

Statement of Qualifications
Drainage Engineering
for
Transportation Projects

2016





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STATEMENT OF QUALIFICATIONS

INTRODUCTION

H & H Resources, Inc. (HHR) was founded and incorporated in 2001 as a civil engineering consulting firm to assist clients in finding practical, feasible, and economical civil engineering design and permitting solutions. Our goal is to deliver products and services that are on time, accurate, and within budget. **HHR** specializes in drainage engineering for transportation projects, and also provides other related civil engineering services. **HHR** is registered as a consulting engineering firm to practice in the states of Texas, Georgia, North Carolina, and Alabama.

The majority of our engineers are Certified Floodplain Managers. Many have experience in teaching training courses on drainage design, have had technical papers published and provide expert witnessing for universities and state and local agencies. HHR is not only capable of providing practical and economical hydraulic design results but has a reputation in the industry for “thinking out of the box” and developing cost-effective solutions to complex issues. HHR has established a client trust that is proven over time and a confidence that precise results will be achieved from a select group of highly respected engineers and technical staff.

Our principals, Eric Friedrich, P.E., CFM and Wayne Fowler, P.E., CFM, each have over 30 years of experience. The staff includes registered professional engineers, GIS specialists and technical and administrative support, bringing to the firm a vast amount of engineering design experience and understanding for accomplishing all types of project responsibilities.

To illustrate our company’s comprehensive background, our engineers have worked as staff or consultants for the following public entities:

- U.S.D.A Natural Resources Conservation Service
- Texas Department of Transportation
- Georgia Department of Transportation
- Fort Bend County Toll Road Authority, Texas
- Cities of Houston, Fort Worth, Bryan, Georgetown, Texas
- Cities of Atlanta, Albany, Jefferson, Kennesaw, Dallas, and Hiawassee, Georgia
- Georgia Counties: Union, Henry, Lee, Fulton, Tift, Douglas, Hall
- Harris County, TX Flood Control District
- Texas A&M University’s Texas Engineering Extension Service
- UT Austin Center for Lifelong Engineering Education
- University of Texas at Arlington

In an effort to serve our clients better, our engineers continue to update their skills by receiving continuing education in various software programs and engineering topics related to drainage and transportation. As leaders in our profession, HHR provides instructors and training courses in the fields of hydrology, hydraulics, and erosion control. Our principals and employees have been involved in the development of drainage standards, policies, and procedures for local and state governments.

TRANSPORTATION DRAINAGE SERVICES

HHR has expertise to offer the following services on transportation projects:

- **Hydraulic Engineering**
 - Watershed hydrology
 - Bridge and culvert hydraulics
 - Channel improvements
 - Storm Sewer and Culvert Design
 - Pump Station Design
 - Construction plan (PS&E) services
 - Stormwater management (detention, retention, water quality)
 - Detention Pond Analysis and Design
 - Bridge Scour analysis
 - Erosion and Sediment Control
 - Hydrologic and Hydraulic Impact and Mitigation Analysis
 - Master planning
 - Third-party construction plan (PS&E) review
 - Construction Phase Services
- **NFIP-related Submittals**
 - MT-1: CLOMA, LOMA, e-LOMA, CLOMR-F, LOMR-F
 - MT-2: CLOMR/LOMR
 - Floodway No Impact analysis and certification
 - Base Flood Elevation (BFE) determinations & permitting coordination
- **Project Management**
 - Coordination with federal, state and local agencies
 - Coordination with other consultants and disciplines
 - Scheduling
 - Quantity estimates, cost and alternatives analysis
 - Budget management
 - Expert Witness/Pre-Litigation Analysis

As a result of our comprehensive hydraulic and hydrologic design experience we remain proficient in state of the art DOT drainage design standards and methods, including coordination procedures with FEMA, the U.S. Army Corps of Engineers, State environmental agencies, and local flood control districts.

Our engineers have extensive experience in a variety of design software, technical manuals, and procedures including:

- HEC-1, HEC-HMS
- HEC-2, HEC-RAS
- HEC-11
- HEC-14
- EPA-SWMM
- THYSYS, CULVERT, Winstorm
- NRCS TR-20, TR-55, WSP-2
- USGS PeakFQ
- SWFHVD (NUDALLAS)
- HY-8
- UNET
- SMS Programs (RMA2, SED2D)
- Microstation
- Geopak Drainage
- Geopak Roadway
- Geopak Site
- AutoCad
- GIS (Arcmap, Spatial Analyst, 3D analyst)
- Texas DOT Hydraulic Design Manual
- Texas DOT Highway Design Manual
- AASHTO Green Book – A Policy on Geometric Design of Highways and Streets
- Georgia DOT Manual on Drainage Design for Highways
- Georgia Stormwater Management Manual
- Manual for Erosion and Sediment Control in Georgia
- North Carolina Erosion and Sediment Control Planning and Design Manual
- FEMA Flood Insurance Studies (FIS), Flood Insurance Rate Maps (FIRM)
- FEMA Guidelines and Specifications for Flood Hazard Mapping Partners
- FHWA HDS 5, *Hydraulic Design of Highway Culverts*
- FHWA HDS 6, *River Engineering for Highway Encroachments*
- FHWA HY-8, *Culvert Analysis*
- FHWA HEC No. 18, *Evaluating Scour at Bridges*
- FHWA HEC No. 20, *Stream Stability at Highway Structures*
- FHWA HEC No. 23, *Bridge Scour and Stream Instability Countermeasures*

HHR's precertified DOT qualifications demonstrate our exceptional ability to provide drainage engineering for federal, state and local community transportation projects. The following is a list of these qualifications:

Texas DOT Precertifications

- 1.4.1 Land Planning/Engineering
- 3.1.1 Route Studies & Schematic Design - Minor Roadways
- 3.2.1 Route Studies & Schematic Design - Major Roadways
- 3.3.1 Route Studies & Schematic Design – Complex Highways
- 3.4.1 Minor Bridge Layouts
- 3.5.1 Major Bridge Layouts
- 3.6.1 Multi-Level Interchange and Exotic Bridge Layout
- 4.1.1 Minor Roadway Design
- 4.2.1 Major Roadway Design
- 4.3.1 Complex Highway Design
- 4.4.1 Major Freeway Interchanges and Direct Connectors
- 7.1.1 Traffic Engineering Studies
- 8.1.1 Signing, Pavement Marking and Channelization
- 8.2.1 Illumination
- 10.1.1 Hydrologic Studies
- 10.2.1 Basic Hydraulic Design
- 10.3.1 Complex Hydraulic Design
- 10.4.1 Pump Station-Hydraulics
- 10.5.1 Bridge Scour Evaluations and Analysis

Georgia DOT Prequalifications

- 3.12 Hydraulic & Hydrological Studies (Roadway)
- 4.04 Hydraulic & Hydrological Studies (Bridges)
- 4.05 Bridge Inspection
- 9.01 Erosion, Sedimentation, and Pollution Control Comprehensive Monitoring Program

North Carolina DOT Prequalifications

- 00070 Erosion and Sediment Control Design
- 00433 Hydraulic Design – Tier I
- 00434 Hydraulic Design – Tier II

Alabama DOT Prequalifications

Roadway Bridge and Railway Bridge Design
Hydrological Studies and Drainage Design

KEY PERSONNEL

At **HHR**, we value our employees and believe they are second to none. Our experienced professional staff of civil engineers, hydraulic and transportation engineers, GIS professionals, technical support and administrative personnel are selected based on their exceptional qualifications in our areas of expertise to provide our high standard of quality to ensure consistent client satisfaction.

Eric R. Friedrich, P.E., CFM

President

B.S. Civil Engineering, University of Texas, 1983

Mr. Friedrich has over 30 years of professional experience in project management and engineering analysis/design of water resources and transportation projects. His extensive experience includes all phases of project development, from preliminary engineering to PS&E development for highway and bridge projects, with particular expertise in hydrology and hydraulics analysis and design.

In 2001, Mr. Friedrich founded **H & H Resources, Inc. (HHR)**. Prior to launching HHR, Mr. Friedrich gained valuable experience during his 11 years at TxDOT where he worked in the project design group with the Fort Worth District and subsequently moved on to serve as the Director of the Hydraulics Section for the TxDOT Bridge Division. In that capacity, Mr. Friedrich was instrumental in developing course material, and ultimately rolling out the drainage design sections of the statewide in-house Level I and Level II training program where he also served as lead instructor.

He has provided drainage studies, analysis and design of culverts, bridges, storm sewer systems, open channels and ditches, detention ponds, erosion and sediment control systems, and pump stations; analysis for bridge scour; and floodplain/floodway coordination with FEMA. Modeling expertise includes THYSYS Culvert and WinStorm; HEC-1, HEC-HMS, HEC-2, HEC-RAS; SCS TR-20, WSP-2, USGS PeakFQ, Geopak Drainage and EPA SWMM. Mr. Friedrich is an instructor under contract with University of Texas at Arlington teaching hydrology and hydraulics to TxDOT personnel.

Mr. Friedrich has been involved in the development of the following technical publications, standards development, and policy-generation:

- TxDOT Bridge Division Hydraulic Manual 3rd Edition, 1985
- AASHTO Task Force on Hydrology and Hydraulics, 1985 – 1990
- TxDOT Bridge Scour Evaluation Program, 1990
- TxDOT IH 10 Katy Freeway Reconstruction Program, Drainage Design Criteria, 2001-05
- Texas Engineering Extension Service, Professional Development Training Program, Hydrologic and Hydraulic Design for Culverts and Storm Drains, 2003-04.
- TxDOT US 290 / Hempstead Corridor Program Management, Drainage Design Criteria, 2006-09

Mr. Friedrich is a member of the American Society of Civil Engineers (ASCE), and the Texas Floodplain Management Association (TFMA).

Wayne E. Fowler, P.E., CFM

Vice President

B.S. Engineering, Auburn University, 1983

Post-graduate studies, Auburn University, 1984

Mr. Fowler is a registered professional engineer in Georgia, Texas, North Carolina, and Alabama. He has over 30 years of experience in a variety of public and private sector civil engineering projects, particularly in hydrology and hydraulics analysis and design. He has managed roadway, drainage, floodplain, utility, and land development projects. He has served as a County Engineer and Floodplain Administrator. Prior employment experience includes USDA-NRCS; engineering consulting firms in Texas, Georgia, and Alabama; and a 2-yr international assignment in water resource development.

He has provided engineering design and analysis for water resources projects including, bridge hydraulics and scour analysis, municipal and transportation storm sewers, pump stations, detention facilities, pavement drainage, and erosion control. Software experience includes HEC-1, HEC-HMS, SWFHVD, HEC-2, HEC-RAS, HY-8, WSP2, PeakFQ, XP-SWMM.

Mr. Fowler is especially qualified for projects that have National Flood Insurance Program (NFIP) implications, having prepared over 90 Conditional Letter of Map Revision (CLOMR) and LOMR applications, No-Rise certifications, and other NFIP- or FEMA-related submittals in Texas, Georgia, and North Carolina. He has assisted with countywide floodplain mapping and floodplain map modernization projects. He has extensive experience in watershed hydrology, floodplain analysis, bridge, floodway, and encroachment modeling, coordination with FEMA, and floodplain/floodway delineation.

Mr. Fowler is a member of the American Society of Civil Engineers (ASCE), Association of State Floodplain Managers (ASFPM), and Georgia Association of Floodplain Management (GAFM). He is an instructor in Georgia's Erosion Control Certification Program.

John A. Terry, P.E., CFM

Senior Project Manager

B.S. Civil Engineering, University of Texas at Arlington, 1977

Mr. Terry has over 37 years of experience consisting of drainage and transportation engineering, including preliminary engineering and PS&E development for highway and bridge projects for urban freeways, major arterial, and city streets. Mr. Terry retired from TxDOT in 2008 and joined the staff of **HHR** in 2009. He currently manages the Fort Worth branch office.

As Central Design Engineer for TxDOT's Fort Worth District, Mr. Terry managed development of PS&E with both TxDOT staff and consultants. He developed numerous roadway detail standard sheets for TxDOT-FTW, addressing various roadway, pavement, drainage, maintenance and erosion control issues, and has developed Special Specifications and Special Provisions to supplement TxDOT Standard Specifications. He has made presentations to the annual TxDOT Transportation Short Course, at Fort Worth District Consultant Workshops, and as an expert witness in right of way condemnation cases, for commissioner's hearings and jury trials. As the Fort Worth District Hydraulics Engineer, Mr. Terry reviewed all drainage design for the District, and developed innovative formats for hydraulic reports and bridge hydraulic data. He investigated drainage complaints and coordinated with Area Office and maintenance staff to resolve problems that resulted from TxDOT facilities. He also served as a Project Advisor on several TxDOT drainage-related research projects, and served on the Executive Oversight Committee for updating the TxDOT Hydraulic Design Manual.

Mr. Terry's hydraulic modeling experience includes WinStorm, Geopak Drainage, THYSYS Culvert, HY-8, HEC-HMS, HEC-2, HEC-RAS; SCS TR-55, USGS PeakFQ. Mr. Terry is an instructor under contract with the University of Texas at Arlington teaching hydrology and hydraulics to TxDOT personnel.

Charles D. Absher, P.E., CFM

Senior Project Manager

B.S. Civil Engineering, Georgia Institute of Technology, 1989

Mr. Absher manages the Atlanta area branch office. He has over 26 years of engineering experience in water resource assessments and modeling, floodplain mapping, hydrologic/hydraulic analysis, and civil design and is a registered professional engineer in Georgia, Texas, North Carolina, South Carolina, Florida and Tennessee. His expertise includes unsteady flow analysis for bridge tidal hydraulics using HEC-RAS, and its precursor, UNET. In addition, he has developed transportation hydrology/hydraulics using SWMM for a variety of transportation drainage designs. He is also experienced in the application of Geographic Information System (GIS) databases as related to water resource systems planning, analysis, and design.

Mr. Absher is a member of the Georgia Association of Floodplain Management, is a Certified Engineer of Record for Civil and Hydrologic/Hydraulic Design under Georgia Safe Dams Program, and is a Certified Design Professional in Erosion & Sediment Control by the Georgia Soil & Water Conservation Commission.

Cynthia R. Carle, P.E., CFM

Project Manager

B.S. Civil Engineering, Texas A&M University-Kingsville, 1998

Ms. Carle manages HHR's Sugar Land, Texas branch office. Her primary area of expertise is surface water hydrology and hydraulics. For over 17 years, she has served as Project Manager and Engineer on numerous transportation drainage projects. Her project experience includes storm sewer improvements, floodplain studies, drainage and storm water management, bridge and culvert hydraulic analysis, hydrologic and hydraulic computer modeling, drainage mitigation analysis, and bridge scour analysis.

Ms. Carle has computer modeling experience using models developed by the U.S. Army Corps of Engineers including HEC-1, HEC-2, HEC-HMS, HEC-RAS; the Soil Conservation Service including TR-20, TR-55 and WSP2; the Texas Department of Transportation including CULVERT, WINSTORM, THYSYS RUNOFF and, THYSYS PUMP; and the Environmental Protection Agency (EPA) Stormwater Management Model (SWMM). Ms. Carle is a member of the Texas Floodplain Management Association (TFMA).

Veronica N. Hodge, P.E., CFM

Project Manager

B.S. Civil Engineering, Texas A&M University, 1996

Ms. Hodge specializes in hydrology and hydraulics. For over 19 years, she has served as a Project Manager and Engineer on multiple transportation drainage projects. Her project experience includes storm sewer improvements, drainage and storm water management, bridge and culvert analysis, hydrologic and hydraulic computer modeling, storm water pollution prevention plans (SW3P) and bridge scour analysis.

Ms. Hodge has computer modeling experience using models developed by the U.S. Army Corps of Engineers including HEC-1, HEC-2, HEC-RAS, HEC-HMS; the Soil Conservation Service including TR-20 and TR-55; the Environmental Protection Agency (EPA) Stormwater Management Model (SWMM); the Texas Department of Transportation including CULVERT, WINSTORM and THYSYS RUNOFF; and Geopak Roadway, Drainage and Site software.

Eric J. Calvert, P.E.

Project Manager

B.S. Civil Engineering, Texas A&M University, 1998

Mr. Calvert specializes in hydrologic/hydraulic analysis and design for public works clients including TxDOT, Harris County Flood Control District and the City of Houston. For over 17 years, he has served as a Project Manager and Engineer on multiple transportation drainage projects. His project experience includes impact analysis, channel design, hydrologic and hydraulic modeling, detention basin design, scour analysis and storm sewer improvements and design.

Mr. Calvert has computer modeling experience using models developed by the U.S. Army Corps of Engineers including HEC-1, HEC-2, HEC-RAS, HEC-HMS; the Soil Conservation Service including TR-20 and TR-55; the Environmental Protection Agency (EPA) Stormwater Management Model (SWMM); the Texas Department of Transportation including CULVERT, WINSTORM and THYSYS Culvert; and Geopak Roadway, Drainage and Site software.

Jaime Benoliel, P.E., CFM

Project Engineer

B.S. Civil Engineering, University of Houston, 2001

Ms. Benoliel specializes in hydrology and hydraulics. Prior to joining H&H Resources, Inc., she was employed with the Harris County Flood Control District. She has served as Project Engineer on multiple flood study and transportation drainage projects. Her 15 years of project experience includes storm sewer improvements, bridge, culvert, detention pond sizing, hydrologic and hydraulic computer modeling, and drainage mitigation analysis.

Ms. Benoliel has experience with HEC-1, HEC-2, HEC-RAS (steady and unsteady), GEO-RAS, HEC-HMS; UNET, Geopak Drainage, THYSYS CULVERT and WINSTORM, XP-SWMM, and GIS (Arcmap, Spatial Analyst, 3D analyst), and the Environmental Protection Agency (EPA) Stormwater Management Model (SWMM).

Ms. Benoliel is a member of the Texas Floodplain Management Association (TFMA), and has been an instructor in drainage engineering courses.

Ms. Benoliel co-authored the following papers with Dr. Yu-Chun Su:

- Sediment Transport Modeling of Dredged Disposal Materials Near Sabine Pass.” Coastal Texas 2020 Technical Erosion Conference 2005, Houston, Texas, September 14-16, 2005.
- “Modeling of Flood Control Channels Using SMS/RMA2.” TFMA 17th Annual Texas Flood Conference, Fort Worth, Texas, 2004.

Martha Miller, P.E.

Project Engineer

B.S. Civil Engineering, Texas A&M University, 1985

Ms. Miller has over 20 years of engineering and contract management experience as project manager, and project engineer for a variety of transportation planning and design projects. Prior to joining H&H Resources, Inc., she has worked 7 years in consulting and 13 years with TxDOT for the Austin Design Division, Austin District and Houston District. Her duties have included supervision of professional staff, budget management, schedule control, coordination with federal, state, local agencies and consulting firms, and expert witness for the State of Texas on right-of-way condemnation hearings. Previous planning experience includes feasibility studies for major roadway and intersection improvements, preparation of geometric schematics, diagrammatic layouts, environmental documents and public involvement for added-capacity freeway and non-freeway facilities. Design experience includes preparation of construction documents (PS&E) for rural and urban improvement projects and added-capacity roadways including roadway design, utility coordination, traffic control plans, pavement markings, signal design, bridge layouts and SW3P. She has performed construction inspection including on-site construction management.

Ms. Miller is experienced in the use of various transportation and traffic engineering computer programs including MicroStation, Geopak Roadway, Passer II, Passer III, Synchro, Highway Capacity Software, FREQ10, and TRANPLAN.

PROJECTS

Our projects vary in size from municipal storm sewer design to complex Interstate corridor analysis and design. HHR has enjoyed working relationships with city mayors, public works superintendents, regulatory officials, county commissioners and managers, state transportation officials, and other consultants.

The following project list illustrates HHR's recent and ongoing projects that have required a wide range of detailed technical knowledge, experience and qualifications.

- **US 290 / Hempstead Tollway, Houston, TX (2006-present);** Program Management Consultant (PMC) Drainage Task Manager. Drainage impact studies for Hempstead Tollway and US 290 from IH 610 to FM 2920. (34 mile corridor). Storm sewer improvements, floodplain impact/mitigation studies, drainage and storm water management, bridge hydraulics, third party review of drainage designs by Section Design Consultants, development of drainage design criteria. Design software: EPA-SWMM, HEC-HMS, HEC-RAS, TxDOT's Winstorm, Microstation, Geopak Drainage and Geopak Site.
- **IH35W-Segment 3B (IH 820 to US 81/287), Fort Worth, TX (2011-present);** HHR is the hydraulic design task leader for the design of a bridge replacement and two bridge class culvert crossings. Services include hydrology and hydraulics design, updating hydrology and hydraulics studies for Big Fossil Creek and tributaries through coordination with the Corps of Engineers Fort Worth District. Drainage design includes hydraulic design and report for bridge replacements and bridge class culverts for frontage roads, ramps and main lanes to avoid backwater impacts to FEMA regulated floodplains; design of bridge and culvert waterways to avoid impacts to Waters of the U.S. and ensure consistency with the Nationwide Permit.
- **IH 610W @ US 59S, TxDOT Houston District, TX, (2012-present);** This multi-level freeway interchange reconstruction was complicated by traffic congestion, frequent flooding, and multiple agency stakeholders. HHR provided hydraulic analysis of existing conditions with various and alternative solutions for reconstruction. The analysis was complex and detailed due to multiple outfalls, two major watersheds, observed flooding, and inadequate capacity of ponds, bridges, pavement drainage, ditches, pump station, receiving channels. Cost-effective solutions included revision to 2 pump stations, re-routing flow, underground and above-ground detention, bridge modifications, and design to accommodate multiple construction phases.
- **Off-System Bridge Replacements, Houston, TX (2011-present);** Project Manager for PS&E preparation including hydraulic design, scour analysis, drainage impact study and reports, drainage plans and related design cross sections, plan details and quantities for five bridge replacements and parallel drainage facilities in Galveston, Brazoria, and Waller Counties. Design software: HEC-2, HEC-RAS, Geopak and Microstation.
- **IH 30 / US 59, Texarkana, TX (2012-2013);** Provided engineering services for a drainage impact study and report. Tasks included drainage area mapping and watershed parameters, hydrologic modeling, and mitigation alternative development. Design software: HEC-RAS, SWMM and Microstation.

- **LaGrange Bypass III, City of LaGrange, GA (2008-2011);** Drainage Task Leader for new culvert crossing location design at Dixie Creek, analyze watershed hydrology, and prepare hydraulic analysis for two culvert crossings within the Shoal Creek tributary to evaluate compliance with NFIP, USACE, local design criteria, and GDOT standards. Design software: HEC-RAS, Microstation.
- **IH 35 From Woodlawn Rd to FM 2063, McLennan County, TX (2010-2011);** Drainage Task Manager. Hydrologic study for 22 crossings, including 4 FEMA detailed study streams. Hydraulic design of all crossings along the 9 mile corridor including local roadway crossings that are affected by the roadway reconstruction. Determine detention requirements at two locations and complete impact analysis. Prepare PS&E drainage area maps and hydraulic data sheets. Design and detail water quality BMPs for the entire corridor. Design all roadside ditches according to local design standards. Design software: EPA-SWMM, HEC-HMS, HEC-2, HEC-RAS, and Microstation.
- **Legacy Park Circle, Kennesaw, GA (2010);** In support of FEMA emergency grant made available by Presidential Disaster Declaration, this bridge-class culvert replacement at Proctor Creek was essential due to the collapse of the culvert and roadway during the epic flood event of September 2009. The City of Kennesaw retained HHR to provide services related to watershed hydrology, bridge hydraulics study, scour analysis, utility and other external agency coordination, public meetings, media coordination, and development of plans and specifications. To show compliance with National Flood Insurance Program and local floodplain regulations, HHR made recommendations for changes to the hydrology and floodplain mapping. Project funded by FEMA for City of Kennesaw. Design software: HEC-1, HEC-RAS, Microstation.
- **Beck Street Extension Project, Bryan, TX (2005-2009);** This project was for the extension of an existing city street through a mapped floodplain. HHR was retained to ensure compliance with NFIP regulations. Services included watershed analysis, floodplain study, drainage design and storm water management for four bridge-class culvert crossings and two detention basins. HHR prepared construction plan sheets for detention basins and Conditional Letter of Map Revision (CLOMR) and Letter of Map Revision (LOMR) request for FEMA review and approval. This effort required coordination with FEMA, City of Bryan, surveyor, and general contractor. Design software: HEC-1, HEC-RAS, Microstation, Geopak Site.
- **College Street at San Gabriel River, Georgetown, TX (2008-2011);** The City of Georgetown planned a new bridge along College Street at the San Gabriel River, along with related road improvements. HHR provided hydrology and hydraulics design including watershed analysis, floodplain study, preparation of Conditional Letter of Map Revision (CLOMR) documents for FEMA submittal, hydraulic design and construction plan development for storm sewer and culvert improvements, Water Pollution Abatement Plan (WPAP) for proposed project in Edwards Aquifer Recharge Zone, Best Management Practices (BMP's) for water quality mitigation including Bioretention Pond design and construction plans, and coordination of WPAP approval through TCEQ. Design software: HEC-HMS, WSP2, HEC-RAS, Microstation, Geopak Drainage, Geopak Site.
- **Airport Terminal Road, Union County, GA (2006-08);** Design of GDOT-funded county road from four-lane divided median highway to airport terminal. Prepared PS&E for new road alignment, GDOT access permit, grading, drainage design, erosion control, striping and signage, and borrow area. Bid and construction phase services. Coordinate

with other consultants and agencies for funding, survey, right-of-way acquisition, geotechnical exploration, reinforced earth design, traffic and airport engineering, and environmental compliance. Design software: Microstation, WinTR-55, HY-8.

- **Precinct Line Rd. at Walker Branch, Fort Worth, TX (2006-08);** TxDOT and the City of Fort Worth collaborated on this bridge replacement project which included elevating the approaches above the base flood and channelizing a portion of the natural channel. HHR prepared hydrology and hydraulics analysis of the proposed improvements including watershed analysis, floodplain study, impact/mitigation analysis, channel geometry and lining design, construction plan sheets, and preparation of Conditional Letter of Map Revision (CLOMR) request. Design software: SWFHYP, HEC-2, HEC-RAS, Microstation, Geopak Site.
- **IH 10 Katy Freeway Expansion GEC, Houston, TX (2001-05);** Drainage Task Leader for General Engineering Consultant. Storm sewer improvements, drainage and storm water management, drainage design coordination, floodplain impact studies, and third party review of drainage designs (PS&E) for 21 miles of freeway main lanes and frontage road reconstruction. Drainage coordination with stakeholder agencies. Hydraulics design of seven stream crossings and three stormwater pumping stations. Coordination of drainage design and permitting in jurisdictional waters. PS&E review of drainage construction for ten construction contracts, preparation of corridor-wide drainage design criteria and special specifications, and coordination with stakeholder and regulatory agencies. Construction phase services. Design software: SWFHYP, HEC-2, HEC-RAS, Microstation, Geopak Site.
- **Heritage Way at Tributary of Bosque River, Erath County, TX;** The existing bridge was removed from service and replaced with a temporary low water crossing, so time was of the essence when HHR was retained to assist with design. Our services included hydrology and hydraulics design for this off-system bridge replacement project. Critical to the performance of the bridge was avoiding flood impacts to adjacent structures in the floodplain.

REFERENCES

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