing the pertinent data for the dam and preparing a comprehensive geotechnical assessment report, overseeing the field investigation and laboratory testing, developing rehabilitation concepts for the dam, performing geotechnical engineering analyses to evaluate the rehabilitation concepts, participating in a failure modes and effects analysis and selection process for the recommended alternative, and preparing a geotechnical investigation report and a design concept report.

White Tanks Flood-Retarding Structure (FRS) No. 4 Rehabilitation, Phoenix, AZ, *Flood Control District of Maricopa County.* Geotechnical Task Manager responsible for developing alternatives and providing technical support for

a National Resources Conservation Service planning-phase study for the rehabilitation of White Tanks FRS No. 4. The project included developing alternatives for no action, dam decommissioning and removal, and dam rehabilitation to meet current criteria, as well as developing a national economic development alternative. As the prime consultant, our firm was responsible for providing dam design alternatives and project management, geotechnical engineering, and environmental analysis services.

Phase I Structure Assessments, Maricopa County, AZ, *Flood Control District of Maricopa County.* Geotechnical Task Manager for Phase I structure assessments of two flood-control dams and one levee, including the Harquahala FRS, the Saddleback FRS, and the Centennial Levee in northwest Maricopa County. Responsible for providing support for the individual structure assessments, including reviewing pertinent data on the dams, performing detailed site inspections, preparing detailed site inspection reports, and participating in failure modes and effects analyses. The individual structure assessment reports included recommendations for follow-up actions, such as field investigations and repairs, engineering studies and analyses, and improvements to operations and maintenance procedures.

Level II Dam Siting Study, Phase II, Wheatland, WY, *Wyoming Water Development Commission.* Geotechnical Task Manager responsible for developing preliminary designs for three earth embankment alternatives. Evaluated on-site materials for use in embankment construction, foundation treatment requirements, slope stability, and soil cement upstream slope plating to prepare the preliminary embankment designs. Also prepared preliminary cost estimates and a design report.

Engineering Studies for a Dam Safety Assessment, Fredonia, AZ, *Town of Fredonia.* Geotechnical Task Manager for engineering studies related to a Natural Resources Conservation Service assessment of a flood-control structure. Responsible for providing support for the individual structure assessment, including reviewing pertinent data on the dam, performing a detailed site inspection, preparing a detailed site inspection report, and participating in a failure modes and effects analysis. The individual structure assessment report included recommendations for follow-up actions, such as field investigations and repairs, engineering studies and analyses, and improvements to operations and maintenance procedures. Also participated in an alternatives analysis study by developing conceptual-level structural solutions to address dam safety issues, including the potential for increased levels of flood protection.

Engineering Study for a Dam Safety Assessment, Pinal County, AZ, *Magma Flood Control District.* Geotechnical Task Manager for engineering studies related to a Natural Resources Conservation Service assessment of a flood-control structure. Responsible for providing support for the individual structure assessment, including reviewing pertinent data on the dam, performing a detailed site inspection, preparing a detailed site inspection report, and participating in a failure modes and effects analysis. The individual structure assessment report included recommendations for follow-up actions, such as field investigations and repairs, engineering studies and analyses, and improvements to operations and maintenance procedures. Also responsible for participating in an alternatives analysis study by developing conceptual-level structural solutions to address dam safety issues, including the potential for increased levels of flood protection.

Level II Dam Siting Study, Wheatland, WY, *Wyoming Water Development Commission.* Geotechnical Task Manager responsible for developing conceptual alternatives for controlling the erosion of a reservoir embankment.

Project Assignment: *Hydraulics Engineer*

Years Experience with Current Firm: *5*

Years Experience with Other Firms: *22*

Education:

B.E., Civil Engineering, NED University of Engineering and Technology (Pakistan), 1980

M.S., Civil Engineering, University of Iowa, 1983

HEC-2 Hydraulics Course, U.S. Army Corps of Engineers, 1985

HEC-1 Hydrology Course, U.S. Army Corps of Engineers, 1986

TR-20 Workshop (Advanced Session), U.S. Department of Agriculture, Soil Conservation Service, 1988

Highways in the River Environment, Dr. E.V. Richardson and Dr. D.B. Simons, 1990

Sediment and Erosion Control, Federal Highway Administration, 1991

Urban Drainage Design, Federal Highway Administration, 1991

HEC-6 Scour and Deposition in Rivers and Reservoirs, WEST Consultants, Inc., 1999

Geomorphology for Floodplain Managers, Flood Control District of Maricopa County, 2000

HEC-RAS Advanced Short Course, Flood Control District of Maricopa County, 2002

Professional Registrations:

P.E.: Arizona - No. 26132 (1992); ASFPM Certified Floodplain Manager: Association of State Floodplain Managers, Inc. - No. US 09 04398 (2009)

Current Responsibilities:

Manager - Hydrology, Hydraulics, and Infrastructure Planning responsible for handling business development activities, providing project management services, and supplying the technical direction for the water resource and infrastructure master planning work associated with flood control/conveyance, transportation, land development, and related environmental and structural projects. Water resource projects involve hydrologic and hydraulic analyses; drainage master planning; flood control (detention basins) and conveyance (channels and storm drains); sediment transport; stormwater management; bridge hydraulics and scour; water distribution and treatment; fish hatcheries; and drainage systems for highways, airports, railroads, parks, golf courses, and land developments. Transportation projects involve state highways, municipal streets, airports, and railroads. Large-scale land planning projects involve land use plans; environmental studies; and water, wastewater, roadway, and drainage infrastructure models and master plans and reports. Land development projects cover residential and multipurpose developments, commercial properties, schools, and golf courses. Has used various methodologies and software, such as the Federal Highway Administration's HEC-18 procedures and the U.S. Army Corps of Engineers' (USACE's) HEC-RAS and HEC-6 programs for scour and sediment transport analyses and designs throughout Arizona. Experience includes the management of many interdisciplinary water resource projects from the initial planning stages and conceptual development through the completion of construction documents and construction administration. Possesses special expertise in the preparation of infrastructure assessment costs, impact fees and credits analyses, and net development costs using the Infrastructure Assessment Model, which he developed. Familiar with the following state-of-the-art methodologies and computer programs: Primavera, HEC-1, HMS, HEC-2, HEC-RAS, BOSS RMS, HEC-6, TR-20, AutoCAD/AutoCAD Map, MicroStation, InRoads, and Microsoft Project.

Summary of Experience:

Saddleback Upper Gila Valley Arroyos No. 1 Watershed, Sites 1, 3, 4, 7, 9, 10, and 12 Earthen Floodwater Retarding Structures, Various Locations, *National Resources Conservation Service, New Mexico State Office.* Hydrology and Hydraulics Task Manager responsible for preparing seven dam assessment reports, which included the results of site inspection, evaluation of dam safety deficiencies, hydrologic modeling using HMR 49

project maximum precipitation and spillway integrity analyses using the SITES program, hydraulic analyses of inflow and outflow works, Geo-RAS and HEC-RAS dam breach analysis and inundation delineations and estimates of the population at risk, and potential loss of life and estimated dollar impacts. The project included the evaluation of alternatives and recommendations for design, operation and maintenance, and an emergency action plan.

White Tanks Flood Retarding Structure (FRS) No. 4 and Jackrabbit Trail and Tuthill Channels, Maricopa County, AZ, *Flood Control District of Maricopa County.* Drainage Engineer responsible preparing alternative detention basin and channel designs while addressing landscaping requirements, stakeholders' input, and right-of-way constraints. Worked on HEC-1, HEC-RAS, and URBI economic modeling to analyze the benefit of FRS No. 4 to the downstream properties.

North Phoenix Area 4E Drainage and Infrastructure Planning Study, Phoenix, AZ, *Arizona State Land Department.* Project Manager responsible for the preparation of a regional drainage study for a large piece of state land next to the City of Phoenix's Sonoran Preserve area. The drainage study will use the Flood Control District of Maricopa County's hydrologic modeling procedures to prepare a regional hydrologic model and estimate flows for the significant washes that traverse the project area.

Hawi No. 3 Reservoir Modifications, Hawi, HI, *State of Hawaii, Department of Land and Natural Resources (DLNR).* Assistant Project Manager/Hydrology and Hydraulics Engineer for the rehabilitation of an earth-embankment dam located on the island of Hawaii and classified as a small dam. The project includes the development of alternatives including removal, rehabilitation, and operational reduction of the reservoir system. The operational reduction alternative was selected for final design and included a number of modifications to the facility to improve performance and reduce risk. Responsible for the technical direction of the site survey, hydrologic and hydraulic analyses, and development of plans and project specifications.

Lalakea, Opaeula, and Ponoholo Dams Review, Various Locations, HI, *State of Hawaii, DLNR.* Task Manager responsible for reviewing the project design report and construction plans for three dams. The effort included a comprehensive review of the hydrology, including the probable maximum flood and the 100-year and smaller frequency storm events; a review of reservoir storage capacity; and a review of the principal and emergency spillways' hydraulic and stability analyses.

Greenway Parkway Bridge Over Cave Creek Wash, Phoenix, AZ, *City of Phoenix Street Transportation Department.* Drainage Engineer for a project that includes preliminary engineering, final design, and possible construction administration services for the replacement of a bridge. The work will be done in accordance with City of Phoenix standards and Maricopa Association of Governments Standard Details and Specifications, and will require coordination with the Flood Control District of Maricopa County.

North Valley Parkway Over Sonoran Wash, Phoenix, AZ, *City of Phoenix.* Drainage Engineer responsible for preparing hydraulic designs for a proposed bridge over Sonoran Wash, which has a 100-year discharge of 9,700 cubic feet per second, after a detailed HEC-RAS backwater analysis. Study alternatives included 400-, 600-, and 1,000-foot-long bridges. A hydrologic and hydraulic analysis was prepared for the roadway drainage system comprising inlets, storm drains, and culverts. Investigation and selection of a recommended alternative included input from the City of Phoenix and the Flood Control District of Maricopa County.

Project Assignment: *Hydraulics*

Years Experience with Current Firm: *11*

Years Experience with Other Firms: *1*

Education:

B.S., Civil Engineering, The Pennsylvania State University, 1997

M.S., Civil Engineering, The Pennsylvania State University, 1999

16-Hour Confined Space Operations Training, 1999

Computer Programming in Visual Basic, Harrisburg Area Community College, 2001

WMS Applications at the Pennsylvania Department of Transportation, 2006

Gannett Fleming Senior Manager Training Program, November 2006

Professional Registrations:

P.E.: Pennsylvania - No. PE070894 (2004); Texas - No. 95983 (2005); ASFPM Certified Floodplain Manager: Association of State Floodplain Managers, Inc. (2009)

Current Responsibilities:

Senior Project Engineer in the Dams and Hydraulics Section responsible for hydrologic and hydraulic (H&H) analyses for water resources projects and design of hydraulic structures related to flood control reservoirs, dams, bridges, and channel improvement construction, rehabilitation, and reconstruction projects including the design of spillways, outlet works, and stilling basins. In addition to completing H&H analyses, also responsible for verifying the work of others and interpreting and communicating results to project team and to the client. Technical specialties include the use of computer models to assist in the design and assessment of hydraulic structures, in hydrologic analyses such as routing inflow hydrographs through complex reservoir systems, in the assessment of bridge scour, and in the determination of reservoir safe yield. Proficient in the use of the U.S. Army Corps of Engineers (USACE) HEC-1, HEC-2, HEC-RAS, and HEC-HMS software; the U.S. Department of Agriculture, Natural Resources Conservation Service (NRCS) Water Resource Site Analysis (SITES) computer model; PondPack; and the Watershed Modeling System (WMS) as well as the development of in-house computer programs for water resource engineering applications. Has provided litigation support as a Hydraulic Engineer in the area of riverine flooding and water supply system operation.

Summary of Experience:

Catskill Watershed Dams, Upstate NY, *New York City Department of Environmental Protection.* Project Engineer responsible for the completion and review of H&H analyses for repairs and upgrades to two dams and appurtenant structures located in the Catskill Mountain region approximately 75 to 125 miles north of Manhattan. Gilboa Dam, constructed from 1919 to 1927, forms Schoharie Reservoir with a storage capacity of 17.6 Bgal. The Ashokan Reservoir, with a storage capacity of 123 Bgal, is formed by Olive Bridge Dam, constructed from 1909 to 1915, and a system of seven combination earth and rockfill embankment dikes ranging from 7 to 120 feet in height and 400 to 6,920 feet in length. H&H analyses completed include evaluation of hydrologic parameters, hydrologic model calibration, evaluation of the probable maximum storm and flood, spillway discharge capacity investigations including a physical model study, analysis of Federal Emergency Management Agency consideration due to spillway modifications, reservoir routing investigations, and interconnected pond routing. Wave run-up investigations were also performed. Computer software used included HEC-RAS, HEC-GeoRAS, HEC-HMS, PondPack, and ARC-GIS.

Wyoming Valley Inflatable Dam Study, Wilkes-Barre, PA, *Luzerne County Flood Protection Authority.* Project Engineer responsible for completing hydraulic modeling of a range of flood events on the Susquehanna River at Wilkes-Barre, Pennsylvania, for conditions with and without the proposed inflatable dam. The proposed dam would be operated to create a

seasonal recreation pool and mitigate the effects of the raised levees currently denying access to the river.

Wyoming Valley Inflatable Dam, Wilkes-Barre, PA, *Wyoming Valley Flood Protection Authority.* Designer responsible for editing a feasibility study for an inflatable dam on the Susquehanna River at Wilkes-Barre. The proposed dam would be operated to create a seasonal recreation pool and mitigate the effects of the raised levees currently denying access to the river. The feasibility study report evaluated engineering, environmental, recreational, and economic issues to identify the optimum project, estimated to cost approximately $14 million.

Marysville Upland Reservoir Safe Yield Study, Marysville, OH, *City of Marysville.* Hydraulic Designer responsible for safe yield analyses for a new 1,400 Mgal upland reservoir for the City of Marysville. The analyses included reconstituting missing streamflow data and developing a computer model to determine the safe yield of the proposed system for different configurations and operating assumptions.

White Tanks Flood-Retarding Structure (FRS) No. 4, Maricopa County, AZ, *Flood Control District of Maricopa County.* Project Engineer responsible for an NRCS planning-phase study for the rehabilitation of White Tanks FRS No. 4. The project included the preparation of an NRCS work plan/environmental assessment, which involved developing alternatives for no action, the decommissioning/removal of the dam, and the rehabilitation of the dam to meet current criteria, as well as developing a national economic development alternative. Completed unsteady-flow analyses using the USACE HEC-RAS computer model for the reach downstream of the dam to estimate flood depths and velocities during extreme events for the alternatives under consideration.

Dam Safety Improvements for Springton Dam, Delaware County, PA, *Aqua Pennsylvania.* Project Engineer responsible for preparing and reviewing hydraulic analyses and conceptual designs of dam safety improvement alternatives for Springton Dam, an earthen embankment approximately 70 feet high and 1,600 feet long. Improvement alternatives included roller-compacted concrete (RCC) overtopping protection on the earthen embankment, the installation of Hydroplus fusegates on the spillway crest, and the construction of a labyrinth weir on the existing emergency spillway.

Ryerson Station State Park Dam, Greene County, PA, *Pennsylvania Department of Conservation and Natural Resources.* Project Engineer responsible for performing hydrologic and hydraulic analyses for the conceptual design of dam rehabilitation alternatives for the existing concrete gravity dam. Estimated the probable maximum flood and other events using a HEC-1 hydrologic model of the watershed and reservoir. Prepared spillway discharge rating curves for the existing spillway based on the U.S. Department of the Interior, Bureau of Reclamation's methodology presented in *Design of Small Dams.* Performed standard step backwater analyses of the reach downstream of the dam using the USACE HEC-RAS computer model to assess tailwater conditions during extreme flood events.

Lost River Site 16, Hardy County, WV, *U.S. Department of Agriculture, NRCS.* Project Engineer responsible for the completion of hydrologic and hydraulic planning-level studies and investigations to support an environmental impact statement and design of a new 90-foot-high, zoned earthfill dam. Hydrologic analyses were completed using the NRCS's SITES computer model, which was also used to evaluate the proposed spillway's susceptibility to erosion damage and breaching. Dam break analyses were performed using HEC-RAS and HEC-GeoRAS in conjunction with ARC-GIS. Dam break inundation mapping was prepared.

Project Assignment: *Geotechnical*

Years Experience with Current Firm: *23*

Years Experience with Other Firms: *1*

Education:

B.S., Civil Engineering, Clarkson University, 1985

M.S., Civil Engineering, Clarkson University, 1987

Nuclear Testing Equipment Training, 1990

Construction Dewatering Short Course, The University of Florida, 1993

Anchored Earth Retention Seminar, 1994

40-Hour Hazardous Materials Handling Training

Development of Ground Motion Parameters for Dam Safety Evaluation Seminar, ICODS Technical Seminar #4, FEMA, Emmitsburg, MD, February 1997

16-Hour Confined Space Operations Training, 1998

East Coast Seismicity, Ground Motions, and Liquefaction Evaluation Seminar, 2000

Seismic Design and Analysis of Embankment Dams Webinar, American Society of Civil Engineers, November 2006

Geotechnical Review of Embankment Projects Webinar, University of Missouri-Rolla, December 2007

Internal Erosion and Piping Considerations for Dam Safety, University of Missouri-Rolla, December 2008

Structural (Dam) Behavior Monitoring, October 2009

USBR Dam Safety Risk Analysis Workshop, February 2010

Professional Registrations:

P.E.: Pennsylvania - No. PE040726E (1990); Texas - No. 96410 (2005); West Virginia - No. 016608 (2005)

Current Responsibilities:

Geotechnical Project Manager on all types of civil projects responsible for directing site reconnaissance, subsurface investigations, preparation of geotechnical and foundation engineering reports, geotechnical design, geotechnical analyses, and geotechnical instrumentation design and monitoring. Prepares construction contract provisions and provides construction inspection for geotechnical projects.

Manager of Gannett Fleming's Geotechnical Testing Laboratory responsible for monitoring laboratory operations, determining laboratory requirements, and supervising laboratory testing activities. Also provides consultation for interpreting laboratory results.

Summary of Experience:

Catskill Watershed Dams, Upstate NY, *New York City Department of Environmental Protection.* Senior Geotechnical Engineer responsible for condition assessments, preliminary and final design, and construction plans and specifications for repairs and upgrades to two dams and appurtenant structures located in the Catskill Mountain region approximately 75 to125 miles north of Manhattan. Gilboa Dam, constructed from 1919 to 1927, forms Schoharie Reservoir with a storage capacity of 17.6 Bgal. Repairs to the 180-foot-high Gilboa Dam include modification and replacement of a stone masonry façade on a 1,324-foot-long stair-stepped spillway. Repairs to the 210-foot-high Olive Bridge Dam include drain system refurbishment and minor concrete repairs as well as drain system refurbishments for the seven embankment dikes ranging 7 to 120 feet in height and 400 to 6,920 feet in length. Gannett Fleming is mainly responsible for dam-related repairs.

Lyman Run Dam Replacement Construction, Coudersport, PA, *Pennsylvania Department of General Services (PA DGS).* Senior Geotechnical Project Manager responsible for preparation of a reservoir refilling and monitoring plan for the $15 million dam replacement project at the site of an existing 40-foot-high earth dam located at Lyman Run State Park. Also responsible for evaluating the monitoring data during refilling of the reservoir. The existing dam was breached in response to dam safety problems related to seepage, spillway capacity, and spillway structure performance.

Lyman Run Dam Replacement Project, Galeton, PA, PA DGS. Senior Geotechnical

Engineer responsible for peer review of the rehabilitation design of a 1,200-foot-long, 45-foot-high replacement earth embankment dam with a labyrinth spillway. Design included subsurface investigation, geotechnical laboratory testing program, soil and rock design parameters selection, foundation grade selection, slope stability analysis including seismic stability assessment, seepage and grout curtain design analysis, and internal stability and filter design assessment.

Ragged Mountain Dam, Charlottesville, VA, *Rivanna Water and Sewer Authority.* Assistant Project Manager/Senior Geotechnical Project Manager responsible for preliminary and final design services for a new 120-foot-high, 900-foot-long, roller-compacted concrete (RCC) gravity dam to replace an existing 47-foot-high embankment dam (circa 1885) and 67-foot-high gravity dam (circa 1908) to increase system storage capacity by 2,000 Mgal.

Final Design and Construction-Phase Services for Lost River Site 16, Hardy County WV, *U.S. Department of Agriculture, Natural Resources Conservation Service.* Senior Geotechnical Project Manager responsible for the management of investigations and design of this new 80-foot-high zoned earthfill dam. Services included subsurface exploration and testing of soil and rock materials; final design; preparation of plans, specifications, and construction cost estimate (PS&E); and preparation of construction schedule.

Hunting Run Dam, Spotsylvania County, VA, *County of Spotsylvania Department of Utilities.* Geotechnical Project Manager responsible for geotechnical investigations and analyses for final design of this 2,200-foot-long, 90-foot-high water supply dam. Work included planning and inspection of the boring and test pit programs, pressure testing of foundation rock, geologic mapping and joint surveys, laboratory testing of soil and rock samples, site characterization and foundation selection for the alternatives, construction material studies, stability analyses, earth dam embankment design, and dam safety instrumentation design.

Design of Elkwater Fork Dam, Randolph County, WV, *U.S. Department of Agriculture, Natural Resources Conservation Service.* Senior Geotechnical Project Manager responsible for overall coordination and management of investigations and design of a 130-foot-high, 700-foot-long RCC gravity dam. Services included ground surveys and aerial mapping of the dam and reservoir area, subsurface exploration and testing of soil and rock materials, foundation design, seismic hazard assessment, hydrologic and hydraulic analyses, preliminary design and layout, final design, preparation of PS&E, and preparation of construction schedule.

Watres Dam, Lackawanna County, PA, *Pennsylvania American Water.* Senior Geotechnical Project Manager for the investigation and analyses, final design, and construction-phase services for the rehabilitation of the 135-foot-high, 1,400-foot-long earth embankment dam. Performed review of historical data, visual inspection, and analysis and interpretation of performance data. Prepared report with evaluation of performance and recommendations for additional investigations and analyses. Performed first phase of the subsurface investigation, which included borings, field permeability tests, piezometer installations, and laboratory testing.

Bear Creek Dam Design-Build Project, Bear Creek, PA, *Bear Creek Association.* Geotechnical Project Manager responsible for subsurface investigation, testing, geotechnical analyses, and design for seepage, stability, dewatering, and foundation treatment and construction services related to geotechnical issues for an RCC replacement dam at the site of a severely damaged timber crib dam.

Project Assignment: *RCC Foundation*

Years Experience with Current Firm: *24*

Years Experience with Other Firms: *1*

Education:

B.S., Civil Engineering, The Pennsylvania State University, 1986

Troubleshooting Concrete Problems, American Concrete Institute, Baltimore, MD, 1988

Development of Ground Motion Parameters for Dam Safety Evaluation, ICODS Technical Seminar #4, FEMA, Emmitsburg, MD, February 1997

International Roller-Compacted Concrete (RCC) Dams Seminar, Schnabel Engineering, Denver, CO, September 1998

RCC Dam Seminar, Portland Cement Association, Johnstown, PA, 1991; Palmdale, CA, 1993; Bethlehem, PA, 1998; Las Vegas, NV, 2000; and Fredericksburg, VA, 2001

Practical Concrete Materials Seminar, American Concrete Institute, San Diego, CA, 2000

4th International Symposium on Roller-Compacted Concrete (RCC) Dams, Madrid, Spain, 2003

Dam Surveillance and Monitoring Workshop, United States Society on Dams, Sacramento, CA, October 2006

Seismic Design and Analysis of Embankment Dams Webinar, American Society of Civil Engineers, November 2006

Rock Scour Workshop, United States Society on Dams, Philadelphia, PA, March 2007

Professional Registrations:

P.E.: Pennsylvania - No. PE041846E (1991); California - No. 59534 (1999); Virginia - No. 035051 (2000); New York - No. 082165 (2004)

Current Responsibilities:

Engineering Manager in the Dams and Hydraulics Section responsible for development of technical aspects of the project as well as associated project management duties. Experienced in the planning, design, and construction of more than 70 existing dam rehabilitation and new dam design projects. Technical specialties include roller-compacted concrete (RCC) materials and concrete gravity dam design, inflatable rubber dams and crest gates, hydrologic analysis, hydraulic design, construction management, dam safety and construction inspections, regulatory permitting, and construction contract document preparation.

Summary of Experience:

Gilboa Dam Reconstruction, Gilboa, Schoharie County, NY, *New York City Department of Environmental Protection (NYCDEP).* Senior Project Manager responsible for management and technical oversight for design, bidding, and construction support services for the reconstruction of the 180-foot-high, 2,000-foot-long composite cyclopean concrete gravity and earthfill embankment structure originally built in 1927. The project involves the reconstruction of the 1,324-foot-long, stair-stepped cyclopean-concrete gravity spillway and side channel and associated training walls as well as construction of a new low-level outlets works.

Gilboa Dam Interim Stability Improvements, Gilboa, NY, *NYCDEP.* Senior Project Manager responsible for management and technical oversight for design, bidding, and construction support services for three of five contracts for emergency repairs to the 180-foot-high, 2,000-foot-long composite cyclopean concrete gravity and earthfill embankment dam originally built in 1927. The three contracts involved installation of a 2,100-foot-long log boom in the reservoir, four temporary 48-inch-diameter steel siphon pipes over the spillway, and 79 high-capacity post-tensioned rock anchors within the 1,324-foot-long concrete gravity spillway section. Design for all five contracts was completed in a record 3 months, anchor installation was completed within 9 months, and the overall project was completed in less than 12 months.

Kimball Creek Dam, Calistoga, CA, *City of Calistoga.* Senior Project Manager responsible for preliminary design of modifications to the existing concrete spillway of the 75-foot-high, 300-foot-long earthfill embankment dam

originally constructed in 1939. Proposed spillway modifications consisted of replacement of a 4-foot-high, 58-foot-long wooden flashboard system that was seasonally installed on the spillway crest to increase reservoir storage capacity with a new permanent 4-foot-high inflatable rubber crest gate system. Design services included evaluation of the use of either a Bridgestone or Obermeyer inflatable gate system, preparation of preliminary construction contract drawings and specifications for the selected Bridgestone system, and permitting coordination with the California Division of the Safety of Dams. Design services also included design of a gate-control equipment building and remote power supply.

Forest Park Raw Water Intake and Diversion Dam, Chalfont, PA, *North Penn/North Wales Water Authorities.* Project Manager responsible for managing preliminary/final design and preparing construction contract documents for a moveable crest gate structure. The Forest Park Diversion Dam is a 4.5-foot-high, 84-foot-long inflatable rubber dam across the North Branch of Neshaminy Creek located in a northern suburb of Philadelphia. The rubber dam diverts up to 40 Mgal of raw water daily to a bankside concrete intake serving the Forest Park Water Treatment Plant.

Mill Creek Diversion Dam, Marysville, OH, *City of Marysville*. Senior Project Manager responsible for preliminary and final design and construction plans and specifications for a new 4.5-foot-high, 100-foot-long inflatable rubber dam. The rubber dam will divert up to 40 Mgal of raw water daily to a passive intake screen system and pumping station serving the Marysville Water Treatment Plant.

Penn Forest Dam Replacement Project, Bethlehem, PA, *City of Bethlehem.* Civil Project Manager responsible for preparing contract documents for five of seven construction contracts for a new 180-foot-high, 2,500-foot-long RCC gravity dam. Responsibilities included RCC mix design and testing program; diversion works design and layout; inspection/drainage gallery design; repair/modifications of an existing 1,200-foot-long concrete chute spillway and 115-foot-high intake tower and outlet works; coordination of electrical, mechanical, structural, and general civil designs; bid-phase services; shop drawing review; RCC construction inspection; and video documentation of construction.

Penn Forest Dam Alternatives Study, Bethlehem, PA, *City of Bethlehem.* Project Manager responsible for investigating the feasibility of constructing a new 180-foot-high RCC replacement dam approximately 460 feet upstream of the existing 145-foot-high, 1,930-foot-long earthfill embankment dam. The RCC replacement dam was one of five alternatives evaluated to correct excessive foundation and embankment seepage problems at the existing dam. Investigations for the RCC dam included preliminary stability and diversion works analyses and conceptual cost estimating.

Olivenhain Dam Design Phase Services, San Diego, CA, *San Diego County Water Authority.* RCC Design Task Leader and Senior Project Manager responsible for preliminary/final design and supporting construction management services to the prime consultant for a new 310-foot-high, 2,586-foot-long RCC gravity dam. Direct responsibilities included fast-track scheduling and constructibility evaluation; RCC and conventional concrete materials investigations and quality, strength, and thermal property testing; on-site aggregate production and RCC placement trials; design of RCC dam details, downstream facing system, and foundation gallery. Supervised all RCC and dam instrumentation design and contract document preparation tasks and assisted in permitting with the California Division of Safety of Dams.

Project Assignment: *Structural Engineer*

Years Experience with Current Firm: *18*

Years Experience with Other Firms: *20*

Education:

B.E., Civil Engineering, University of Bombay, 1965

M.Tech., Structural Engineering, Indian Institute of Technology, 1967

Ph.D., Structural Engineering, University of Kentucky, 1972

Professional Registrations:

P.E.: Arizona (Civil) - No. 14621 (1982); Arizona (Structural) - No. 21887 (1988); California (Civil) - No. 46942 (1991); California (Structural) - No. 3579 (1991); Nevada - No. 009361 (1991); Texas (inactive) - No. 79640 (1994); Hawaii - No. PE-11203 (2004)

Current Responsibilities:

Principal in the Nabar Stanley Brown, Inc. (NSB) Group of Gannett Fleming with experience in various aspects of the engineering profession, including three years as a professor of structural engineering. Has an extensive background in the design of water and wastewater treatment facilities. Has acted as Project Engineer and provided structural design and construction administration services on more than $250 million worth of construction projects in the last 8 years. As a Project Engineer, is experienced in the various aspects of project management from conceptual planning to trouble shooting in the field. In dealings with members of the project team, has a long record of establishing excellent personal rapport, which extends well beyond the completion of the projects.

Summary of Experience:

Experience Prior to Gannett Fleming:

NSB, Inc. (prior to its acquisition by Gannett Fleming), Phoenix, AZ

Structural Engineer/Senior Principal responsible for providing structural design and construction administration services on more than $250 million worth of construction projects. Was selected to provide structural design on a capacity expansion to 91st Avenue Wastewater Treatment Plant in Phoenix, Arizona. The expansion had a construction budget of more than $100 million and was Sateesh's third major expansion project at the facility. Provided structural design on several new solids handling facilities, as well as modifications to an existing building. The buildings range in size from one story to four stories and one design project would house what are believed to be the largest centrifuge machines in the world.

Unified Plant 2005 (UP05) Expansion, 91st Avenue Wastewater Treatment Plant, Phoenix, AZ, *City of Phoenix.* Project Manager for the NSB design team, which provided structural design and construction administration for the facility. The 30 mgd expansion had a construction budget of $115 million. The design tasks included new primary clarifiers, new aeration basins, a return activated sludge/waste activated sludge pump station, new secondary sedimentation basins, and effluent conveyance structures. The project is currently under construction.

Unified Plant 2001 (UP01) Expansion, 91st Avenue Wastewater Treatment Plant, Phoenix, AZ, *City of Phoenix.* Project Manager for the NSB design team, which provided structural design and construction administration for the facility. The design tasks included modifications to the headworks, bar screens, new primary clarifiers, new aeration basins, a return activated sludge/waste activated sludge pump station, new secondary sedimentation basins, and effluent conveyance structures.

North Gateway Water Reclamation Plant, Phase 1, Phoenix, AZ, *City of Phoenix.* Project Manager of the NSB structural design team, which provided the design for the new facility. The water reclamation plant is located in North Phoenix, adjacent to the I-17 freeway. The project design tasks included an influent pump station, screening and grit facility, primary sedimentation basins, aeration basins, blower

building, secondary sedimentation basins, return activated sludge/waste activated sludge pump station, filtration facility, backwash equalization pump station, ultraviolet disinfection facility, chemical building, effluent pump station , odor control facility, and electrical building. The total construction value of the new plant was estimated at $30 million.

New Solids Thickening Facilities, 91st Avenue Wastewater Treatment Plant, Phoenix, AZ, *City of Phoenix.* Project Engineer for the NSB team, which provided structural design and construction administration for a $ 19 million upgrade. The project included a new solids thickening building, auxiliary electrical switchgear building, and odor control facility. The solids thickening building is one story in height and contains a full basement level. The main one-story building portion is approximately 45 feet clear height. There are a total of two centrifuges located on the structural ground-floor level with expansion capabilities of a total of six machines. The structure is a concrete moment frame system with a concrete masonry unit exterior wall system. A 100-foot-span, 20-ton capacity bridge crane system is located in the building for ease of maintenance of the centrifuge equipment. The centrifuges operating in the building are believed to be among the largest in the world.

Pecos and McQueen Pump Station, Chandler, AZ, *City of Chandler.* Project Engineer involved in the structural design and construction administration for a $1.2 million facility. The top slab of the pump station is located 2 feet below grade, with a depth of 35 feet for the wet well and dry well structures. The station would have an ultimate peak pumping capacity of 7.5 mgd.

3B Capacity Expansion, 91st Avenue Wastewater Treatment Plant, Phoenix, AZ, *City of Phoenix.* Project Manager for the NSB design team, which provided structural design and construction administration for the facility. The 15 mgd expansion had a construction budget of $64 million. The design tasks included modifications to the headworks; new bar screens; new grit influent and effluent channels; the addition of four new grit basins, including two new grit pump stations; the addition of two Parshall flumes; two new primary sedimentation basins; two new aeration basins; the addition of a methanol feed system; two new secondary sedimentation basins and a return activated sludge/waste activated sludge pump station; a new chlorine contact basin; a new digester; and modifications to the existing dewatering building. NSB's design set included a total of 160 structural drawings.

Nitrification/Denitrification Expansion, 91st Avenue Wastewater Treatment Plant, Phoenix, AZ, *City of Phoenix.* Project Manager for the NSB design team, which provided structural design and construction administration services for a $51 million project. The scope included structural modification to the existing aeration basins and the design of new elements, including secondary clarifiers, control buildings, a chemical building, flow splitter structures, internal mixed liquor recycle pump stations, a return activated sludge/waste activated sludge pump station, and other miscellaneous structures. NSB's design set included a total of 110 structural drawings. The project was awarded the Marvin M. Black Award for partnering between the construction and design teams.

Project Assignment: *Instrumentation and Controls*

Years Experience with Current Firm: *12*

Years Experience with Other Firms: *9*

Education:

B.S., Electrical Engineering, Lehigh University, 1998

M.S., Information Systems Management, Shippensburg University, 2008

Mines and Obstacles Familiarization Course, U.S. Army, 1988

Special Electronic Systems Repairer Course, U.S. Army, 1991

Primary Leadership Development Course, U.S. Army, 1994

Basic Installer Course, U.S. Army, 1995

Field Sanitation Course, U.S. Army, 1996

Basic Noncommissioned Officer Course, U.S. Army, 1996

Nuclear, Biological, and Chemical Defense Officer Course, U.S. Army, 1997

Professional Registrations:

P.E.: Pennsylvania - No. PE078661 (2011); e-RAILSAFE Badge: e-VERIFILE.COM, Inc. - No. 987820401477 (2010)

Current Responsibilities:

Instrumentation and Control Systems Group Manager responsible for providing design, scheduling, and quality assurance services for various telecommunications, control, and instrumentation system projects. Interfaces directly with municipal, commercial, and industrial clients. Responsibilities include planning and executing various types of design-build projects, as well as developing standards and procedures for projects. Experience includes the design, construction, and maintenance of many industry-standard supervisory control and data acquisition (SCADA), communications, access-control, intrusion-detection, and closed-circuit television (CCTV) systems.

Summary of Experience:

Fish Passage Facility at the Sunbury Fabridam, Sunbury, PA, *Pennsylvania Department of General Services.* Senior Designer responsible for evaluating the best method to use for video and security communications between the Camp Shikellamy Ranger Station and a proposed new fish passage project approximately 2 miles away. Conducted field testing to evaluate the use of 5.8 GHz microwave communications for a wireless Ethernet link. Designed the system to avoid existing obstructions, interference, and link degradation caused by overwater conditions and multipath radio reflections off nearby buildings.

Catskill Watershed Dams, Upstate NY, *New York City Department of Environmental Protection (NYCDEP).* Senior Project Manager responsible for the design and construction-phase services of an automated data acquisition system (ADAS) to monitor monolith position at Gilboa Dam. Constructed between 1919 and 1927, Gilboa Dam forms Schoharie Reservoir, which has a storage capacity of 17.6 Bgal and includes a 182-foot-high, 1,324-foot-long, stair-stepped spillway and a 140-foot-high, 700-foot-long earthen embankment. Specific responsibilities include the design of ADAS control enclosures, communications system architecture, instrument installation details, interface with an existing NYCDEP Modicon programmable logic controller system, and associated electrical installation. Managed a construction engineering team that oversaw testing, installation, and startup of the system.

Upground Reservoir Improvements, Marysville, OH, *City of Marysville.* Design Manager for a SCADA system to allow the City to monitor a new remote upground reservoir and remotely operate a stream intake and a new, unmanned raw water pumping station from an existing water treatment plant control room. The pump station control system operated an inflatable dam, intake airburst and

deicing systems, variable-frequency pumps, and other station systems. A hybrid solar and wind power supply was used to power the reservoir level control panel due to its remote location. An unlicensed wireless radio system provided communications for the SCADA system. The radio system design required the detailed design of tall antenna monopole installations at both new and existing sites.

Penn Forest Dam Replacement, Bethlehem, PA, *City of Bethlehem.* Senior Designer responsible for reviewing and commenting on installation and contractual documents related to an automated data acquisition system for remote instrument monitoring and reporting at the dam. Designed measures to maximize system reliability and availability, as well as to minimize future maintenance costs. Also designed lightning and surge protection upgrades geared to enhance personnel safety and mitigate the potential for lightning damage to the facility and equipment. Provided troubleshooting and contractor assistance with third-party system interfaces to generator, ventilation, and other facility systems.

Moss Bluff Lock and Dam Replacement, Marion County, FL, *St. Johns River Water Management District.* Design Manager responsible for developing an approach for replacing an outdated control system for a lock on the Ocklawaha River and related site components.

Waterbury Dam Instrumentation Upgrade Design-Build, Waterbury, VT, *Vermont Department of Environmental Conservation.* Senior Designer responsible for the design and construction of an automated data acquisition system (ADAS) upgrade used to measure monitoring well levels at more than 50 points on a large earth embankment dam. The ADAS also automatically monitored seepage flow at a new weir, new weather instruments, and the operational status of an onsite hydroelectric facility. The project featured a large-structure transient and safety grounding system.

Swinging Bridge Dam Automated Instrumentation System, Forestburgh, NY, *Mirant Corporation.* Design Manager responsible for providing a geotechnical instrumentation system for a large, earth embankment hydroelectric dam. The project featured the design of an instrumentation system to collect water-level data from drilled holes in an access tunnel below the penstock of the dam. The system communicates sensor information over fiber-optic cables to a remote monitoring shelter where the information is stored on a microcomputer server, reduced, and displayed graphically for operator use. The design required that the equipment could be fabricated from commercial, off-the-shelf and locally procured items because of an emergency schedule. The system had to be simple to install in a wet, humid tunnel with concurrent heavy construction activities. Despite the difficult conditions, the system was designed, fabricated, tested, installed, programmed, and placed in operation in less than two months after the start of design.

Hunting Run Dam, Spotsylvania County, VA, *Spotsylvania County Utilities.* Senior Designer responsible for analyzing and making design upgrades to a radio communications system that interconnects the Hunting Run and Motts Run Dams with the Motts Run and Ni River Water Treatment Plants. Troubleshot and developed corrective design requirements to mitigate equipment damage due to unexpectedly high lightning damage. Developed design upgrades to intake communication and controls wiring for the Motts Run Dam chimney intake structure that was damaged by high-intake water flows; eventually designed armored installation for fiber optic, communications, and power wiring using custom submarine cable retrofit.

Project Assignment: *Civil Design & Permitting*

Years Experience with Current Firm: *12*

Years Experience with Other Firms: *2*

Education:

B.S., Civil Engineering, Northern Arizona University, 1999

Alternative Project Delivery Methods: Construction Management at Risk (CM-at-Risk) Training, Arizona State University, 2007

Leadership in Engineering Administration Program, American Council of Engineering Companies of Arizona, 2009

Professional Registrations:

P.E.: California - No. 65036 (2003); Arizona - No. 41221 (2004); Utah - No. 7362482-2202 (2009); Washington - No. 47257 (2010); Hawaii - No. 14057 (2010); e-RAILSAFE Badge: e-VERIFILE.COM, Inc. - No. 129011901477 (2007); ASFPM Certified Floodplain Manager: Association of State Floodplain Managers, Inc. - No. US 08 03376 (2008); USGBC - LEED 2.2 Accredited Professional (2009)

Current Responsibilities:

Project Engineer/Project Manager responsible for performing engineering calculations, preparing project specifications and cost estimates, developing plans, and providing project coordination and construction-phase services. Design experience involves water and sewer mains; wastewater treatment facilities; storm drainage and stormwater management calculations, including hydraulic modeling; paving; grading; erosion and sediment control; and data assembly for permit applications. Computer background includes the use of AutoCAD, InRoads SelectCAD, WaterCAD, SewerCAD, StormCAD, HEC-RAS, HEC-1, and HEC-HMS software. Responsibilities also involve client contact services, budget processing, and scheduling.

Summary of Experience:

Saddleback Dam Mitigation, Maricopa County, AZ, *Flood Control District of Maricopa County.* Project Engineer for the rehabilitation of a compacted earthfill dam. The project includes the development of alternatives for the rehabilitation of an approximately 5.1-mile-long dam that has experienced the formation of numerous erosion holes and longitudinal cracking along the dam crest, beginning approximately two years after construction was completed. Responsibilities include the detailed design of rehabilitation improvements, preparation of plans and project specifications, and project coordination. Future services will also include preparing final bid documents and providing bid and construction-phase services.

Hawi No. 3 Reservoir Maintenance and Remediation Improvements, Hawi, HI, *State of Hawaii, Department of Land and Natural Resources.* Project Engineer for the rehabilitation of an earth-embankment reservoir located on the island of Hawaii and classified as a small dam. The improvements include spillway reconstruction, embankment regrading, outlet works intake structure improvements, and inflow works and access road improvements. Responsibilities include detailed design of the remediation improvements, preparation of plans and project specifications, and project coordination. The reservoir improvements also include the preparation of a stormwater pollution prevention plan (SWPPP). The SWPPP identifies site-specific erosion and sediment control measures, stormwater management practices, housekeeping techniques, and maintenance and inspection procedures to satisfy the client's National Pollutant Discharge Elimination System (NPDES) permit requirements. Services also include providing bidding and construction-phase services.

CAREER HIGHLIGHTS

Debora J. Miller, Ph.D., P.E., is a geotechnical engineer with nearly 30 years of experience, specializing in embankment dam engineering. Dr. Miller has been the lead designer on new dams and dam rehabilitation projects in the desert southwest and Rocky Mountain regions of the U.S. and in Australia. She is highly experienced and well qualified to facilitate failure modes and effects analysis (FMEA) as part of dam safety risk analysis, and has served as the FMEA facilitator or core team member for risk analysis of several flood control and water retention dams in Arizona, including the Harquahala and Saddleback FRS; Wickenburg FRS; Fredonia FRS; Powerline, Vineyard, and Rittenhouse FRS; Safford area FRS (3 dams); and the Tempe Town Lake preliminary design phase.

EDUCATION

Ph.D. (1996) Civil/Geotechnical Engineering, Colorado State University, Ft. Collins, CO
M.S. (1985) Civil/Geotechnical Engineering, Colorado State University, Ft. Collins, CO
B.S. (1979) Civil Engineering, University of New Mexico, Albuquerque, NM

REGISTRATION/CERTIFICATION

Professional Engineer: Colorado, Montana, Wyoming, Arizona, New Mexico

SELECT RELEVANT DAM ENGINEERING PROJECT EXPERIENCE

Engineering Studies for Dam Safety Risk Assessments in Arizona for Various Clients. Dr. Miller served as Facilitator for Failure Modes and Effects Analysis (FMEA) workshops for the following projects:

- ***Powerline, Vineyard Road, Rittenhouse FRS,*** *Maricopa County Flood Control District.* Level III FMEA to support alternatives evaluation for dam safety remediation.
- ***Fredonia, AZ,*** *Town of Fredonia/Kimley Horn & Associates.* Natural Resources Conservation Service (NRCS) assessment of a flood control structure.
- ***Structures Assessments, Safford Arizona Area Flood Retarding Structures, Graham County, Arizona,*** *City of Safford/Town of Thatcher/Graham County.* Three flood retarding structures in the Safford area.
- ***Phase I Structures Assessment. Harquahala and Saddleback Flood Retarding Structures, Maricopa County Flood Control District.*** Two flood retarding structures (embankment dams) in western Maricopa County, Arizona.
- ***Wickenburg Flood Retarding Structures. Maricopa County Flood Control District.*** Facilitated the FMEA and participated in an alternatives analysis study to develop conceptual-level structural solutions to address dam safety issues.

Wissota Hydro Project, Eau Claire, Wisconsin, *Xcel Energy.* Member of three-person core team for the pilot project implementing the Federal Energy Regulatory Commission's (FERC) failure modes analysis (FMA) as part of FERC Part 12 relicensing.

Preliminary Hydrologic and Flood Detention Studies, *Rio Tinto Iron Ore, Perth, Western Australia*
Managed a study to evaluate the feasibility of constructing a 56,000 acre-feet flood detention reservoir at a planned open pit mine in the cyclone-prone northwestern Australia. Risk-Based Cost Benefit Analysis resulted in a recommended size and configurations of the flood control system comprising a large dam, and major downstream floodway channels and levees.

Dan Hertel, P.E.
Engineering Solutions, LLC
Cost and Constructability Consultant

Overview

Mr. Hertel has a 30 year background in the construction of dams, pipelines, and other water resource projects. He is an expert in the area of dam construction, heavy-civil construction, and cost estimating. Primary areas of specialization include construction cost estimating, constructability review, construction management, and value engineering. Experience includes oversight of estimating operations including project selection, risk assessment, personnel assignments, constructability analysis, cost estimating, and bid review.

Operations Manager position included overall project responsibility for project management from bid through project completion.

His background includes detailed cost estimates on RCC and zoned embankment dams, spillways, pipelines, and water resources projects exceeding $200 million, and he is able to apply the necessary detail to make sound economic decisions during project design phases.

Areas of Expertise

Construction Cost Estimating, Constructability Review, Board of Consultants, Value Engineering. RCC Dams, Earth Fill Dams, Pipelines, Water Resources Projects

Years of Experience - 30

Education

BS Construction Engineering 1982 Montana State University

Registered Civil Engineer

Past Experience

Operations Manager and Chief Estimator, Barnard Construction Company, Inc. (1990-2010)

As an Operations Manager, Chief Estimator, and Vice President of one of America's premier dam constructors, Mr. Hertel has unique experience and perspective. During Mr. Hertel's 20 years at Barnard Construction, the company constructed numerous projects, including dams and pipelines throughout the United States.

Cost Estimating and Constructability Consultant, Engineering Solutions, LLC (2010-Present)

Example Projects:

- Quality and Consistency Control (QCC) Review Panel, Addicks and Barker Dams, Texas
- USACE DSMS Constructability Review Panel, Isabella Dam, California
- Construction Cost Estimate for Riverside Dam Emergency Spillway, Weld County, Colorado
- Construction Cost Estimate for RCC Dam Feasibility, Sourdough Dam, Bozeman, Montana
- Construction Cost Estimate for Four Alternative Designs, Idylwilde Dam, Loveland, Colorado
- Construction Cost Estimate for Three Alternative Designs, Lower Pine Lake Dam Rehab, Cheney, WA
- Construction Cost Estimate for Three Alternative Designs, Tomahawk Dam Rehabilitation, North Dakota

Professional Societies/Affiliates

U.S. Society on Dams (USSD), ICOLD, ASDSO, ASCE
Former President and Current Board Member USSD

Publications

Presenter and panel member 2011 and 2007 International RCC conference, Atlanta, GA.
Technical papers authored and co-authored include: *Guidelines for Responsible Construction Cost Estimating for Engineers and Owners,* U.S. Society on Dams, 2011;*Accurate and Reliable Construction Cost Estimates,* U.S. Society on Dams, 2009; *Alternative Project Delivery Methods for Dam Construction and Rehabilitation,* U.S. Society on Dams, 2008; *Estimating Costs and Escalation in Today's Market,* U.S. Society on Dams, 2007.

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