RFP No. 20250526

Water Quality Sampling and Analysis
ANNUAL CONTRACT

PREPARED FOR:
Charlotte County

PREPARED BY:
Kimley»Horn
Expect More. Experience Better.

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Cover Letter

July 21, 2025

Charlotte County
Purchasing Division
18500 Murdock Circle, Suite 344
Port Charlotte, Florida 33948

Kimley-Horn and Associates, Inc.
1514 Broadway, Suite 301
Fort Myers, FL 33901

RE: Water Quality Sampling and Analysis – Annual Contract (RFP NO. 20250526)

Dear Members of the Professional Services Committee:

Kimley-Horn is pleased to submit our proposal for Charlotte County's Water Quality Sampling and Analysis Annual Contract (RFP No. 20250526). We are excited for the opportunity to support the County's water quality monitoring program and are fully prepared to meet the scope of services outlined in the RFP. Our team brings a strong combination of technical expertise, regulatory knowledge, and a commitment to responsive service.

Why Kimley-Horn?

Our history with clients in Florida has demonstrated our ability to assemble a diverse team of in-house professionals from our local offices. As your project manager, **Kellie Clark, PE**, and members of our team have proudly served Charlotte County for the past 18 years. We have local and regional experience with water quality monitoring programs throughout southwest Florida. Our team has expertise in environmental monitoring with the ability to prioritize accuracy, timeliness, and compliance with Florida Department of Environmental Protection (FDEP) guidelines to ensure the highest level of service. Kimley-Horn has the size, diversity of talent and services, and proven history of producing innovative, award-winning designs to be the partner the County needs. We have come to appreciate the value and importance of remaining true to our roots, focusing on our local clients, and providing them with the personalized and responsive services they deserve.

Unmatched Technical Expertise

Kimley-Horn understands the importance of accurate and timely water quality data to support Charlotte County's environmental and regulatory goals. We are prepared to provide monthly surface water sampling at locations throughout the County, as well as special short-term and short-notice sampling events as requested. We have strengthened our team by adding **Dale Dixon, PhD** with **Benchmark EnviroAnalytical, Inc.** (BenchmarkEA) for laboratory analysis. Our team is equipped to collect, analyze, and report data in accordance with all applicable standards, including those set forth by the FDEP, the Department of Health (DOH), and Rule 62-160, F.A.C. We bring extensive experience in engineering, environmental science, and statistical analysis that will position us to collaborate with the County to develop a comprehensive water quality monitoring program.

Local Responsiveness

Kimley-Horn's Fort Myers office will serve as the primary office, while our Sarasota office will serve as the secondary office with both offices responsible for the services related to this monitoring program. We will provide you with a strong local presence and maximize our local staff. We will work diligently, encouraging open communication to keep you informed about project activities and primary schedule achievements. From our previous work history with Charlotte County, your staff knows we are committed to working with you as a partner, offering you the most effective level of communication to relay project issues, progress, and results that best serve your needs in a timely manner.

Commitment to Charlotte County

We are confident that our team's qualifications, combined with our understanding of the County's needs and our commitment to excellence, make us a strong partner for this important work. Additionally, our team understands the County's future goals, challenges, and opportunities. We understands the importance of responsiveness as well as the technical experience to handle every aspect of the County's goals under this contract. Our team doesn't just complete tasks but delivers successful projects that will serve Charlotte County for years to come. We believe creating a long-lasting partnership with the County is imperative to meeting the County's expectations. We will go the extra mile to deliver highly responsive service and solutions suitable for Charlotte County's needs and goals. Kimley-Horn is proud of our long-standing relationship with the County, and we look forward to the opportunity to serve you.

Sincerely,

KIMLEY-HORN AND ASSOCIATES, INC.

Kellie Clark, PE
Project Manager/Vice President

Lewis Bryant, PE
Principal-in-Charge

As a Vice President of the firm, Kellie Clark, PE, is legally authorized to bind Kimley-Horn for this contract.

This proposal was made without collusion with any other person or entity submitting a proposal pursuant to this RFP.

The Project Manager or Principal will not be substituted without the express permission of the County, as stated on page 13 of RFP NO. 20250526 under RP-26 Proposal Requirements, items A and C.

I. TEAM PROPOSED FOR THIS PROJECT

I. TEAM PROPOSED FOR THIS PROJECT

A. Background of the Personnel

Kimley-Horn understands the importance of assembling a strong project team; by selecting our team as your consultant for this project, you are truly seeking a long-term partner and trusted advisor. The County needs a core team of experts with relevant hands-on experience and a high level of responsiveness, both in terms of exceptional local support and technical expertise. As you've experienced working with our proposed team, including your project manager, **Kellie Clark, PE**, you can rely on accessing any resources you need. Rest assured, immediate assistance is just a phone call away. **Kimley-Horn has proudly served Charlotte County for the past 18 years, and we look forward to continuing our partnership.**

1. Project Manager

Kellie Clark, PE
Project Manager

With over 16 years of experience in water resources engineering, Kellie Clark, PE, is exceptionally well-suited to serve as Charlotte County's project manager for this water quality sampling and analysis. Kellie has spent her entire career serving municipalities throughout the state of Florida, completing projects in more than a dozen counties statewide. Her expertise includes watershed management programs, hydrologic and hydraulic modeling, water resources master planning, flood control and water quality projects, and floodplain mapping. Kellie has led numerous efforts involving water quality modeling and assessment, including pollutant load analyses, TMDL evaluations, and the design of regional stormwater treatment facilities aimed at improving nitrogen and phosphorus removal. Her project experience spans stormwater master planning, infrastructure inventory and maintenance, and the design and permitting of retrofit systems, wetland restoration, and water quality improvement projects. Her technical proficiency with tools like ArcGIS, ICPR, and InfoWater further supports her ability to deliver data-driven, impactful solutions for water quality enhancement. **The Project Manager will not be substituted without the express permission of the County.**

2. Other Key Personnel

Lewis Bryant, PE | Principal-in-Charge

Serving as your Principal-in-Charge, Lewis Bryant, has more than 25 years of experience with municipal utility engineering, including utility relocation, master planning, distribution system design, hydraulic computer modeling and analysis, and construction phasing and inspections. Lewis brings a comprehensive understanding of integrated water planning practices and compliance reporting. His leadership and technical expertise from working throughout the country will positively impact each stage of this project, from contract negotiations through to completion and recommendations for long-range regulatory compliance. Lewis has the authority to execute the contract, secure technical resources, and ensure that project needs are met. Lewis will continue to provide oversight throughout, lending his expertise to all aspects of this project. **The Principal-in-Charge will not be substituted without the express permission of the County.**

Alan Garri, PE | Technical Advisor

Alan is a senior project manager with Kimley-Horn with 23 years of experience involving water, wastewater, stormwater, and roadway design. He brings extensive experience in sanitary sewer evaluations, including the design and construction of traditional gravity sewer and lift station systems, vacuum sewer systems, and low-pressure systems. His leadership on projects such as the Septic to Sewer Master Planning Study for the City of Belleview and the Crystal River Southern Sewer Expansion demonstrates his ability to guide complex infrastructure transitions.

Molly Williams, PE | Quality Control/Quality Assurance

Molly has 29 years of experience involving stormwater management including stormwater modeling and development of capital improvement projects; design, permitting, and construction of regional stormwater management systems; financial and operational analysis; FEMA support; needs analysis and implementation planning; and emergency management and response. Molly served as Sarasota County's Stormwater Utility Manager for 4 years and during her tenure, several key accomplishments led to the streamlining of the Stormwater Utility functions including alignment of the operation and maintenance activities with the goals of the Community Rating System (CRS) program and the NPDES/MS4 permit requirements and to facilitate the periodic CRS audits and the annual NPDES reporting.

Kira Hansen, PhD, PE | Surface Water Quality Monitoring; Regulatory Compliance/ Quality Assurance; Statistical Analysis

Kira is a professional engineer with nine years of experience involving water resources master planning, hydrologic and hydraulic modeling, drainage design, sustainable and resilient design and agricultural water and nutrient management. She is passionate about the intersection between land and water resources and the communities that they impact. Her dissertation focused on the development and systems analysis of fresh vegetable production with a focus on water, nutrient, pest and disease management. Kira has served as a civil analyst on stormwater master plans and private development stormwater system design. She has experience with federal grant writing and compliance, stakeholder engagement/ communication and data visualization.

Ronnie Van Fleet, PWS | Surface Water Quality Monitoring; Statistical Analysis

Ronnie is a seasoned environmental scientist and project manager with over 37 years of experience supporting public and private sector projects across Florida. His expertise includes environmental permitting, wetland delineation, habitat assessments, and listed species studies, with a strong focus on sampling design and statistical analysis. Ronnie has led numerous monitoring programs involving water quality, wetland assessment procedures (WAP), and fisheries studies—applying rigorous statistical methods to guide data collection, evaluate trends, and ensure regulatory compliance. Known for his leadership and technical writing, Ronnie has managed complex water resource projects and is recognized for his ability to translate field data into actionable insights that support long-term environmental stewardship.

Kim Arnold, PG | Groundwater Monitoring and Hydrogeology Planning

Kim Arnold has worked as a practicing hydrogeologist in Southwest Florida for 22 years. As a former South Florida Water Management District (SFWMD) employee, she has extensive experience with regulatory permitting; water supply planning; testing and construction observation services; groundwater modeling; and due diligence services. Her history working for SFWMD enhances her ability to hold meaningful conversations with regulators, which is especially important when defining terms and conditions of program compliance, and when developing clear and concise reporting documents. Kim's portfolio includes a broad range of water and wastewater infrastructure projects; her work encompasses wellfield expansions, deep injection well permitting and construction, regulatory compliance, and water use permitting. With a strong history of supporting utility clients, Kim brings a depth of technical expertise and regulatory insight that enhances the success of complex environmental and infrastructure initiatives. Kim has a great working relationship with local well drillers and will be responsible for scheduling and construction coordination tasks.

Jennifer Briggs, PMP | Regulatory Compliance/Quality Assurance

With over seven years of experience in water and wastewater regulatory compliance, Jennifer Briggs, PMP brings a strong background in project coordination, data management, and regulatory reporting. She has successfully led compliance efforts for Charlotte County Utilities, including quarterly reporting, Environmental Resource Permit inspections, and dashboard development to track regulatory deadlines. Jennifer's expertise with tools like Power BI, Smartsheet, Excel, and GIS enables her to manage and communicate monitoring data clearly and effectively. Her deep understanding of FDEP permitting and strong relationships with regulatory agencies ensure seamless coordination throughout the project lifecycle. She also has extensive experience with groundwater monitoring and well management, demonstrated through her leadership on Charlotte County's Regulatory Compliance Program and the West Villages Reuse Distribution Program.

Jeff Goodwin | Regulatory Compliance/Quality Assurance

Jeff brings 26 years of experience working with utility infrastructure. He is a strong community and social services professional skilled in water treatment, environmental awareness, environmental services, environmental consulting, and wastewater resource management. He has extensive experience with regulatory compliance, consent order negotiation and reporting, wastewater treatment processes, transmission, and collection systems. Jeff complements our team with an owner's perspective in developing and delivering capital projects, wastewater treatment processes and operations, and regulatory compliance. His work in the public sector and in private consulting spans a range of unique project challenges. He is thoroughly prepared to assist the County and project team with exceeding compliance reporting requirements and delivering a comprehensive plan for the Lakeview/Midway and Cape Haze Water Quality Septic-to-Sewer Water Quality Monitoring project.

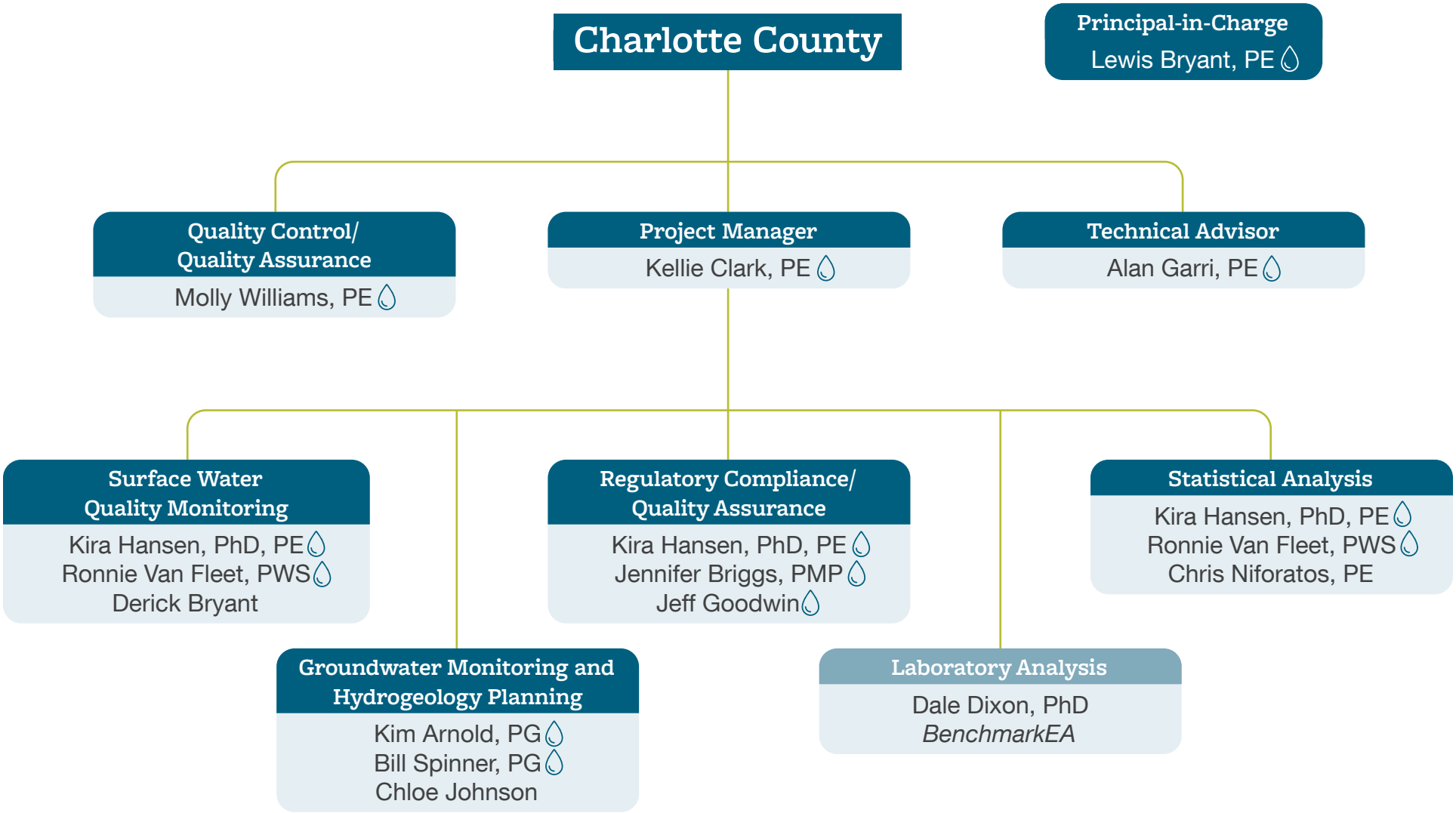
Bill Spinner, PG | Groundwater Monitoring and Hydrogeology Planning

Bill has 21 years of experience with conducting and managing assessment and remediation projects involving brownfield sites, hazardous waste, industrial waste, petroleum contamination, and regulatory reporting. He is experienced with environmental compliance, RCRA, CERCLA, and state hazardous waste and petroleum cleanup programs. He has conducted several phase I and II environmental site assessments on commercial and industrial facilities, and has conducted contamination screening on corridors throughout the U.S.

3. Consultants

BenchmarkEA | Laboratory Analysis

BenchmarkEA has 33 years of experience in analyzing water, soil and sediment. The laboratory is owner operated with three Florida locations—with one in North Port, Winter Haven, and Palmetto. All three laboratories are NELAP certified and are operated by personnel having science degrees in chemistry or biology. The realm of certification includes organics, metals, inorganics, physical properties and microbiology. BenchmarkEA is also certified by the Florida Office of Supplier Diversity as a Minority Business Enterprise. BenchmarkEA's laboratory director has a PhD in organic chemistry and is familiar with the laboratory operations. The management team of supervisors and quality assurance officers works together to meet the company objective of providing "correct results the first time, on time."



Key Personnel

Resumes of our key personnel and subconsultant are provided on the following pages.

Kellie Clark, PE

Project Manager

Professional Credentials

- Master of Engineering, Civil Engineering, University of Florida
- Bachelor of Science, Civil Engineering, University of Florida
- Professional Engineer in Florida, #77642

Professional Organizations

- American Water Resources Association (AWRA), Board Member
- Florida Engineering Society (FES), Member

Special Qualifications

- Passion for modeling, whether its hydrologic and hydraulic or water quality
- Has spent her entire career serving municipalities throughout the state of Florida
- Special expertise with watershed management programs, hydrologic and hydraulic modeling, water resources master planning, flood control and water quality projects, and floodplain mapping
- Experienced with stormwater master planning; infrastructure inventory and maintenance; water quality modeling and assessment; and design and permitting

Relevant Experience

Babcock Ranch Monitoring, Lee County, FL — Project manager. Kimley-Horn is working with Babcock Ranch Property Holdings, LLC, (BPH) to monitor water quality within a 18,000-acre area per compliance requirements for a settlement between BPH and Lee County. The team conducts quarterly site visits to collect water level data from 40 monitoring locations, ensuring compliance with mitigation and water use permitting. In addition, monthly samples are collected at 15 sites for water quality parameters including nutrients (Nitrogen, Phosphorus, TSS, Salinity) and flow measurements. Kimley-Horn also conducted semi-annual pesticide and fertilizer sampling, which was carried out at 6 locations, along with regular groundwater sampling. Our team conducts quality assurance and quality control procedures on all data collected including statistical analyses which are combined into an annual report submitted to the County.

City of Vero Beach Water Quality and Stormwater Master Plan, Vero Beach, FL — Project manager. Kimley-Horn assisted the City of Vero Beach with a, 8,600 acre city-wide Stormwater Management Plan to improve water quality of stormwater discharge and historic flooding concerns. As a low-lying coastal city located upstream of the environmentally sensitive Indian River Lagoon, the City has experienced increasing flooding incidents and has developed a long-term plan to address the increasing flooding while improving water quality. Our team evaluated the City's stormwater management system within each basin and developed conceptual stormwater improvements to create cost effective stormwater alternatives. Kimely-Horn coordinated with the City to develop a long-range capital stormwater improvement plan to address these identified deficiencies and improve local and regional water quality.

City of Lake Wales Watershed Management Plan, Lake Wales, FL — Project manager. Kimley-Horn is assisting the City of Lake Wales to develop a Watershed Management Plan to identify locations and extents of flooding. An existing conditions model is being developed based on data provided by various agencies including the City that will map floodplains associated with various storm events. Results from the developed model are used to determine the Flood Protection Level of Service for existing buildings and roads. Kimley-Horn is working to coordinate with FDEP to help the city apply for grants and complete technical memorandums for project screening. Kimley-Horn is performing water quality sampling of Lake Wales to determine swim ability based on EPA guidelines.

Highlands County Professional Services for Water Quality and Drainage Studies, Highlands County, FL — Project engineer. Kimley-Horn is providing engineering services to Highlands County to assess water quality and identify improvements needed to address flooding concerns in three areas throughout the County and conduct a peer review of existing modeling within a fourth area. Kimley-Horn will utilize existing large-scale watershed modeling to create stormwater models at a smaller scale that will generally utilize roadways as basin divides and overland weirs. This project will be a planning-level study to determine recommended stormwater improvements in this area. The study's deliverables are anticipated to serve as documentation in future grant or loan submittals.

Hendry Creek West Branch Water Quality Improvements, Lee County, FL — Project engineer. Recognized as one of the leading engineers in the local community for water quality enhancement design, the Kimley-Horn team designed one of the first tidal water quality created wetlands in Southwest Florida. This project created a stormwater park that not only provided education to the community about stormwater through interaction but was also designed to treat water flowing in two directions: from the Gulf and to the Gulf. The innovative design served as a showcase project for water quality improvement in Southwest Florida. Kimley-Horn provided continuous flow monitoring and weekly water quality monitoring of the site to gather the necessary design information to meet grant requirements.

Lewis Bryant, PE

Principal-in-Charge

Professional Credentials

- Master, Business Administration, University of Florida
- Master of Science, Civil Engineering, University of Florida
- Bachelor of Science, Technology, Regets College
- Bachelor of Science, Civil Engineering, University of Florida
- Professional Engineer in Florida, #65582

Professional Organizations

- Florida Engineering Society (FES), Member
- Water Environment Federation (WEF), Member
- American Water Works Association (AWWA), Member

Special Qualifications

- Skilled project manager for utility relocation/expansion projects, collection system condition assessments, water and wastewater treatment facilities design, facility expansion plans, capacity analysis reports, and water use permits
- Experience includes FDOT JPA utility relocation projects, water and wastewater distribution system projects, wastewater treatment plant modifications, expansion plans and capacity analysis reports, water treatment plant design and modifications, water and wastewater utility mapping, modeling, expansions, and construction inspections

Relevant Experience

Charlotte County Utilities, FY 2021 through FY 2025 Regulatory Compliance Water and Wastewater, Port Charlotte, FL — Principal-in-charge. Kimley-Horn was selected to perform the FY22 through FY24 regulatory compliance water and wastewater professional engineering support for CCUD. These services included tasks to evaluate and maintain CCUD's compliance with regulatory requirements as set out in the existing permits. Services included project management, preparation of a Collection System Action Plan and Capacity Analysis Report, and development of the West Port Water Reclamation Facility (WRF) permit renewal application. The team conducted site inspections, facilitated coordination with FDEP, and performed regulatory audits for multiple facilities. Additionally, Kimley-Horn prepared quarterly compliance reports, maintained a regulatory dashboard, and provided recommendations to ensure continued operational and regulatory compliance across the County's wastewater infrastructure.

North Port Utilities Hydraulic Modeling and Water Quality Analysis, North Port, FL — Project engineer. Kimley-Horn converted and updated the model from Bentley into Innovyze software for to provide on-call modeling services to support the City's water quality initiatives, as well as long-range master planning support. Services provided under this contract will include on-call services support, hydraulic model updates, water distribution system evaluation, operational evaluation, water quality evaluations, and as-needed modeling support. Kimley-Horn converted and updated the model from Bentley into Innovyze software for to provide on-call modeling services to support the City's water quality initiatives, as well as long-range master planning support. Services provided under this contract will include on-call services support, hydraulic model updates, water distribution system evaluation, operational evaluation, water quality evaluations, and as-needed modeling support.

Dunnellon Rainbow Springs Infrastructure Development Project, Dunnellon, FL — Project manager. Kimley-Horn provided engineering design, permitting, bidding assistance, construction phase services, environmental services, FDEP grant administration assistance, geotechnical services, and surveying. The Rainbow Springs Infrastructure Development project is located in the Dunnellon utility system. The project consisted of the construction of approximately 28,520 linear feet of sanitary sewer force main piping from the Juliette Falls Water Reclamation Facility (WRF) to the Dunnellon WRF. The force main route begins at the Juliette Falls WRF and follows 180th Avenue Road south to Marion County Road 484 then west to San Jose Blvd. then south to the City of Dunnellon WRF. Funding for the project was made available through a cost reimbursement grant administered by the Florida Department of Environmental Protection (FDEP).

Sunshine Water Services Continuing Contract, FL — Project engineer. Sunshine Water Services (formerly Utilities Inc. of Florida) owns and operates 46 private utility systems throughout Florida. Since 2016, Kimley-Horn has been providing responsive, on-call professional engineering services for evaluation, planning, design, permitting, bidding, and construction phase services for water, wastewater, and reclaimed water systems. Projects have include the Mid-County Reuse Feasibility Analysis, Mid-County WWTP MBR Improvements, Mid-County Headworks and Grit Removal Improvements, and Hydraulic Model/Nutrient Analysis.

Alan Garri, PE

Technical Advisor

Professional Credentials

- Bachelor of Science, Mechanical Engineering, University of Florida
- Professional Engineer in Florida, #70674

Professional Organizations

- American Water Resources Association (AWRA), Member
- Florida Engineering Society (FES), Member
- Florida Institute of Consulting Engineers (FICE), Member
- National Society of Professional Engineers (NSPE), Member

Special Qualifications

- Has extensive experience with Water Management District and FDEP loan and grant funding programs
- Member of the SWIM Technical Advisory Board evaluating the health of the springs and rivers in Citrus and Marion County
- Member of the Florida Engineering Society Conservation and Environmental Quality Committee which monitors water quality related legislation and coordinates with FDEP to relay professional engineering

Relevant Experience

Crystal River Community Redevelopment Area (CRA) Stormwater Quality Master Plan, Crystal River, FL — Project engineer. The creation of the Crystal River CRA Stormwater Quality Master Plan improved total nitrogen and total phosphorus water quality in Kings Bay. The master plan also streamlined the future development and redevelopment of waterfront community assets within the CRA boundaries. The master plan included the total boundary area of the CRA with a heightened focus on the waterfront areas. It identified and provided conceptual design calculations for the project that the City could execute that were regional in nature and provided compensatory treatment for waterfront overlay areas within the CRA. In addition, the master plan provided additional site-specific design parameters for waterfront urban infill that improved water quality, met regulatory permit requirements, and maximized developable area for economic benefit. The master plan resulted in designs and recommendations that were consistent with the goals and requirements of regional stakeholders and regulatory agencies, namely SWFWMD and FDEP. It satisfied the planning design/ document requirements for funding alternatives such as SWFWMD grants, SRF loan applications, and public-private partnerships.

Dunnellon Rainbow Springs Septic to Sewer Feasibility Study, Dunnellon, FL — Project manager. Kimley-Horn was selected by Marion County Utilities to develop the preliminary project design for the Septic to Sewer Feasibility Study. This project involved developing flow projections, estimating the size of a regional wastewater treatment facility, conducting a revenue sufficiency analysis, developing a preliminary project design for each septic to sewer area, and estimating costs to design permit and construct the collection system. Preliminary sewer system layout, lift station siting, project phasing, initial cost estimates, identification of needed lots or easements. Grant compliance and public information meetings and coordination were also a part of this project. Sewer system layout methodology was praised by Marion County and referenced as what they thought they would need for the planning portion of this program management.

Stormwater Pump Station at the Intersection of Alton Road and North Bay Road and Associated Stormwater Improvements for North Bay Road Design-Build Project, Miami Beach, FL — Project manager and engineer of record. The project involved the relocation of three stormwater pump stations along Alton Road in the City of Miami Beach. The stations were located adjacent to Biscayne Bay on 10th Street, 14th Street, and adjacent to 5th Street. Services included verification and completion of stormwater modeling for the stormwater pump stations, pump station and stormwater conveyance system design, and FDOT plan revisions. The design had to incorporate systems to remove trash and provide water quality prior to discharge. Permitting and submittals were made to South Florida Water Management District and FDOT. The project involved the relocation of three stormwater pump stations along Alton Road in the City of Miami Beach.

Jupiter Inlet Colony Neighborhood Rehabilitation, Jupiter Inlet Colony, FL
QC/QA reviewer. Kimley-Horn provided construction management and engineer of record services for the Jupiter Inlet Colony Neighborhood Rehabilitation. This project converted its existing 241 septic tank systems to a central gravity sanitary sewer system. This elimination of individual septic systems leads to significant reductions in nutrient loading to groundwater and surface water bodies, providing for a 100% reduction in total nitrogen and phosphorus. This project consisted of the design for gravity sewer and lift station installation, lining of cement asbestos potable water mains, as well as new stormwater drainage system consisting of 5,500 linear feet of exfiltration trench, and roadway reconstruction. Additionally this project included bid phase service assistance, supervising the administration of the construction, and grant research and applications.

Molly Williams, PE

Quality Control/Quality Assurance

Professional Credentials

- Bachelor of Science, Civil Engineering, University of Cincinnati
- Professional Engineer in Florida, #54281

Professional Organizations

- American Society of Civil Engineers (ASCE), Member

Special Qualifications

- Has 29 years of experience
- Specialized expertise in stormwater management, financial and operational analysis, FEMA support, needs analysis and implementation planning, emergency management and response, transportation planning, roadways, and bicycle/pedestrian studies

Relevant Experience

Dona Bay Phase 2, Venice, FL — Project engineer. As part of the Dona Bay Watershed Restoration Program, the Dona Bay regional stormwater treatment facility includes creating storage capacity, designing conveyance improvements, and reestablishing the historical flows to the Myakka River. Modifications to control structures serving a wetland rehydration area, more than 8,000 feet of 72" pipe connecting the rehydration area to the proposed +-370-acre treatment facility are designed to reestablish the historical flow regime and reduce the freshwater discharge to the Dona Bay. Since the regional stormwater storage facility may be a source of potable water in the future, a secondary offsite system designed to collect, provide water quality treatment, and attenuate runoff from adjacent industrial properties. The offsite system includes a large littoral shelf to treat the runoff prior to discharge. The Dona Bay regional stormwater treatment facilities aim to reduce pollutant loads by an estimated 940 lbs/year of TN and a 10% improvement in saltwater habitat over 77 acres. A stormwater model (Extended Period Simulation) has been developed to verify total annual and average daily flows to the Dona Bay Phase 2 project and the permitted discharges to Myakka River Watershed to meet the requirements for the Southwest Florida Water Management District Cooperative Funding Initiative Grant.

Multi-Basin Stormwater Assessments, Naples, FL — Project engineer. Kimley-Horn is currently assisting the City of Naples in developing a stormwater basin assessment for five selected basins within the City limits. As a low-lying coastal area, the City has experienced increasing flooding incidents and has developed a long term plan to address the increasing flooding by basin. Our team is developing short, medium, and long range plans to address not only the current flooding occurring in the area; but also future flooding caused by climate change, including the impacts of sea level rise, and the increasing intensity return intervals of extreme events. Also included in these efforts are the financial models that will assist the City's decision makers in determining the long term costs of sea level rise to the tax base and home values, and how changes supported by the planning efforts will mitigate those loses.

Babcock Ranch Monitoring, Lee County, FL — Project engineer. Kimley-Horn is working with Babcock Ranch Property Holdings, LLC, (BPH) to monitor water quality within a 18,000-acre area per compliance requirements for a settlement between BPH and Lee County. The team conducts quarterly site visits to collect water level data from 40 monitoring locations, ensuring compliance with mitigation and water use permitting. In addition, monthly samples are collected at 15 sites for water quality parameters including nutrients (Nitrogen, Phosphorus, TSS, Salinity) and flow measurements. Kimley-Horn also conducted semi-annual pesticide and fertilizer sampling, which was carried out at 6 locations, along with regular groundwater sampling. Our team conducts quality assurance and quality control procedures on all data collected including statistical analyses which are combined into an annual report submitted to the County.

Bobby Jones Golf Course and Environmental Park, Sarasota, FL — Project engineer and grant support. Kimley-Horn prepared the environmental permitting applications for the SWFWMD ERP and Florida Department of Environmental Protection (FDEP) 404 program. Staff also coordinated with environmental staff at those agencies to conduct site visits and help ensure the project complied with environmental regulations. Kimley-Horn also conducted the necessary protected species surveys, notably a bonneted bat survey because the project area lies within the United States Fish and Wildlife Services (USFWS) consultation area. Portions of the Bobby Jones Golf Course property were constructed on a landfill, which extends into the west end of 17th Street Park. Limits of the landfill were delineated through field testing, and groundwater sampling was performed. Kimley-Horn coordinated with FDEP for project requirements related to work adjacent to the landfill area.

Kira Hansen, PhD, PE

Surface Water Quality Monitoring; Regulatory Compliance/Quality Assurance; Statistical Analysis

Professional Credentials

- Doctorate, Agricultural Engineering, University of Florida
- Masters, Agricultural Engineering, University of Florida
- Bachelors, Agricultural Engineering, University of Florida
- Professional Engineer in Florida, #99539

Professional Organizations

- American Water Resources Association (AWRA), Member

Special Qualifications

- Has nine years of experience involving water resources master planning, hydrologic and hydraulic modeling, drainage design, sustainable and resilient design and agricultural water and nutrient management
- Kira is proficient with ICPR4, ArcGIS, ET GeoWizards, HYDRUS 2D and HEC-RAS software and MATLAB, R, Visual Basics, and Python coding languages

Relevant Experience

Babcock Ranch Monitoring, Lee County, FL — Project engineer. Kimley-Horn is working with Babcock Ranch Property Holdings, LLC, (BPH) to monitor water quality within a 18,000-acre area per compliance requirements for a settlement between BPH and Lee County. The team conducts quarterly site visits to collect water level data from 40 monitoring locations, ensuring compliance with mitigation and water use permitting. In addition, monthly samples are collected at 15 sites for water quality parameters including nutrients (Nitrogen, Phosphorus, TSS, Salinity) and flow measurements. Kimley-Horn also conducted semi-annual pesticide and fertilizer sampling, which was carried out at 6 locations, along with regular groundwater sampling. Our team conducts quality assurance and quality control procedures on all data collected including statistical analyses which are combined into an annual report submitted to the County.

Spruce Creek Pollutant Loading Analysis, Port Orange, FL — Project engineer. Kimley-Horn was retained by the City of Port Orange to estimate the pollutant loading from the city limits to the Spruce Creek watershed. Kimley-Horn estimated the total nitrogen, total phosphorus, and dissolved oxygen loading from land use, municipal wastewater services and septic tanks. Kimley-Horn also estimated fecal coliform loading for a portion of the Spruce Creek watershed which was impaired for fecal coliform. Kimley-Horn will use this information in conjunction with the City to meet requirements for the MS4 permits for the City of Port Orange and identify locations for BMPs placement.

Watershed Management Plan, Lake Wales, FL — Project engineer. Kimley-Horn is assisting the City of Lake Wales to develop a Watershed Management Plan to identify locations and extents of flooding. An existing conditions model is being developed based on data provided by various agencies including the City that will map floodplains associated with various storm events. Results from the developed model are used to determine the Flood Protection Level of Service for existing buildings and roads. Kimley-Horn is working to coordinate with FDEP to help the city apply for grants and complete technical memorandums for project screening. Kimley-Horn is performing water quality sampling of Lake Wales to determine swim ability based on FDOH guidelines.

*Evaluation of Compact Bed Geometries for Water, Nutrient, and Economic Efficiency for Any Fresh Vegetables, East Coast of the US — Graduate student research assistant at the University of Florida. Conducted research projects focused on the evaluation of compact bed geometries to enhance the cultivation of fresh vegetables using plastic mulch across diverse regions including Florida, South Carolina, and the Eastern Shore of Virginia. These projects centered on optimizing production systems while ensuring environmental sustainability, particularly in irrigation, pest, and nutrient management. Kira Hansen designed and executed statistical experiments in collaboration with stakeholders. This involved site selection, layout planning, and the development of experimental protocols tailored to specific crop requirements. She gathered comprehensive data on plant performance, water usage, and nutrient dynamics. Employed advanced analytical techniques, leveraging tools such as HYDRUS 2D for unsaturated zone modeling and R for statistical analysis. The projects required multi-disciplinary coordination among various offices and teams. Kira ensured seamless communication and collaboration between project engineers, agricultural scientists, and field technicians, fostering a cohesive approach to problem-solving and project management. The result of this research increased environmental sustainability by promoting efficient irrigation practices and mitigating the impact of agricultural activities on ecosystems with the conversion of more the 50,000 acres of land to compact bed plasticulture production.

**Experience prior to Kimley-Horn*

Ronnie Van Fleet, PWS

Surface Water Quality Monitoring; Statistical Analysis

Professional Credentials

- Master of Science, Limnology, University of Florida
- Bachelor of Science, Wildlife Ecology, University of Florida
- Professional Wetland Scientist in SWS, #000731

Professional Organizations

- American Public Works Association (APWA), Member
- Florida Association of Environmental Professionals (FAEP), Member
- Society of Wetland Scientists (SWS), Life Time Member

Special Qualifications

- Environmental scientist with 37 years of professional experience
- Experience includes water quality monitoring for various wellfield projects, Sarasota County's Ambient Water Quality Monitoring Program, and various academic studies in North Central Florida, development of water quality monitoring programs and QC/QA Plans, best management practice water quality studies for stormwater and water quality projects, and compliance projects for unauthorized utilities discharges

Relevant Experience

Celery Fields Regional Stormwater Facility (CFRSF) Best Management Practice (BMP) Treatment Effectiveness, Sarasota County, FL — Upon completion of the final phase of their premier stormwater treatment and flood control facility, Sarasota County was required to demonstrate to the Florida Department of Environmental Protection (FDEP) that the stated pollutant load removal was being achieved. Ronnie was the lead project scientist in charge of data management and analysis for this two-year BMP study to quantify the effectiveness of the CFRSF in the treatment of stormwater runoff from the Phillippi Creek Basin. This study included preparation and FDEP approval of a Quality Assurance Project Plan; mobilization and installation of seven sites with continuous stage and/or velocity meters, ISCO automatic water quality samplers, dataloggers, modems/telemetry equipment, solar panels, and shelters; real-time data display website; a time of travel study; collection of 17 composite water quality samples for storm and baseflow events; flow discharge measurements and rating curve development for all sites; preparation of quarterly data reports containing calculated discharge, rainfall, water quality, and pollutant removal efficiency results; and a comprehensive final report.

Sarasota County Stream Flow Monitoring and Rating Curve Development, Sarasota County, FL — Ronnie served as a project scientist to perform flow monitoring in various stream throughout Sarasota County. Monthly flow measurements at 21 tidal and non-tidal stream sites were taken. In addition to the regular monthly inspections, high and low flow events were also measured annually to capture a full range of flow events. Stage data collected every 15 minutes or hourly from the County's gaging stations is obtained, QC/QA performed, and the data processed to develop standard USGS primary computations. Rating curves have been developed and were modified at the end of each year of monitoring. Primary computations of hourly and mean daily stage, maximum, minimum and mean daily discharge are provided monthly, with total, maximum, minimum, mean and runoff in inches summarized by month in annual reports.

FDOT District 7, Old Tampa Bay Water Quality Improvement and Seagrass Monitoring Project, Hillsborough County, FL — The Old Tampa Bay Water Quality Improvement Project consists of constructing a 229-foot bridge opening in the Courtney Campbell to increase water circulation in the far eastern portion of Old Tampa Bay. The project will partially reestablish the hydrologic integrity, significantly restore the historical flow patterns, and ameliorate water quality impacts associated with the artificial impediment to water circulation. These improvements are anticipated to improve conditions sufficiently such that approximately 320 acres of seagrass meadows would be enhanced. The project involved finding baseline and post-construction monitoring necessary to document the project's success, as well as assist in permit compliance and construction support. This project includes a dye study, neutrally buoyant object monitoring, continuous and monthly water quality measurements, dissolution block monitoring and semi-annual seagrass species composition and cover measurements within 270 quadrats. Ronnie served as a Project Scientist for the extensive water quality and seagrass monitoring program.

FDOT Hydrobiological Monitoring of the Evers Reservoir and Braden River, Manatee County, FL — The project involved conducting investigations of the Evers Reservoir (ER) and the tidal Braden and Manatee Rivers to characterize physical, chemical, and biological conditions. Ronnie served as a Project Scientist for a quarterly water quality monitoring and data reporting program involving two stations in ER and 10 sites in the tidal Braden and Manatee Rivers and has continued since 1992.

Kim Arnold, PG

Groundwater Monitoring and Hydrogeology Planning

Professional Credentials

- Master, Earth and Atmospheric Science, Duke University
- Master, Environmental Engineering, University of Florida
- Bachelor of Science, Geology, Southern Methodist University
- Professional Geologist in Florida, #2565

Professional Organizations

- American Water Resources Association (AWRA), Member

Special Qualifications

- 22 years of experience as a practicing hydrogeologist in Southwest Florida
- Experience with regulatory permitting; water supply planning; production and injection well design, testing and construction observation services; groundwater modeling; and due diligence American Institute of Professional Geologists (AIPG)/ Florida Association of Professional Geologists (FAPG) National Groundwater Association (NGWA)

Relevant Experience

FY25 Regulatory Compliance Services: Hydrogeology, Port Charlotte, FL — Technical advisor. Kimley-Horn provided comprehensive regulatory compliance and permitting support for Charlotte County Utilities' wastewater and reclaimed water systems. Services included program management, wellfield monitoring and reporting, permit renewals, groundwater monitoring, injection well and monitoring well improvements, mechanical integrity testing. Additionally, Kimley-Horn prepared quarterly compliance reports, maintained a regulatory dashboard, and provided recommendations to ensure continued operational and regulatory compliance across the County's wastewater infrastructure.

Babcock Ranch Monitoring, Lee County, FL — Project engineer. Kimley-Horn is working with Babcock Ranch Property Holdings, LLC, (BPH) to monitor water quality within a 18,000-acre area per compliance requirements for a settlement between BPH and Lee County. The team conducts quarterly site visits to collect water level data from 40 monitoring locations, ensuring compliance with mitigation and water use permitting. In addition, monthly samples are collected at 15 sites for water quality parameters including nutrients (Nitrogen, Phosphorus, TSS, Salinity) and flow measurements. Kimley-Horn also conducted semi-annual pesticide and fertilizer sampling, which was carried out at 6 locations, along with regular groundwater sampling. Our team conducts quality assurance and quality control procedures on all data collected including statistical analyses which are combined into an annual report submitted to the County.

Collier County Wellhouse 25 Assessment and SRCO, Collier County, FL — Project manager. Collier County Utilities experienced a release of diesel fuel near a shallow PWS well following Hurricane Irma. The assessment involved soil sampling along with the installation, survey, instrumentation, and sampling of monitoring wells to establish groundwater flow gradients and determine whether parameters of concern fell below the applicable Soil Cleanup Target Levels (SCTLs) and Groundwater Cleanup Target Levels (GCTLs) following remediation activities by others. A report summarizing the findings was prepared and submitted to the FDEP along with a request for a Site Rehabilitation Completion Order (SRCO), which the FDEP granted.

Cattle Dip Vat Arsenic Assessment and Delineation, Glades County, FL — Project manager. The project involved performing a Ph I ESA on an approximately 1,200-acre site, which identified the presence of a historical cattle dipping vat (CDV). The subsequent CDV assessment involved multiple rounds of soils and groundwater sampling to identify the presence and extent of elevated arsenic levels. Several dozen monitoring wells of various depths were installed, surveyed, instrumented, and sampled to determine groundwater flow gradients and delineate the horizontal and vertical extent of arsenic migration. Soil sampling also delineated the extent of elevated toxaphene concentrations. Preliminary options for remediation were presented to the client, along with a summary of assessment results, in a series of letter reports.

Ave Maria Public Water System (PWS) Wellfield Expansion, Ave Maria, FL — Project manager. Kimley-Horn designed, permitted, and provided services during construction for two additional Sandstone aquifer production wells at the WTP site. They prepared plans and specifications for 12" diameter Sandstone aquifer wells, along with water quality sampling and step-drawdown testing. The variable and largely unconsolidated target production zone required careful field observation and coordination with the water well contractor to determine casing and total depths, as well as screened versus open hole construction. Upon completion, both wells produced in excess of 1,000 GPM with chloride concentrations less than 30 mg/L using an open hole construction technique.

Jennifer Briggs, PMP

Regulatory Compliance/Quality Assurance

Professional Credentials

- Bachelor of Science, Psychology, Florida State University
- Project Management Professional, #4071427

Professional Organizations

- American Water Works Association (AWWA), Member
- Sarasota County Bicycle Pedestrian Advisory Committee

Special Qualifications

- Has obtained permits for Sarasota County Utilities, Charlotte County Utilities, and City of North Port
- Permit modifications for Sarasota County Utilities North Master Reuse System, including permit modifications to change capacity and monitoring well relocations
- Experience planning, coordinating, and permitting relocation of monitoring well networks in Sarasota County
- Extensive experience in project management, coordination, and oversight of hydrogeology compliance for Charlotte County Utilities, including septic-to-sewer monitoring well plugging and abandonment of over 60 wells

Relevant Experience

Charlotte County Utilities, FY 21-FY 25 Regulatory Compliance Services, Charlotte County, FL — Deputy project manager. Kimley-Horn was selected to perform the FY22 through FY24 regulatory compliance water, wastewater, and hydrogeology professional engineering support for CCUD. These services included tasks to evaluate and maintain CCUD's compliance with regulatory requirements as set out in the existing permits. Additionally, regulatory assistance was provided to prepare for regulatory changes and to modify existing practices to meet changing regulatory scrutiny. The regulatory compliance tasks included WRF and Inject Well permit renewals, water and wastewater treatment facilities audits, and capacity evaluations.

Charlotte County Utilities Facilities Audit Reports, Port Charlotte, FL — Deputy project manager. Kimley-Horn has been engaged over the past four years under regulatory compliance contracts to conduct comprehensive audit reports for Charlotte County Utilities, covering all major facilities, including Burnt Store WRF, East Port WRF, Rotonda WRF, West Port WRF, the Leachate Facility, Burnt Store ROWTP, and the laboratory. Each audit provided an in-depth overview of facility backgrounds and processes, followed by detailed inspections conducted in collaboration with chief operators to assess permit compliance and operational effectiveness. The audits evaluated the condition of all processes and equipment, with findings documented to identify areas requiring attention. Additionally, historical DMR data was analyzed to compare performance against permitting requirements, facilitating the identification of compliance trends and potential issues. The reports concluded with recommendations for necessary repairs and operational enhancements. Jennifer was responsible for keeping the project schedule on track including coordination, report preparation, and ensuring that the findings met regulatory standards to support the ongoing efficiency of the County's wastewater treatment infrastructure.

West Villages Improvement District Regulatory Compliance Services, North Port, FL
Permit coordinator. Kimley-Horn is responsible for supporting the West Villages Improvement District to manage and comply with the FDEP operating permit for the reuse distribution system. Documents developed as part of the reuse distribution system permit management include the Operation and Maintenance Manual, Cross Connection Control Manual, and Reuse storage pond inventory. Kimley-Horn is involved in the planning of the reuse distribution system to consult on the impacts on the permit and identify the viability of projects from a regulatory perspective. Finally, the project includes training WVID staff on developing discharge monitoring reports and managing and maintaining the requirements of the FDEP permit.

Boca Grande CDBG-MIT Grant Assistance, Punta Gorda, FL — Administrative support. Kimley-Horn assisted the City of Punta Gorda with the application and approval for a CDBG-MIT grant (Boca Grande Area Water Quality Improvement Project) in the amount of $2,521,250.00 to increase community resiliency and provide necessary flood control and water quality treatment of stormwater runoff from the Boca Grande neighborhood. Kimley-Horn assisted the City of Punta Gorda with the application and approval for a CDBG-MIT grant (Boca Grande Area Water Quality Improvement Project) in the amount of $2,521,250.00 to increase community resiliency and provide necessary flood control and water quality treatment of stormwater runoff from the Boca Grande neighborhood.

Jeff Goodwin

Regulatory Compliance/Quality Assurance

Professional Credentials

- Bachelor of Science, Biology, Guilford College

Professional Organizations

- Florida Water Environment Association (FWEA), Member
- American Water Works Association (AWWA), Member

Special Qualifications

- Brings 26 years of experience working with utility infrastructure
- Extensive experience with regulatory compliance, consent order negotiation and reporting, wastewater treatment processes, transmission, and collection systems
- Skilled in water treatment, environmental awareness, environmental services, environmental consulting, and wastewater resource management
- Member of the AWWA Utility Council

Relevant Experience

Charlotte County Utilities, FY 2024, FY 2025 Regulatory Compliance Water and Wastewater, Port Charlotte, FL — QC/QA reviewer. Kimley-Horn was selected to perform the FY22 through FY24 regulatory compliance water and wastewater professional engineering support for CCUD. These services included tasks to evaluate and maintain CCUD's compliance with regulatory requirements as set out in the existing permits. Services included project management, preparation of a Collection System Action Plan and Capacity Analysis Report, and development of the West Port Water Reclamation Facility (WRF) permit renewal application. The team conducted site inspections, facilitated coordination with FDEP, and performed regulatory audits for multiple facilities. Additionally, Kimley-Horn prepared quarterly compliance reports, maintained a regulatory dashboard, and provided recommendations to ensure continued operational and regulatory compliance across the County's wastewater infrastructure.

West Villages Improvement District Regulatory Compliance Services, North Port, FL Technical advisor. Kimley-Horn is responsible for supporting the West Villages Improvement District to manage and comply with the FDEP operating permit for the reuse distribution system. Documents developed as part of the reuse distribution system permit management include the Operation and Maintenance Manual, Cross Connection Control Manual, and Reuse storage pond inventory. Kimley-Horn is involved in the planning of the reuse distribution system to consult on the impacts on the permit and identify the viability of projects from a regulatory perspective. Finally, the project includes training WVID staff on developing discharge monitoring reports and managing and maintaining the requirements of the FDEP permit.

Pinellas County Septic to Sewer Program Project 1 - Professional Engineering Services - ARPA Funds; 23-0289-RFP-CCNA-Non-Continuing, St. Petersburg, FL — Team member. Kimley-Horn completed a high-level alternatives analysis to determine the most feasible alternative for septic to sewer replacement in the designated service areas. Each service area was evaluated to determine the potential impacts to the associated impaired water body as well as the estimated nutrient reduction associated with the septic tank removal. Factors such as community impacts, assessment of public perception and input, and review of feasible collection system technologies were considered. The alternatives were evaluated based on capital cost, operations, maintenance/accessibility, public inconvenience, and life cycle cost. Kimley-Horn provided a recommended alternative to the Client which included a phased construction approach in order to utilize available funds.

Southeast Master Pump Station, Zephyrhills, FL — Technical advisor. The project developed a basis of design report based on the Southeast Master Pump Station Siting and Force Main Route Study (MPS Study) within Pasco County's Southeastern Sewer Collection System. Kimley-Horn utilized the County's existing pump daily runtime data, field hardware reports, future development plans, and land use categories to establish existing and future sanitary flows in a hydraulic model of the County's sewer system. The hydraulic model was used to properly size the MPS and the corresponding discharge force main to connect into the existing sewer system. The report provided site alternatives for a new master pump station (MPS) to provide additional sewer capacity for the service area as well as determined a route for the proposed force main to discharge to the headworks at the Southeast Wastewater Treatment plant (SEWWTP).

Bill Spinner, PG

Groundwater Monitoring and Hydrogeology Planning

Professional Credentials

- Bachelor of Science, Geology, University of South Florida
- Professional Geologist in Florida, #2570

Special Qualifications

- Has more than 21 years of experience with preparing Phase I Environmental Site Assessments and conducting and managing remediation projects involving Brownfi eld sites, hazardous waste, industrial waste, and petroleum contamination; groundwater modeling; and regulatory reporting
- Experience with environmental compliance, RCRA, CERCLA, and state hazardous waste and petroleum cleanup programs

Relevant Experience

Pine Island Flatwoods Preserve Groundwater Monitoring and Reporting, Lee County, FL
Project manager. Kimley-Horn is providing Lee County with continuing groundwater monitoring services. The project team coordinates with the Lee County analytical laboratory to collect groundwater samples from a network of eight wells on a quarterly basis. Quarterly Groundwater Monitoring Reports are prepared, outlining all sampling activities. Data is evaluated to determine groundwater trends.

Ridge Fertilizer, Lake Wales, FL — Project manager. Kimley-Horn performed a Phase II ESA to evaluate groundwater conditions across the site. Results of this investigation identifi ed dieldrin in the groundwater in the area along the western property boundary at concentrations exceeding the GCTL. Soil impacts were identified in the central portion of the site at concentrations exceeding the residential direct exposure soil cleanup target levels (RSCTLs). Kimley-Horn completed a Limited Site Assessment to further evaluate soil and groundwater impacts identified during the June 2011 Phase II ESA. Additional assessment events defined the horizontal and vertical extent of soil and groundwater impacts. The FDEP granted a conditional site rehabilitation completion order (CSRCO) that included encapsulating the impacted soil and limiting groundwater use onsite. Kimley-Horn prepared an Engineering Control Maintenance Plan (ECMP) to ensure the cap is maintained. Kimley-Horn conducts annual observations of the cap as part of the ECMP.

St. Petersburg FedEx Logistics Facility Reuse of Former Landfill, St. Petersburg, FL —
Project manager. Kimley-Horn was contracted to perform a Phase I Environmental Site Assessment (ESA) on a Closed Class III Landfi ll for the purposes of redeveloping the landfill into a distribution facility, which will include a 240,000-square-foot warehouse, parking lots, and stormwater retention ponds on top of the landfi ll. A Phase II ESA was completed to evaluate current landfi ll conditions with respect to soil/groundwater contamination and landfi ll gas concentrations. Kimley-Horn coordinated with the Florida Department of Environmental Protection (FDEP) prior to any landfi ll disturbance, and to discuss longterm care. Kimley-Horn prepared documents required by FDEP (Waste Relocation Plan, Health and Safety Plan, Permit Revisions) to ensure landfill integrity and to provide our client with the information necessary for good business decisions. All documents were approved, and the facility has been constructed. Kimley-Horn prepared the necessary permit modifications for post-construction monitoring and is currently overseeing groundwater and landfill gas monitoring.

Resorts World Miami (former Miami Herald site), Miami, FL— Member of the Kimley-Horn team that is providing site/civil engineering, environmental, and ongoing traffic engineering services for the 14-acre bayfront site that previously housed the Miami Herald newspaper at 1 Herald Plaza in Miami. The proposed project includes four new hotels with more than 5,000 rooms and two residential towers featuring up to 1,000 units; a luxury retail galleria; a 3.6-acre rooftop lagoon and natural sand beach; more than 50 restaurants, lounges, bars, and nightclubs; a high-tech multimedia entertainment area showcasing the music and culture of Florida and South America; and 700,000 square feet of convention and meeting space. The resort will help develop the three-mile BayWalk, which highlights a 150-acre leisure and entertainment area in downtown Miami. Team tasks include due diligence, parking studies, underground utility design, preparation of a Special Area Plan (SAP) traffic study consistent with City of Miami 21 Zoning Code, environmental site assessment and potential remediation planning, including contaminant delineation, water quality evaluation, and quarterly groundwater monitoring.

Resume
Dale D. Dixon, PhD
Laboratory Director, BenchmarkEA

Dr. Dixon is BenchmarkEA's Laboratory Director and is responsible for laboratories in North Port and Palmetto. As a company co-founder he has led the company from one employee twenty-four years ago to thirty employees currently. During this period, the laboratory operation has changed from initially a predominantly manual mode to a highly automated operation for both analyses and processing generated data. Because of his first-hand experience in this development, Dr. Dixon is intimately familiar with all facets of the environmental laboratory. He has emphasized utilization of up-to-date analytical instruments and automated reporting up-loadable to client systems. Under Dr. Dixon's direction the company has grown to a current clientele base that includes industrial, mining, engineering and governmental markets.

Dr. Dixon has 33 years of experience managing all aspects of environmental analyses and sample collection in the field. His experience background includes managing long term surface water studies and groundwater projects for drinking water production sites such as ASR wells with RO systems and groundwater monitoring for large industrial facilities. During the years of operation he has developed numerous relationships with engineering firms and governmental agencies.

Dr. Dixon has extensive laboratory management experience including the areas of organic chemistry, polymer chemistry, catalytic chemistry and analytical chemistry. Prior to the founding of BenchmarkEA, he managed industrial chemical research at Air Products and Chemicals, Inc. Achievements include being named as an inventor on forty-four patents and as an author on twenty-three technical publications. His work won the IR-100 award from Industrial Research Magazine for having one of the one hundred most important inventions for 1978.

Dr. Dixon received a Ph.D. degree in organic chemistry from Oregon State University.

II. PROPOSED MANAGEMENT PLAN

II. PROPOSED MANAGEMENT PLAN

A. Team Organization/Responsible Parties

Kimley-Horn has a long history of achieving successful projects through a combination of effective project management and technical expertise. Kimley-Horn's unique singe profit center mindset and organizational structure ensures that sampling is completed routinely and on time, ensuring comprehensive coverage and support throughout the duration of the project. Kimley-Horn has two local offices, Fort Myers and Sarasota that have seventeen surface water engineering and seven environmental staff that are ready and able to serve the County.

Project Management Team

Our project team organization starts out with our integrated management team that consists of **Kellie Clark, PE; Lewis Bryant, PE; Alan Garri, PE; Kira Hansen, PhD, PE; and Molly Williams, PE**. Our team's comprehensive knowledge and thorough understanding of water quality monitoring and data analysis are essential for this project's success. It requires a keen awareness of FDEP standards, procedures and guidelines, close coordination with public agencies, and interaction with the community. Most importantly, an understanding of the community's vision for the future allows us to anticipate needs and provide creative solutions that address today's needs while planning for tomorrow.

Kimley-Horn operates a client-centered style of management. Our practice-centered structure means we are oriented toward maintaining the high levels of quality and communication that you expect. **Kellie Clark, PE**, will serve as project manager and will work closely with Charlotte County staff throughout the project. Our project management approach consists of the following proven fundamentals:

- ✓ Develop a clear understanding of the project goals
- ✓ Develop a comprehensive work plan and schedule to set milestones and project goals
- ✓ Set weekly milestones (more manageable) that support the larger milestones and review with the project team on a weekly basis
- ✓ Create an atmosphere that encourages clear communications and teamwork to accomplish the project goals
- ✓ Make quality a priority every day

UNDERSTANDING PROJECT GOALS. Clearly defining the challenges and setting objectives is critical to a successful project. Our vision for project success involves open discussions with the County about the challenges that need to be addressed and priorities that need to be considered. We will provide Charlotte County staff with advice based on the benefit of our experience and our unique local knowledge. We will analyze critical success factors alongside unique project challenges so that priorities can be set and objectives can be defined.

DEVELOPING A COMPREHENSIVE WORK PLAN. After collectively understanding the project goals, we will develop a comprehensive work plan that identifies the goals and provides a focused action plan that is necessary to achieve those goals. Anticipating the challenges and obstacles early in the process allows the team and County to investigate and understand these challenges while developing mechanisms to address them before they have an impact on project schedules and budgets. Our project approach utilizes schedule control mechanisms at decision-making points in the project.

SET WEEKLY MILESTONES. As a result of the extensive relationships between the team, we can easily connect on a weekly basis to ensure schedule and milestones are on track and discuss and communicate any concerns that can immediately be brought to the County's attention. Meeting weekly helps meet our long-term monthly project objectives and ultimately our overall project goals and milestones.

INVOLVE STAKEHOLDERS AND VARIOUS DISCIPLINES. Success in projects like this one can be difficult to achieve if all parties and stakeholders including regulatory agencies, are not involved from the beginning. It will be critical for all parties to stay involved for the duration of the project and specifically during times when critical decisions are being discussed. Keeping the stakeholders and other disciplines involved will help identify any obstacles early on that may impact the project schedule or budget. Furthermore, involvement throughout the process will create committed stakeholder alignment for the future of the County's water plans for the western County service area.

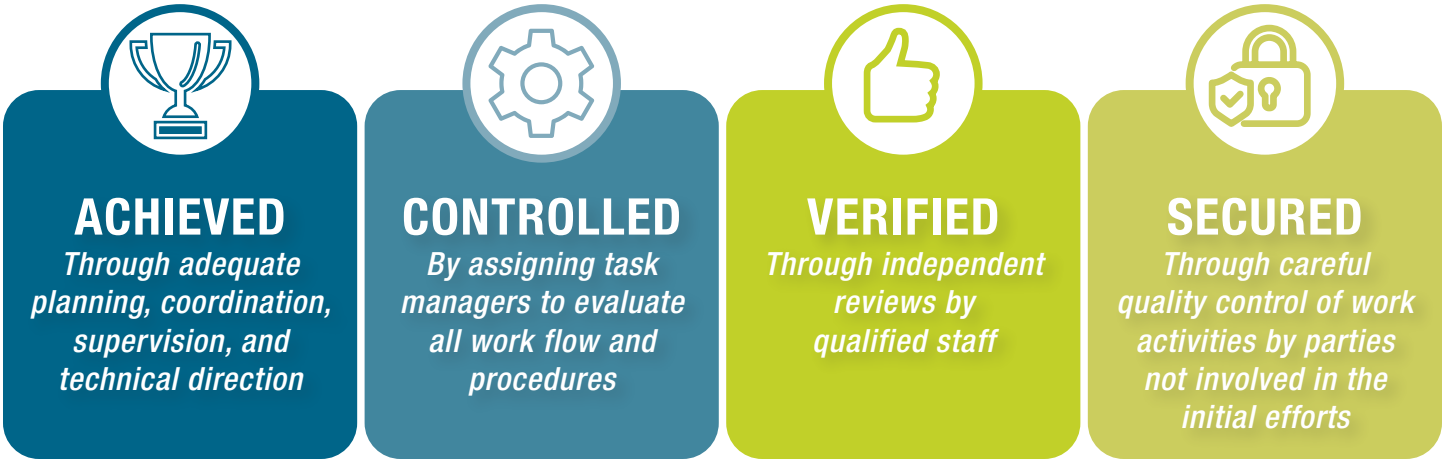
COMMUNICATION IS KEY. Clear communication with our clients and the project team is part of the routine at Kimley-Horn. Based on the County's desired level of communication, Kimley-Horn will tailor and implement a communication and reporting program to meet the County's project management needs and vision for success. Kimley-Horn will collaborate closely with the County to clearly understand the project objectives and we will focus on continual and open communication of all project activities. Our team of engineers will be involved in every step of the development of this plan from beginning to end. This allows County staff and other stakeholders to communicate their desires early in the analysis and maintain a consistent point of communication throughout the project life.

CULTURE OF QUALITY. Kimley-Horn has developed an extensive internal quality control program. Our formal QC/QA program is based upon assigning experienced senior professionals, who are otherwise qualified to manage a particular project, to serve as independent peer review of all deliverables, including interim deliverables.

As your surface water monitoring consultant for Charlotte County's project, Kimley-Horn will provide you with:

- ✓ Consultant staff who are detail-oriented, locally based, and will draw on their extensive engineering design and monitoring to make the best decisions for the County's residents and staff
- ✓ A project manager who is enthusiastic about serving Charlotte County and has done so through years of previous County work
- ✓ Team members with experience and a proven track record in the planning, statistical design, and monitoring
- ✓ A multidisciplinary firm with the strength, depth, and resources that only a national firm can provide, coupled with the staff and relationships required to work with local regulators effectively and efficiently
- ✓ A team with the passion, desire, experience, and creativity to develop innovative, time- and cost-saving ideas to meet your needs on this project

Kimley-Horn Quality Control is



1. Program Management/Scheduling/Logistics

Your project manager, **Kellie Clark, PE** will be responsible for the overall project management, including coordination with the County, field work scheduling, and project schedule and logistics, helping to ensure that key milestones are met. She will utilize our project management software and internal tools to communicate timelines, track progress, and keep the team aligned.

While Kellie will serve as the primary point of accountability, each team member will contribute to maintaining the schedule and delivering high-quality work. **Molly Williams, PE** will oversee quality assurance, ensuring that all monitoring protocols, data collection, and reporting meet regulatory standards and support the County's long-term water quality goals.

Kellie Clark, PE, will work closely with County staff to help ensure the monitoring plan supports representative sampling aligned with project goals and timelines. **Kira Hansen, PhD, PE**, will oversee surface water quality monitoring efforts, statistical analysis of monitoring results and Quality Control/Quality Assurance (QC/QA) procedures for monitoring data. **Alan Garri, PE,** will serve as a technical advisor to the team with years of experience in total nitrogen (TN) removal, basin management action plan (BMAP) compliance, and construction management. Kira will work closely with Alan to confirm methodology early on and periodically throughout the project. As needed, **Kim Arnold, PG**, will lead groundwater monitoring and hydrogeologic planning in the case of groundwater monitoring needs. **Ronnie Van Fleet, PWS**, will be responsible for any water vegetation and physical habitat classification.

2. Field Sample Collection/Measurement

Kellie Clark, PE and **Kira Hansen PhD, PE** will lead the efforts for field sample collection and measurements. This team has extensive experience with field sample collection and management of field logs, chains of custody, and maintaining high regulatory standards. Kimley-Horn also has experience with geospatial information systems (GIS) which will serve to increase data availability, geospatial data collection, and coordination with the County. Kimley-Horn staff are trained and familiar with the FDEP Standard Operating Procedures (SOPs), and sample collection will be performed consistent with DEP-SOP-001/01 and SOP FS2100 for Surface Water Sampling.

3. Analytical Laboratory for Parameters Described in RP-23, Sections A and B (May be Multiple Labs)

Kellie Clark, PE, and **Dale Dixon, PhD**, will be the primary contacts with regards to analytical laboratory analysis. BenchmarkEA will be our primary laboratory for the parameters listed in RP-23A, as they are certified for each of the listed analytes. If the County identifies any additional sampling they would like to conduct that BenchmarkEA is not certified to perform, BenchmarkEA regularly works with a network of laboratories state wide to perform specialty analyses the County may request. When BenchmarkEA is not certified for an analysis, the sample can be outsourced through their receiving department. **Dale Dixon, PhD** will ensure the samples arrive at the subconsultant lab and results will be added onto the BenchmarkEA final report. Subconsultant lab data will be indicated using their laboratory number under the analyst column on the final submitted report.

4. Data/Documentation Review and Reporting

Kellie Clark, PE, Dale Dixon, PhD, and **Kira Hansen PhD, PE**, will lead internal coordination and communication efforts to ensure seamless collaboration with County staff and regulatory agencies. **Dale Dixon, PhD**, will complete QC/QA practices within the laboratory to ensure the data meets the needs of the County. **Kellie Clark, PE**, and **Kira Hansen, PhD, PE**, will be responsible for reporting the final values to the County in a format consistent with the Florida Department of Environmental Protection's (FDEP's) Watershed Information Network (FDEP WIN).

III. PREVIOUS EXPERIENCE OF TEAM PROPOSED FOR THIS PROJECT

III. PREVIOUS EXPERIENCE OF TEAM PROPOSED FOR THIS PROJECT

Kimley-Horn offers a team with the technical expertise and field experience to support Charlotte County's water quality sampling and analysis efforts. We have assembled a team with the qualifications to deliver all required services under this contract, including sample collection, laboratory coordination, QC/QA, and regulatory reporting. Our integrated water resources team is committed to providing cost-effective, scientifically sound solutions that meet FDEP standards and support the County's environmental goals. With a strong background in groundwater and surface water sampling, we understand the regulatory expectations and logistical challenges of this work.

This section includes recent project examples in which our team members collaborated on efforts similar in scope and design to the services requested in this RFP.

Our proposed management team—**Kellie Clark, PE; Lewis Bryant, PE; Alan Garri, PE; Kira Hansen, PhD, PE;** and **Molly Williams, PE**—have a long-standing history of collaboration on water quality and environmental compliance projects across Florida. These individuals have worked together on numerous efforts involving surface water and groundwater monitoring, regulatory reporting, and infrastructure planning. Their coordination is not only well-established but also deeply integrated into Kimley-Horn's practice-centered structure, which emphasizes cross-discipline collaboration and continuity across project phases.

Relevant Team Experience

Our team understands the complexities of planning and executing water quality sampling and analysis programs that are scientifically rigorous, regulatory-compliant, and responsive to site-specific conditions. With extensive experience supporting public utilities and environmental agencies, we are well-versed in the protocols, documentation, and quality assurance standards required by FDEP and other regulatory bodies. Our professionals bring a strong track record in surface and groundwater sampling, nutrient and microbial analysis, and data reporting aligned with state and federal requirements. The following projects highlight how members of our project team have recently collaborated to deliver comprehensive water quality services that align with the goals and scope of this contract.

Charlotte County Utilities Regulatory Compliance Water, Wastewater, and Hydrogeology

CHARLOTTE COUNTY, FL

Kimley-Horn was selected to perform the Fiscal Year FY21, FY22, FY23, FY24, and FY25 regulatory compliance water, wastewater, and hydrogeology professional engineering support for CCUD. These services included tasks to evaluate and maintain CCUD's compliance with regulatory requirements as set out in the existing permits. Additionally, regulatory assistance is provided to prepare for regulatory changes and to modify existing practices to meet changing regulatory scrutiny. The regulatory compliance program with CCU tracks multiple compliance requirements of one (1) water treatment plant, four (4) wastewater treatment plants, one (1) leachate facility, three (3) groundwater monitoring systems and three (3) underground injection control systems. Kimley-Horn provides excellent project management, coordination, data collection, reporting, and regulatory compliance consulting to CCUD, utilizing

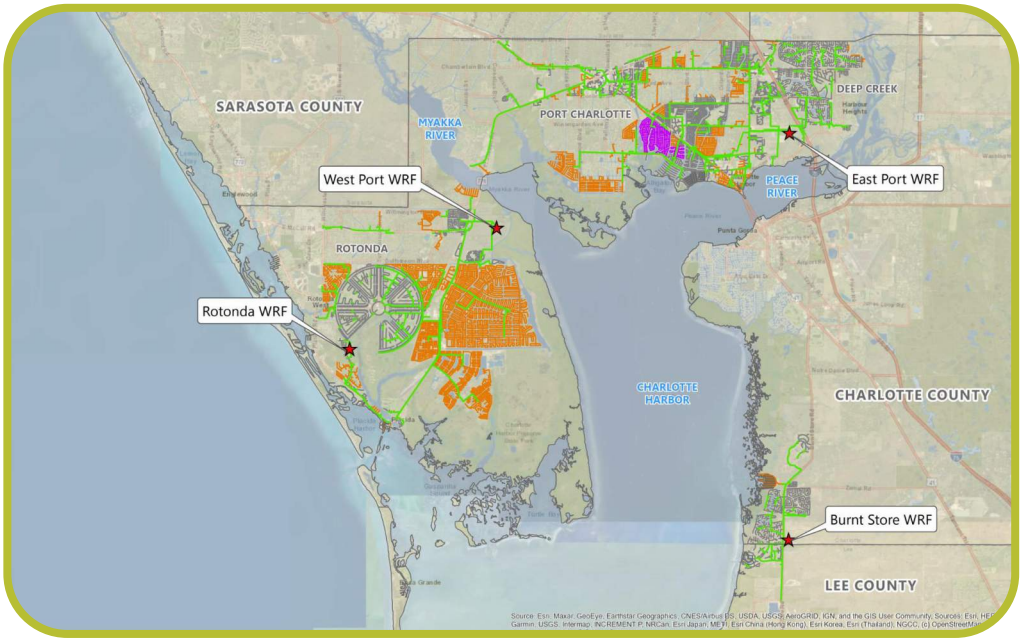
Project Relevance

- ✓ Regulatory compliance and permitting
- ✓ Groundwater monitoring

online dashboard with compliance deadline tracking, quarterly compliance reports, an online ShareFile datebase, and progress meetings.

Our involvement with this program has afforded us a comprehensive understanding of the County's facilities, service area, and personnel, so we're able to hit the ground running at the moment of contract award.

The following were completed or are currently underway:



- West Port WRF, East Port IW-1, Burnt Store IW-2, and Burnt Store IW-1 permit renewals
- Deep injection well plugging and abandonment cost estimates
- Spring Lake Pilot septic to sewer well plugging and abandonment
- WRF and reclaimed water booster pump station vulnerability assessments
- Treatment facilities quarterly updates
- Calloosahatchee River Basin Management Action Plan Development
- Burnt Store Annual Wellfield Report
- Burnt Store and West/Central Public Supply Annual Reports and Water Audits
- Babcock Ranch wellfield monitoring and 10-year compliance report
- Burnt Store IW-1 operational testing and regulatory review assistance
- Burnt Store RO Membrane Clean-in-Place Standard Operating Protocol
- Burnt Store Production Well 15 evaluations
- EPA Lead Service Line Inventory
- Consent Order Compliance Program Management

The project also includes tracking flows and water quality at all treatment facilities as reported to FDEP and permit compliance schedules. A dashboard was developed to simplify this tracking and include a user-friendly interface to track historical flow and water quality data and schedules.

Monitoring Wells P&A for West Spring Lake Septic to Sewer Program

CHARLOTTE COUNTY, FL

Kimley-Horn was engaged to support a septic-to-sewer conversion initiative by providing professional engineering services for the plugging and abandonment (P&A) of approximately 68 monitoring wells previously constructed by the County. As part of this effort, Kimley-Horn contracted a licensed hydrogeologist to develop detailed P&A plans in coordination with the County, the Southwest Florida Water Management District (SWFWMD), and the selected well contractor. The team conducted site visits to locate and assess each well, reviewed SWFWMD records to gather construction details, and developed technical specifications and bid documents to support contractor procurement. Kimley-Horn provided ongoing support throughout the bidding process and supervised the P&A operations, which were executed by a licensed well contractor responsible for securing permits and submitting completion reports to SWFWMD. These reports were compiled into a comprehensive final report prepared by Kimley-Horn, which included location maps, data tables, and all applicable regulatory documentation. The report underwent multiple review cycles with both the client and the County to ensure accuracy and completeness prior to final submission.

Project Relevance

- ✓ Regulatory reporting
- ✓ Groundwater monitoring
- ✓ Coordination with SWFWMD and FDEP

West Villages Improvement District Regulatory Compliance Services

NORTH PORT, FL

Kimley-Horn is responsible for supporting the West Villages Improvement District (WVID) to manage and comply with the FDEP operating permit for the reuse distribution system. Groundwater monitoring is routinely sampled and analyzed for compliance. Through our regulatory services, Kimley-Horn has tracked aquifer behavior through quarterly groundwater condition reporting, which has led to permit modifications for updated water quality parameters. In addition to groundwater analysis and tracking, all required monthly, quarterly, and annual reporting is developed and submitted by Kimley-Horn or provided to the WVID for electronic submittals such as in the EzDMR system. Documents developed as part of the reuse distribution system permit management include:

Project Relevance

- ✓ Groundwater sampling
- ✓ Quarterly and annual reporting
- ✓ Permit compliance

- Quarterly groundwater sampling reports
- Annual Reuse Report
- Operations and Maintenance (O&M) Manual
- Cross Connection Control Manual
- Reuse Storage Pond Inventory
- WVID RDS Domestic Wastewater Facility Permit Renewal Application Package

Kimley-Horn is involved in the planning of the reuse distribution system to consult on the impacts on the permit and identify the viability of projects from a regulatory perspective. Finally, the project includes training WVID staff on developing discharge monitoring reports and managing and maintaining the requirements of the FDEP permit.

Water Quality Sampling

LAKE WALES, FL

Kimley-Horn is partnering with the City of Lake Wales to develop a comprehensive Watershed Management Plan aimed at identifying flood-prone areas and improving water quality in Lake Wales. As part of this initiative, an existing conditions model is being created using data from the City and other agencies to map floodplains for various storm events. This model will help determine the Flood Protection Level of Service for existing buildings and roads. In addition to the modeling work, Kimley-Horn is coordinating with the Florida Department of Environmental Protection (FDEP) to assist the City in applying for grants and preparing technical memorandums for project screening.

Project Relevance

- ✓ Year-long water quality monitoring program
- ✓ E. coli sampling
- ✓ Coordination with FDEP
- ✓ Regulatory compliance

Complementing the flood risk assessment, Kimley-Horn is also conducting a year-long water quality monitoring program for Lake Wales. This includes E. Coli sampling at four designated locations, twice per month, totaling 24 sampling events per site. These locations are aligned with up to two swim areas, and all samples are collected simultaneously. Kimley-Horn will coordinate the delivery of samples to a laboratory. Once all sampling events are completed, Kimley-Horn will analyze the results and prepare a technical memorandum summarizing the data and evaluating swim safety based on EPA guidelines. Additionally, Kimley-Horn will offer on-site training to City staff interested in learning proper sampling techniques.

Babcock Ranch Community Independent Special District (ISD) District Engineer

FORT MYERS, FL

Kimley-Horn's role as District Engineer for the Babcock Ranch Community Independent Special District. Kimley-Horn provides professional services that include developing the District Improvement Plan, preparing reports, and supporting meetings of the District's Board of Supervisors. The firm also reviews development plans and permits for compliance with District policies and regulations. Additional responsibilities include acting as the District's designated professional representative, providing strategic consultation and technical guidance throughout the duration of each project.

Project Relevance

- ✓ Regulatory compliance
- ✓ Coordination with SFWMD and FDEP

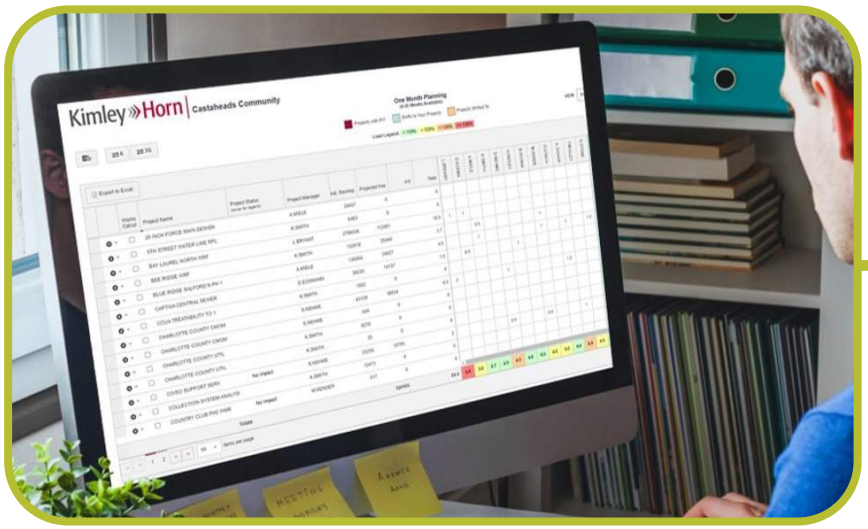
IV. PROJECT CONTROL

IV. PROJECT CONTROL

A. Schedule

We recognize control of budget and schedule are critical to the success of any project. Meeting your schedule for deliverables and adhering to budget is not just our goal—it is a requirement. Kimley-Horn's first step in accountable supervision of your budget and schedule is understanding the County's vision for the project and developing a realistic itinerary and allowance to make that vision a reality. This critical phase will be accomplished through clear communication between County staff and your project manager, **Kellie Clark, PE**. We will define the project requirements, recognize potential obstacles to success, identify possible opportunities to achieve additional value within the same project, and create a project work plan that allows us to accomplish your goals resourcefully. Paramount to the success of any project is continued partnering to adapt as necessary to unforeseen circumstances. For that reason, we will include critical decision-making points in our work plans so the project team and County can agree upon the best course of action to keep the project on track at all times.

Our proactive management process ensures the availability of firmwide and Florida-based resources for project staffing requirements. **This management process, called "Castaheads," is a proprietary program** that is maintained on Kimley-Horn's computer network and is accessible by all project managers nationwide. It is the primary means of tracking and evaluating our staffing needs. Updated monthly by project managers, the Castaheads system is used to define specific staffing needs for the current month and for the next six months. The Castaheads process ensures that sufficient staff and hours are available to meet project schedules.



Internally, our team has several in-house tools to stay connected and work seamlessly between offices. This commitment to shared resources is part of our overall culture to ensure we bring the right experts and resources to your project. Specifically, for this project, that means that we will be able to work with the County if short-term or short-notice sampling needs to be conducted.

In addition to the Castaheads process, Kimley-Horn also manages our staff workload via a weekly project coordination meeting with the use of Asana. At this meeting, the project list is updated, new and proposed projects are added, production staff members and a reviewer are assigned to new projects and due dates are determined. Using Asana we can import Microsoft project schedules, which are converted to tasks and milestones that are tracked on a weekly basis. Through the use of both tools, we have an excellent understanding of our current capacity and easily assign available staff to ensure milestones are met. If needed, meetings for individual projects are held to coordinate subconsultants and review project elements, and site visits are coordinated with the client as required.

Response Plan for Scheduling Issues

As you will see with our specific project schedule in the Approach section, we have set up our schedule to intentionally lower risk associated with any potential scheduling issues. Kimley-Horn is committed to delivering high-quality, timely, and responsive services. In a situation where a scheduling issue is unavoidable, Kimley-Horn will:

1. **Immediate Response and Assessment:** Upon identification of an issue, our project manager will promptly engage with Charlotte County staff to understand the concern. We will document the issue, clarify expectations, and evaluate the impact on deliverables and timelines.
2. **Root Cause and Corrective Action:** We will conduct a quick internal review to identify the cause—whether it's a technical error, miscommunication, or resource issue. Within 48 hours, we'll submit a corrective action plan outlining the issue, how we will fix it, any QC/QA adjustments, and a revised delivery timeline. If needed, we'll reassign or add staff to ensure the fix is completed quickly and correctly.
3. **Oversight and Prevention:** To restore confidence and prevent recurrence, we'll increase internal reviews for the remainder of the task. We'll also share lessons learned across our teams to improve future performance and maintain high standards.

Steps to Ensure Timely Project Completion

Kimley-Horn ensures timely project completion through a structured and proactive management approach. Our strategy includes:

- ✓ **Comprehensive Work Planning:** At project initiation, a detailed work plan is developed with clear deliverables, milestone dates, assigned staff, and integrated QC/QA checkpoints.
- ✓ **Dedicated Project Management:** Each task order is led by a Project Manager responsible for schedule adherence, resource coordination, and communication. Industry-standard tools like Microsoft Project and Primavera are used to monitor progress.
- ✓ **Progress Reporting:** Regular meetings and written reports keep County staff informed, track milestones, and address risks with tools such as earned value metrics and schedule analysis.
- ✓ **Flexible Staffing:** A robust team can be quickly scaled to address workload changes, including options for embedded staff to support County departments.
- ✓ **Risk Management:** Risks are identified early, tracked, and addressed with mitigation and contingency plans as needed throughout the project.
- ✓ **Integrated QC/QA:** Peer reviews and scheduled quality checks are embedded in the process, ensuring deliverables meet standards and reducing rework.

B. Cost

Effective cost control for this water quality sampling and analysis contract begins with a strong understanding of the County's systems, data collection processes, and the right personnel to engage. These are relationships that **Kellie Clark, PE**, and our team have developed over time, allowing us to streamline coordination and reduce inefficiencies. Our project management team brings the structure and foresight needed to keep efforts on track and within budget. By collaborating closely with County stakeholders and aligning internal milestones with future construction timelines, we will help ensure that each phase—from monitoring to implementation—is executed with precision and fiscal responsibility.

Our best cost control resources—our staff—have several tools for helping them control cost and schedule. Project manager Kellie Clark, PE, has the experience to develop appropriate targets, tailor a suitable course of action, and provide timely decision-making for any unexpected challenges.

Protocol for Communicating and Negotiating Cost Changes

Cost is inherently tied to experience and project understanding. One of the vital cost control mechanisms for this project will be the team's previous experiences and lessons learned, and applying those to this project. The lessons learned include:

- Identifying realistic goals
- Developing a focused project work plan that addresses only the items necessary to accomplish the goals
- Anticipating the implications of decisions made in early phases to future phases
- Preparing a mechanism for addressing unexpected challenges is essential in establishing cost and schedule control
- Leaning on experience to foresee hidden cost that may arise

The first step to controlling cost is understanding your vision and developing realistic budgets and schedules to make that vision a reality.

We know there always will be unexpected challenges special to any given project, so it is paramount that an approach be developed and adhered to that controls what can be controlled and builds in mechanisms for dealing with the unexpected.

Kimley-Horn's Approach to Cost-Effective Project

- ✓ **Smart Planning and Scoping:** We begin each project by clearly defining the scope with County staff to avoid overdesign and unnecessary costs. Our team uses lessons learned from similar projects to recommend practical, phased solutions that align with available funding and long-term goals.
- ✓ **Efficient Tools and Reviews:** We use advanced tools like GIS, hydraulic modeling, and Power BI to optimize designs and reduce manual work. Our internal value engineering and constructability reviews help identify cost-saving opportunities early.
- ✓ **Flexible Staffing and Collaboration:** By offering embedded or remote staff support, we help the County scale resources as needed without long-term overhead. We maintain close coordination with County teams to ensure designs are practical, maintainable, and aligned with operational needs.

Demonstrate Ability to Meet Project Cost Control

Our ability to meet project cost control goals is demonstrated by our long-standing track record of delivering projects for Charlotte County on time and within budget. Our team is well-versed in the County's internal processes, approval workflows, and key personnel—knowledge that allows us to navigate project requirements efficiently and avoid unnecessary delays or costs. Over the past several years, we've processed minimal change orders on County projects, with most being client-driven for additional services beyond the original scope. This success stems from our commitment to listening closely to our clients, clearly defining expectations, and making informed design decisions from the beginning of each project. We maintain organized records of all project correspondence and prioritize proactive communication, ensuring that any potential impacts to schedule or budget are addressed early.

With core values rooted in honesty and integrity, our team is dedicated to building trust and transparency throughout the life of the contract.

Who will be Responsible for Cost Control?

Kellie Clark, PE will be the main point of contact for this contract and will be fully responsible for cost control throughout the duration of the contract. Additionally, with the remaining team members as part of the project management team, **Lewis Bryant, PE**, and **Molly Williams, PE**, you can be assured that the project costs will remain in control.

C. Recent, Current and Projected Workload

Prior to selecting staff for this assignment, our team reviewed our "Castaheads" program and projected our workload and availability for the next 18- to 24-month period. We are confident we have the availability of our team for the duration of the contract. This contract fits perfectly into our schedule. Our staff will be available during the times needed, and not only our team, as portrayed in this proposal, but also various professional personnel nationwide that can be pulled in to assist if needed.

ENSURING AVAILABILITY. We know there will always be unexpected challenges unique to any project, so it is paramount that we plan well for what can be controlled and build mechanisms for dealing with the unexpected. We will utilize workload forecasting to manage and meet our deadlines.

The project team members assigned to this contract will be involved and available to the County for the entire duration of the contract. Current availability percentages are illustrated below.

STAFF MEMBER	ROLE	AVAILABILITY
Kellie Clark, PE	Project Manager	50%
Lewis Bryant, PE	Principal-in-Charge	45%
Alan Garri, PE	Technical Advisor	45%
Molly Williams, PE	Quality Control/Quality Assurance	40%

Kira Hansen, PhD, PE	Surface Water Quality Monitoring; Regulatory Compliance/Quality Assurance; Statistical Analysis	50%
Ronnie Van Fleet, PWS	Surface Water Quality Monitoring; Statistical Analysis	50%
Derick Bryant	Surface Water Quality Monitoring	55%
Kim Arnold, PG	Groundwater Monitoring and Hydrogeology Planning	50%
Bill Spinner, PG	Groundwater Monitoring and Hydrogeology Planning	45%
Chloe Johnson	Groundwater Monitoring and Hydrogeology Planning	60%
Jennifer Briggs, PMP	Regulatory Compliance/Quality Assurance	55%
Jeff Goodwin	Regulatory Compliance/Quality Assurance	45%
Chris Niforatos, PE	Statistical Analysis	40%
Dale Dixon, PhD *BenchmarkEA*	Laboratory Analysis	50%

V. PRESENT PROPOSED DESIGN APPROACH FOR THIS PROJECT

V. PRESENT PROPOSED DESIGN APPROACH FOR THIS PROJECT

Kimley-Horn has a strong understanding of the baseline water quality data, existing conditions, and regulatory requirements in the project area to support Charlotte County's goals and objectives. We understand Charlotte County's goals of maintaining long-term health, enjoyment, and availability of their water resources.

Kimley-Horn has conducted a thorough due diligence of the baseline data available across the County including data from stakeholders such as the Coastal and Heartland National Estuary Partnership (CHNEP) Water Atlas, South Florida Water Management District (SFWMD) DBHYDRO, Southwest Florida Water Management District (SWFWMD) Environmental Data Portal, and Florida Department of Environmental Protection (FDEP) STORET. We've highlighted our understanding of the project area and some key considerations that will help to move this project forward to achieve sustainable water management and conservation goals in Charlotte County.

A. Project Scheduling, Coordination, and Sample Collection Execution

Project Schedule

We are confident that we can meet the technical and staffing needs anticipated for the consistent monthly and special short-term monitoring projects. Kimley-Horn is highly proactive when it comes to anticipating and managing our current workload and capacity to ensure project pursuits and additional work will not impact our ability to serve our clients. Please see *Tab IV. Project Controls* for additional information regarding our firm's methods for schedule control and workload optimization. Our proactive management process ensures the availability of firmwide and Florida-based resources for project staffing requirements. **The objective is to balance the workload in a manner that maximizes the use of local production staff, while ensuring that all project requirements and compliance deadlines are met.**

Kimley-Horn has decades of experience scheduling complex monitoring projects that match the scale and complexity of this project. From that experience we have developed a suggested schedule for monthly sampling to spread workload across the month. Spreading the sampling will allow flexibility in the case of emergency or unsafe/unforeseen circumstances such as inclement weather, natural hazards (e.g., wild animals, insects), or equipment breakdown. Spreading sampling across the month can also allow for resampling; if there are any quality control issues detected, so data acquisition and compliance are always at the forefront.

The scheduling graphic on the following page shows an example month and showcases the four main processes that will conducted during each month. Bi-weekly coordination meetings will be held with Kimley-Horn, BenchmarkEA, and County staff to maintain integration of project staff and schedule. Sample collection, including water sampling and field measures, will be completed on a rolling basis with at least one sample collected for each month of the contract period. Field measurement QC will occur in the same week as sample collection and will be used to identify any potential data quality issues or scheduling concerns. The sample analysis will be completed by Benchmark within the appropriate holding times. Kimley-Horn will receive the reporting results and will review the results for completeness and quality. This review will likely be two weeks to a month behind the sample collection data. Kimley-Horn will format the data into the Florida Department of Environmental Protection's Watershed Information Network (FDEP WIN) format, consolidate the quality assurance documentation, and submit it to the County about a month after sampling, minimizing the risk of scheduling difficulties.

Oct '25
Nov '25
Dec '25
Jan '26
Feb '26
Mar '26
Apr '26
May '26
Jun '26
Jul '26
Aug '26
Sep '26

Schedule

Example Month

Week 1	Week 2	Week 3	Week 4
Touchbase with Charlotte County		Touchbase with Charlotte County	
Sample Collection	Sample Collection	Sample Collection	Sample Collection
QC/QA Review of Field Collected Data	QC/QA Review of Field Collected Data	QC/QA Review of Field Collected Data	QC/QA Review of Field Collected Data
Laboratory Analysis	Laboratory Analysis	Laboratory Analysis	Laboratory Analysis
Information Submission to the County			

Touchbase with Charlotte County

Scheduled project meetings with Charlotte County to discuss sampling locations and upcoming short-term sampling projects or short-notice sampling events or other relevant concerns such as the need for additional sampling types such as such as flow or physical conditions of the site.

Sample Collection

Sample collection will be divided into logistically manageable sections. This approach ensures that important sampling requirements, such as the timing for tidal sampling locations (e.g., sampling must occur during the ebb tide), are maintained.

QC/QA Review of Field Collected Data

Review field logs (e.g., field observations, sonde calibration and verification) and field measurements for quality control or any unsafe conditions at the project site.

Laboratory Analysis

Conduct sample analysis, QC/QA of samples and analytes per standard procedure.

Information Submission to the County

Submit all field and laboratory analytical results and associated information (e.g., chain of custodies, etc.) to the County for the previous months' sampling events. Where appropriate this information will be formatted per WIN MDQS requirements.

= Indication that this meeting will discuss the previous month's findings

Note: A copy of BenchmarkEA's Analytical Laboratory Report is provided in the Appendix provided at the end of this proposal.

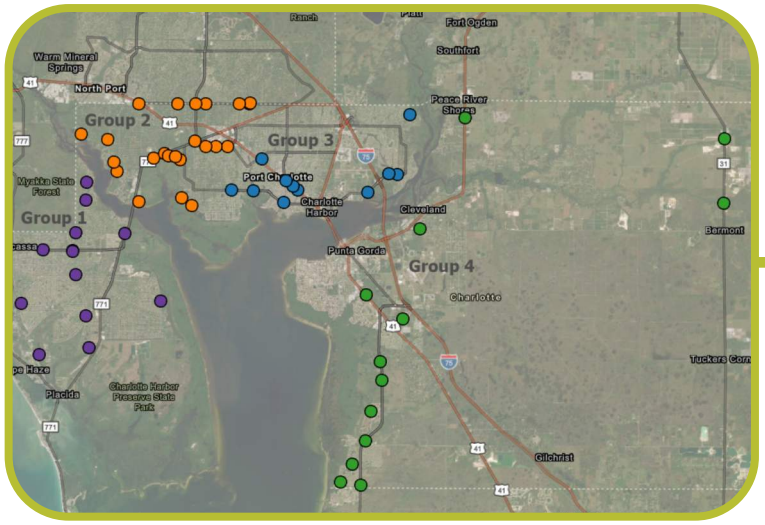
Coordination

We recognize that it is important to make sure that each staff member's input is recognized in an approach that will achieve the objectives of both staff and key stakeholders as identified by staff in our early discussions. This approach will help ensure not only that we are providing a compliant water quality monitoring project to you, but we will deliver a partnership of trust that will benefit your continued growth into the future.

Our commitment to staff integration goes far beyond the initial phase of this work. It will continue throughout the duration of the project. This focus on regular communication will strengthen the development of the monitoring project.

To provide transparency throughout the duration of the project, a project management team website or GIS dashboard can be created. This website is secure and will be available to the Kimley-Horn team and County staff only. Here, sample logs and data analysis and their due dates and statuses are tracked. This also allows the full project team—including the County—to have access to all project documents at any time during the duration of the project. This is just one tool that our project management team can leverage as we complete this project for Charlotte County.

Sample Collection Execution



Our monthly sampling protocol will involve a planned ambient water sample collection route across the County's 92 designated locations, 22 in West County, 50 in Mid County, and 20 in South County. We will split the sampling locations into four groups, to make more manageable collection routes. We have taken the proposed sampling points from the provided GIS files and developed 4 different routes that will allow Kimley-Horn to collect field measurements and samples from the groups ensuring collection will occur in a timely manner. About one third of the identified points have been identified by the County as either Tidal or likely tidal. Splitting the tidal locations across sampling groups allows us to ensure that sampling will occur during ebb tide as ebb tide occurs in this area in the morning with low tide occurring in the early afternoon. Splitting the sampling will also ensure that samples can be processed by BenchmarkEA within the holding times required by the laboratory methodologies.

Kimley-Horn staff are trained and familiar with the Florida Department of Environmental Protection's Standard Operating Procedures (SOPs), and sample collection will be performed consistent with DEP-SOP-001/01 and SOP FS2100 for Surface Water Sampling. This training ensures that the sampling will be sufficient for inclusion in FDEP's processes for identification of impaired surface waters and Total Maximum Daily Load (TMDL) development.

All necessary materials and equipment for sample collection, transport, storage, and analysis will be supplied to field teams. Every sample collection session includes thorough documentation of environmental variables such as water clarity, vegetation presence, weather conditions, and tidal stage. This information will be denoted in sampling logs developed for each individual site which will be scanned into the Kimley-Horn electronic filing system upon the return of the field crew to the office.

Kimley-Horn also utilizes the GIS Collector/Enterprise application to allow a scientist to have a more interactive device and aerial background in the field, which can be customized specifically to each individual project. The tool allows environmental scientists and biologists to update site-specific data in real time and associate any photographic evidence with the location in the field. This system can provide "instant" updates from the field and be customized to specific projects. Our team has successfully used this application to organize and manage large scale data collection for sand skink, gopher tortoises, Florida scrub-jays, and protected plant surveys.

Kimley-Horn has an extensive team with technical expertise covering a variety of sampling procedures including groundwater sampling, contaminant monitoring, microbial analysis, source tracking, streamflow and discharge, and in-situ parameters including water vegetation, and habitat physical, chemical, level, flow, or qualitative observations.

Sample Analysis

Kimley-Horn has established a strong and collaborative relationship with **BenchmarkEA** and other local laboratories, ensuring seamless coordination and integration of our environmental sampling efforts. Our longstanding partnerships are built upon mutual trust and a shared commitment to delivering accurate and high-quality water quality data for our clients. We work closely with these laboratories to align chains of custody, submission formats, and quality control measures, ensuring that every sample collected meets the highest standards. By fostering these relationships, we are able to leverage the expertise and capabilities of local labs to enhance our monitoring programs and provide reliable data to support informed decision-making and regulatory compliance.

BenchmarkEA is certified to conduct analysis on the following analytes using the methods shown below. Some of these methods require the use of preservative chemicals, temperature ranges and/or have holding times associated with analysis. BenchmarkEA and Kimley-Horn understand these needs and are able to appropriately tailor sampling to meet these requirements. BenchmarkEA retains samples for 60 days for QC staff to request reanalysis.

ANALYTE	ANALYSIS METHOD	BENCHMARK CERTIFIED
Total Kjeldahl Nitrogen	EPA 351.2	✓
Total Ammonia Nitrogen	EPA 351.2	✓
Nitrite/Nitrate Nitrogen	EPA 300.0	✓
Total Nitrogen	EPA 351.2 + EPA 353.2	✓
Dissolved Orthophosphate	EPA 365.3	✓
Total Phosphorous	EPA 365.3	✓
Total Organic Carbon	SM 5310 B-2014	✓
Chlorophyll a, corrected for Pheophytin	SM 10200 H	✓
Turbidity	EPA 180.1	✓

Total Suspended Solids	SM 2540 D-2015	✓
True Color	SM 2120 B-2011	✓
Fecal Coliform	COLILERT®-18 (Fecal Coliforms)	✓
E. coli	SM 9223 B-2016 (Colilert QT)	✓
Enterococci	ENTEROLERT / QUANTI-TRAY	✓
pH	SM 4500-H+ B-2011	✓
Salinity	SM 2520 B	✓
Conductivity	SM 2510 B-2011	✓

Kimley-Horn has experience conducting statistical analysis for quality control and trend identification. We have experience with analysis, and/or interpretation of water quality, level, and/or flow monitoring data to aid in characterizing water quality conditions, causes, and effects as well as aid in TMDL-related planning, determination, and responses. Kimley-Horn also has extensive experience conducting nutrient loading calculations, groundwater, surface water, and nutrient modeling to help support the County's goals of improving water quality while enabling continued growth and development.

B. Data Review and Submission Processes

In surface water quality monitoring, the review and reporting of data and documentation are essential to verifying the integrity and accuracy of environmental sampling. Once the field crew has uploaded the field observations into the electronic filing system the responsibility for data documentation review and reporting will shift to the experienced environmental and water quality staff members. Kimley-Horn will supervise the review the recordings of field observations, sample collection procedures, and analytical results for indications of errors in the field. This data is then thoroughly reviewed using statistical analysis tools to identify any inconsistencies or outliers. If any errors or issues are detected the sampling schedule will allow for additional sampling to occur within the monthly time period to minimize the risk of being out of compliance.

Comprehensive QC/QA checks are conducted to ensure that all data meets the required standards and is free from contamination or errors. Our QC/QA lead for this project is **Molly Williams, PE**. Our reporting process is designed to be clear and detailed, providing stakeholders with a transparent view of the findings and insights derived from the data. This rigorous approach ensures that our water quality assessments are reliable and actionable, contributing to effective environmental management and policy development. The data will be compiled into the format for submission to the Florida Department of Environmental Protection's Watershed Information Network. Kimley-Horn will store the records related to this project for 5-years from the sample date.

C. Data Quality Objectives/ Indicators

Proposed Data Quality Objectives (DQO)

Kimley-Horn will work with the county to determine what the appropriate Data Quality Objectives (DQOs) will be for this project, considering both long-term and short-term program sampling goals. We understand that the County already has DQOs in place for the 2022- 2023 sampling program, so we will reference these and will update as needed with the County's input. We anticipate the following overarching DQO, which heavily aligns with the Florida Department of Environmental Protection's Water Status Monitoring Network will apply to this project:

- ✓ Provide data of a known quality and confidence to use in County water quality programs and to aid in the development of rules and thresholds in support of effective management of County water resources.

A specific DQO proposed for the data collection as a part of this sampling project is shown below:

- ✓ Produce data to estimate the condition of each sampling location, with a 95% confidence level and margin of error between 5 and 15%.
- ✓ Produce an adequate amount of data to determine whether trends exist in fresh flowing surface water or tidal systems throughout the County.

Quality Control Systems

We understand that quality control (QC) measures are essential to ensuring that the data Kimley-Horn collects meets the County and FDEP standards. Some QC measures, such as equipment and field blanks, are mandated under FDEP SOPs, while others can be implemented as needed to improve field conditions or procedures. Our samplers collect equipment and/or field blanks (samples of clean, deionized water) at a minimum 10% frequency rate. This practice allows our staff to monitor various factors that can introduce error in sampling collection. In the field, this might look like difference in the on-site environment, contaminated equipment, unclean containers, as well as sample transport and storage conditions. In the laboratory, we look at contaminated equipment, unclean containers, the suitability of preservatives, and analyte-free water. If analytes of interest are detected in both the blank and associated samples, the data from the associated samples are qualified per Chapter 62-160, F.A.C. **BenchmarkEA is certified by the National Environmental Laboratory Accreditation Program (NELAP) through the Department of Health (DOH) for all primary water quality indicators, ensuring high standards of accuracy and reliability.**

VI. PRESENT EXAMPLES OF RECENTLY ACCOMPLISHED SIMILAR PROJECTS

VI. PRESENT EXAMPLES OF RECENTLY ACCOMPLISHED SIMILAR PROJECTS

Baseline Surface Water Quality Monitoring

SARASOTA COUNTY, FL

Reference Information
Name:
Ryan Fowler, 3H Ranch
Telephone Number:
941.340.7314

Kimley-Horn provided professional environmental consulting services for the Baseline Surface Water Quality Monitoring Program at the 3H Ranch development, a 2,727-acre site located within the Sarasota Bay drainage basin. The program was initiated one year prior to the start of site development activities and focused on two key water bodies—Cow Pen Slough and an unnamed creek. Monthly surface water sampling was conducted at designated monitoring stations in accordance with Florida Department of Environmental Protection (FDEP) Standard Operating Procedures (DEP-SOP-001/01). Analytical parameters included nutrients (e.g., Total Kjeldahl Nitrogen, Total Phosphorus), bacteriological indicators (e.g., E. coli, Fecal Coliform), and physical characteristics such as turbidity, dissolved oxygen, and chlorophyll-a. The program was structured to meet FDEP's data sufficiency requirements under Chapter 62-303.320(4), F.A.C., ensuring at least 10 independent samples were collected across three of four calendar seasons. Monitoring results were reported quarterly to Sarasota County and uploaded annually to Florida's Watershed Information Network (WIN). The program was designed to transition into an ongoing monitoring phase upon commencement of construction and was incorporated into the project's Master Development Order, allowing for future modifications by Sarasota County as needed.

1. Schedule control:
This project's schedule consists of monthly sample events, with a report prepared each quarter consisting of analytical tables, Total Ammonia Nitrogen calculations, field forms, and calibration logs.

2. Cost control:
The budget for each event was determined by labor to collect the samples and prepare reports, laboratory costs, and expenses for equipment.

3. Any additional costs caused by design deficiencies, not program change:
None.

4. Experience designing and implementing water quality monitoring programs:
We have designed water quality monitoring plans for several Master Developments in Manatee and Sarasota counties, each taking into account the County's input.

5. Experience interpreting water quality results in complex hydrological environments:
We currently have three active long term water quality monitoring projects in Manatee and Sarasota Counties that are each of similar nature and complexities.

6. Success in adaptive monitoring over long project timelines:
We stayed in contact with the property owner to notify them of our sampling dates, staying flexible if weather would not allow sampling on a particular day.

7. Challenges encountered and solutions implemented:
None on this project.

Monitoring and Phase 1 ESA

BABCOCK RANCH, FL

Reference Information
Name:
Christina Kontos, Kitson & Partners
Telephone Number:
941.467.1491

Kimley-Horn performed water quality monitoring for the Earthsource Mine (now closed) and the general Babcock Ranch Property, per an agreement between Babcock Property Holdings, LLC and Lee County. The monitoring for the site included water level monitoring of 40 locations across 18,000 acres, monthly nitrogen, phosphorus, and total suspended solid monitoring for 15 locations, semi-annual pesticide and fertilizer sampling for 6 locations, semi-annual groundwater sampling, installation of monitoring wells, and flow monitoring for 15 locations. The data has been used to track trends in pollutant loadings, and to develop realistic flow models for the development. The data will guide the ultimate design of the proposed treatment wetlands as part of the 18,000-acre development, which will be designed to reduce nitrogen and phosphorous discharges to the Caloosahatchee Kimley-Horn has also conducted multiple Phase I ESAs on properties within the Babcock Ranch Community intended for commercial and residential development. The Phase I ESAs on land formerly used for agricultural and mining included historical data review, interviews with persons knowledgeable of current and past site uses, review of regulatory databases, and site reconnaissance. Additional coordination with the client and third parties was needed on selected parcels to produce specialized reliance letters.

1. Schedule control:
This project's schedule consists of monthly sampling when flows exist and collecting data quarterly. Samples are provided to a laboratory each month. Data collected and received is reviewed monthly and then a report is created yearly.

2. Cost control:
A budget is created yearly based on the number of sampling and monitoring locations.

3. Any additional costs caused by design deficiencies, not program change:
None.

4. Experience designing and implementing water quality monitoring programs:
Each year we review the needs of the community and update monitoring locations as needed.

5. Experience interpreting water quality results in complex hydrological environments:
Part of the yearly report is to review and analyze the water quality results.

6. Success in adaptive monitoring over long project timelines:
This monitoring has been ongoing for over 10 years. We have adjusted locations over that time as needed to meet the various needs of the community, including any reporting to other agencies.

7. Challenges encountered and solutions implemented:
One potential challenge is always data discrepancies once back in the office encountered during our quality control review. To mitigate issues with this, we log measurements manually as well as noting the device measurement. We also have a field log where information is kept so that any discrepancies can be quickly reviewed and correct. This clear standard operating procedures avoids data issues.

Blackburn Water Conservation

SARASOTA, FL

Reference Information
Name:
John Lydon, Neal Communities
Telephone Number:
678.410.3576

Kimley-Horn and Associates, Inc. was engaged by Neal Communities to conduct quarterly ambient surface water quality monitoring for the Blackburn Water Conservation area, in accordance with the November 2010 Monitoring Plan. This monitoring was a regulatory requirement tied to the development's progress, currently reported at 85% of its total capacity. Kimley-Horn performed quarterly surface water sampling—twice during the dry season and twice during the wet season—at six designated locations. Sampling included field parameter collection and laboratory analysis for primary organics, including herbicides and pesticides, following EPA Methods 8151 and 8081, respectively. These analyses were conducted on a rotating basis at select stations during the rainy season. All sampling and analysis procedures adhere to Chapter 62-160 of the Florida Administrative Code (F.A.C.). In addition to fieldwork, Kimley-Horn prepared an annual monitoring report summarizing the quarterly results, tabulating data, and evaluating findings against Florida's surface and groundwater quality standards as outlined in Chapter 62-777, F.A.C. The report was submitted to the Sarasota County Water Resources Division, supporting Neal Communities in maintaining environmental compliance and transparency.

1. Schedule control:
The sampling events occurred once every quarter and an annual report was submitted to Sarasota County at the conclusion of the fourth quarter event.

2. Cost control:
The budget for each event was determined by labor to collect the samples and prepare reports, laboratory costs, and expenses for equipment.

3. Any additional costs caused by design deficiencies, not program change:
None.

4. Experience designing and implementing water quality monitoring programs:
Kimley-Horn developed a sampling regiment and identified locations to demonstrate compliance. Kimley-Horn coordinated with a certified lab for testing and prepared reports and analyses for consideration by Sarasota County.

5. Experience interpreting water quality results in complex hydrological environments:
Results from monitoring were reviewed monthly, quarterly, and annually to determine compliance with aforementioned F.A.C. requirements. Kimley-Horn coordinated with a certified lab for additional interpretation and monitoring to clarify results.

6. Success in adaptive monitoring over long project timelines:
This project began in April 2022 and ended in January 2025, with Kimley-Horn inheriting the project in April 2023. We have received positive feedback and have successfully completed this project to the satisfaction of the County.

7. Challenges encountered and solutions implemented:
We have kept open and constant communication with the County. After the April 2023, adjacent roadway expansion construction impacted some of the sample locations. We facilitated a site visit with the County to solicit their opinion and approval for relocation of sample locations, to avoid impacts from the roadway construction.

Pine Island Preservation Site Assessment and Report

LEE COUNTY, FL

Lee County operates the Pine Island Wastewater Treatment Plant and has used the Pine Island Flatwoods Preserve as a spray field for effluent discharge. Kimley-Horn began monitoring groundwater in the vicinity of the spray field in 2017 due to the presence of arsenic in the groundwater first observed in 2012. Observed groundwater quality trends led to a Site Assessment conducted in 2018. The project included sampling of monitoring wells, soil sampling in selected locations, analysis of groundwater flow gradients, a well survey for a 1-mile radius around the site, aquifer characterization to evaluate groundwater flow velocity, and the installation of additional monitoring wells to delineate the area affected by elevated arsenic concentrations.

The project included a pre-assessment planning meeting with the Florida Department of Environmental Protection (FDEP) to get agency agreement with the proposed plan. Causes for the elevated arsenic concentrations in groundwater were investigated, such as the use of copper chromium arsenate (CCA)-treated fence posts in the vicinity of monitoring wells. SPLP analysis of samples from the pesticide-treated fence posts indicated arsenic and other metals had the potential to leach into the groundwater under certain conditions, such as the low pH environments characteristic of some monitoring locations. Kimley-Horn summarized the results of the assessment in a Site Assessment Report submitted to the FDEP.

The report summarized groundwater monitoring well installation, site lithology, aquifer characterization, the results of the well survey, groundwater flow gradients, and groundwater and fence post sampling, as well as providing discussion and conclusions. Following a meeting with FDEP, Lee County and Kimley-Horn staff, the FDEP agreed to Lee County's proposal to remove the CCA-treated fence posts and resume monitoring to see if post removal affected arsenic concentrations in the groundwater.

Reference Information
Name:
Alise Flanjack, Lee County
Telephone Number:
239.229.0488

1. Schedule control:
This project's schedule consists of monthly sampling when flows exist and collecting data quarterly. Samples are provided to a laboratory each month. Data collected and received is reviewed monthly and then a report is created yearly.

2. Cost control:
A budget is created yearly based on the number of sampling and monitoring locations. Costs can be limited by using the Lee County Environmental Laboratory for analytical analysis.

3. Any additional costs caused by design deficiencies, not program change:
None.

4. Experience designing and implementing water quality monitoring programs:
Kimley-Horn designs and conducts several water quality monitoring programs. Currently, Kimley-Horn is working on four projects in Sarasota County for large scale residential redevelopment projects. Additionally, we have developed water quality monitoring programs for private clients, including Babcock Property Holdings, LLC in Charlotte and Lee Counties. We have been conducting monitoring activities for Babcock for 10 years including surface water sampling including flow, groundwater level monitoring and sediment sampling.

5. Experience interpreting water quality results in complex hydrological environments:
In each of the projects mentioned in #4 above, annual or semi-annual reports are generated to evaluate trends throughout the year for the parameters of concern. Trend analyses compare data to the FDEP surface water and/or groundwater criteria for the project.

6. Success in adaptive monitoring over long project timelines:
For one of the projects in Sarasota County, a roadway expansion project eliminated three of our monitoring locations. Kimley-Horn set up a field review with the County regulator to identify alternative monitoring locations, successfully collecting the data needed to continue with the evaluation. Additionally, Kimley-Horn worked with the County regulator to determine the appropriate parameters for the project that were initially required. These were changed mid-project and have remained implemented since that time.

7. Challenges encountered and solutions implemented:
As stated above, Kimley-Horn worked with the County regulator when a roadway expansion project eliminated three monitoring stations. Other challenges include anticipating weather conditions, maneuvering through access gates, livestock, and overgrown vegetation limiting access. Our field staff are agile and think on their feet to ensure project success. Additionally, communication with project managers and client staff is key to ensuring project success.

Celery Fields Regional Stormwater Facility

SARASOTA COUNTY, FL

Reference Information
Name:
Peter Peduzzi, Sarasota County
Telephone Number:
941.650.5057

The Kimley-Horn team planned, designed, and permitted the Celery Fields Regional Stormwater Facility (CFRSF), a highly successful Legacy Project for Sarasota County. The CFRSF is a multi-functional regional stormwater facility located in the Phillippi Creek Drainage Basin, the largest drainage basin in Sarasota County with a long history of flooding. The primary function of this 400-acre facility is flood storage.

Kimley-Horn provided design services for the expansion of this stormwater facility to include the South Cell and Walker Tract. The Celery Fields project demonstrated 1) an expansion of a traditional stormwater management concept into a multi-faceted water resources project, 2) successful collaboration of engineers with the client, environmental, and land planning professionals, 3) creative and cost-effective design solutions for public health and safety needs, and 4) integration of engineering design with the added public value of measurable economic, social, recreational, and sustainability benefits.

To complete its investigation and evaluation of stormwater reuse opportunities at the CFRSF, Kimley-Horn developed annual and seasonal water budgets and compared potential water supply with reuse demands. Dry season water budgets of inflow, groundwater losses, storage and potential withdrawal were developed. Groundwater modeling using the ModFLOW groundwater model was conducted to evaluate a horizontal well system as a means of withdrawing potential reuse water from the CFRSF. Stormwater reuse was anticipated to offset irrigation water demands and improve water quality by reducing runoff volumes to Sarasota Bay, hence reducing pollutant loading.

As part of the Celery Fields Integrated Water Resources Plan, Kimley-Horn conducted:

- Development of flood protection enhancement alternatives, hydrologic/hydraulic modeling, analysis design, and permitting.
- Investigation and evaluation of stormwater reuses opportunities for alternative water supply and water quality benefits.
- Analyzed basin hydrologic and hydraulic characteristics and responses to develop methods for enhancing the flood storage in this 400-acre regional facility.
- The CFRSF project has won numerous awards including:
  - ✓ Environmental Excellence Award from the National Association of Environmental Professionals (NAEP) in the category of Conservation, February 2013
  - ✓ Florida Institute of Consulting Engineers (FICE) – Engineering Excellence Honors Award in the category of Water Resources, January 2014
  - ✓ Outstanding Achievement Award – Florida Stormwater Association (FSA) by Sarasota County Public Works/ Public Utilities, June 2014
  - ✓ US EPA Gulf Guardian Award – Certificate of Appreciation, March 2015
  - ✓ Sarasota Audubon Awards – One World Award (Sister Cities Association to promote cultural diversity and ecotourism), Audubon Chapter of the Year, Leadership Award, Conservation Partner of the Year (CFGC), Gulf Coast LEEdership Award for Nonprofit Construction (Building LEED Gold Certified- Net- Zero Energy Use)

According to Sarasota County Project Manager Peter Peduzzi:

> ***"Project expectations were exceeded because challenges were turned into enhancements for the benefit of the citizens of Sarasota County. Because of proactive asset management by the consulting firm and leveraging of County assets, the project evolved into a watershed park that provides enhanced flood protection, a haven for nature lovers, and a park that offers multiple recreational opportunities. The Celery Fields Regional Stormwater Facility is now a hiking, biking, environmental, and birding destination unlike any in the southwest Florida area."***

1. Schedule control:
The Best Management Practice Water Quality Study monitoring plan required obtaining and analyzing water quality samples over two years on a strict pre-approved schedule under different flow conditions. The schedule that was met allowed Sarasota County to get Florida Department of Environmental Protection reimbursement through a 319 grant within 30 days of the final report.

2. Cost control:
Cost control measures included chain-of-custody streamlining for sample collection, pickup, and analysis through an autosampler and a telemetry system that picked the right flow regimes for seasonal data collection. We also used autosampling equipment already owned and several repurposed and outdated traffic control boxes from the client to keep equipment costs down for the client.

3. Any additional costs caused by design deficiencies, not program change:
The water quality monitoring program followed the pre-approved plan and worked outstanding with no additional costs to the client.

4. Experience designing and implementing water quality monitoring programs:
Our experience with the specialized equipment, the functioning of the facility cells, and producing a sampling design that was reasonable, affordable, and scientifically defensible led to a well written and succinct report with conclusive evidence of nutrient reduction from the various BMPs.

5. Experience interpreting water quality results in complex hydrological environments:
Data were analyzed via various statistical analysis methods. Rhodamine water flow studies were also used to determine water retention times in each of the cells under different flow conditions and at the outfall for the facility.

6. Success in adaptive monitoring over long project timelines:
Routine monitoring of the water quality and flow data indicated that one of the autosamplers was frozen. This equipment malfunction was fixed before the composite samples were taken for one of the more extreme events.

7. Challenges encountered and solutions implemented (e.g., field logistics, coordination, communication):
One of the more interesting challenges that we had was that one of the flow meters had to be reinstalled after an alligator using the culvert presumably moved this heavy structure and temporarily altered flow measurements. The water flow devices were effectively re-installed with scuba diving equipment and affixed to the inside of the culvert so that they were oriented with water flow from the receiving cell.

References

Kimley-Horn is recognized nationwide for the quality of our work environment, for our stature as a business enterprise, and for the outstanding work of our consulting staff. The firm's successful peer recognition has been accompanied by a commitment to providing responsive client service, pursuing continuous quality improvement, and operating as a business-based practice. We are proud of our working relationship with our clients and much of our success is directly related to our efforts to perform high-quality, timely services. You may ask why clients chose Kimley-Horn out of all the top-class consulting firms they have to choose from. Chances are they'd tell you it was because we have a reputation for making them successful. We listen to their needs, meet their schedules, accomplish their missions, deliver results, and exceed expectations. You simply won't find this caliber of service anywhere else.

Kimley-Horn Reference List

Blackburn Water Conservation
Client contact: John Lyndon
Telephone number: 678.410.3576

Baseline Surface Water Monitoring
Client contact: Ryan Fowler
Telephone number: 941.340.7314

Babcock Ranch Monitoring and Phase 1 ESA-Kitson & Partners
Client contact: Christina Kontos
Telephone number: 941.467.1491

Project Manager Reference List

Babcock Ranch
Client contact: Christina Kontos
Telephone number: 941.467.1491

Highlands County
Client contact: Mitchell Thomas, PE
Telephone number: 863.402.6877

City of Lake Wales
Client contact: Nancy Hernandez
Telephone number: 863.678.4182 ext.1310

BenchmarkEA's Reference List

Sarasota County Public Utilities
Client contact: Cesar Rodriguez, Quality Assurance Officer
Telephone number: 941.979.1775

Johnson Engineering, Inc.
Client contact: Tim Denison, Environmental Scientist
Telephone number: 239.229.9062

Florida's Natural Growers, Inc.
Client contact: Joseph Carani, Utilities Supervisor
Telephone number: 863.978.7627

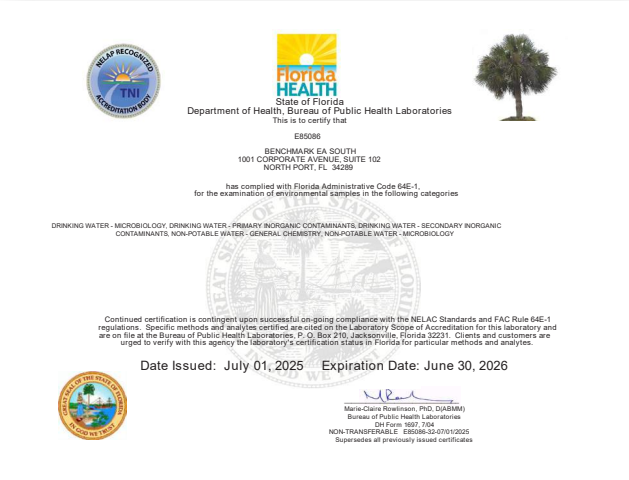
VII. DESCRIBE YOUR EXPERIENCE AND CAPABILITIES IN THE FOLLOWING AREAS

VII. DESCRIBE YOUR EXPERIENCE AND CAPABILITIES IN THE FOLLOWING AREAS

A. Current DOH Performance Evaluation Rating and NELAP Certifications

BenchmarkEA has three laboratories in Florida, located in North Port, Palmetto, and Winter Haven. Each of these laboratories is both inspected and certified by the Florida Department of Health and certification is conducted in accordance with NELAP standards.

North Port Laboratory NELAP Certification



State of Florida
Department of Health, Bureau of Public Health Laboratories
This is to certify that

E85086

BENCHMARK EA SOUTH
1001 CORPORATE AVENUE, SUITE 102
NORTH PORT, FL 34289

has complied with Florida Administrative Code 64E-1,
for the examination of environmental samples in the following categories

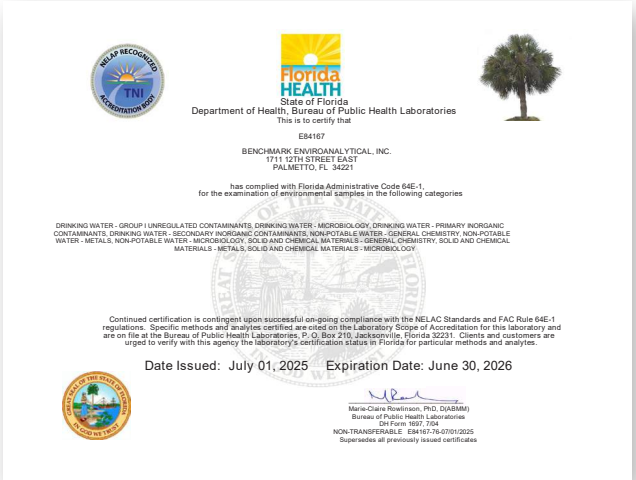
DRINKING WATER - MICROBIOLOGY, DRINKING WATER - PRIMARY INORGANIC CONTAMINANTS, DRINKING WATER - SECONDARY INORGANIC CONTAMINANTS, NON-POTABLE WATER - GENERAL CHEMISTRY, NON-POTABLE WATER - MICROBIOLOGY

Continued certification is contingent upon successful on-going compliance with the NELAC Standards and FAC Rule 64E-1 regulations. Specific methods and analytes certified are cited on the Laboratory Scope of Accreditation for this laboratory and are on file at the Bureau of Public Health Laboratories, P. O. Box 210, Jacksonville, Florida 32231. Clients and customers are urged to verify with this agency the laboratory's certification status in Florida for particular methods and analytes.

Date Issued: July 01, 2025 Expiration Date: June 30, 2026

Marie-Claire Rowlinson, PhD, D(ABMM)
Bureau of Public Health Laboratories
DH Form 1697, 7/04
NON-TRANSFERABLE E85086-32-07/01/2025
Supersedes all previously issued certificates

Palmetto Laboratory NELAP Certification



State of Florida
Department of Health, Bureau of Public Health Laboratories
This is to certify that

E84167

BENCHMARK ENVIROANALYTICAL, INC.
1711 12TH STREET EAST
PALMETTO, FL 34221

has complied with Florida Administrative Code 64E-1,
for the examination of environmental samples in the following categories

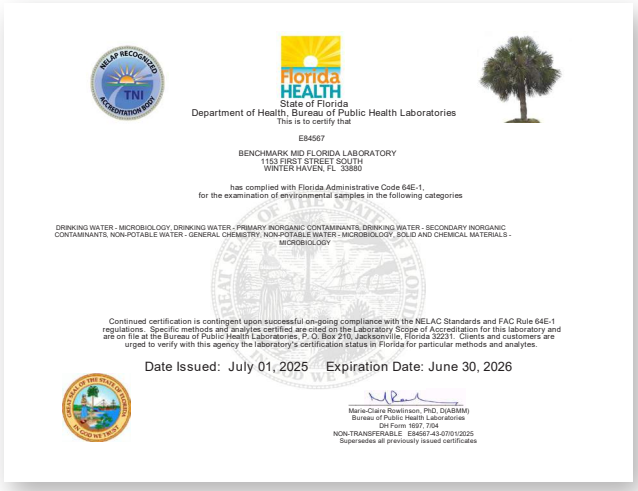
DRINKING WATER - GROUP I UNREGULATED CONTAMINANTS, DRINKING WATER - MICROBIOLOGY, DRINKING WATER - PRIMARY INORGANIC CONTAMINANTS, DRINKING WATER - SECONDARY INORGANIC CONTAMINANTS, NON-POTABLE WATER - GENERAL CHEMISTRY, NON-POTABLE WATER - METALS, NON-POTABLE WATER - MICROBIOLOGY, SOLID AND CHEMICAL MATERIALS - GENERAL CHEMISTRY, SOLID AND CHEMICAL MATERIALS - METALS, SOLID AND CHEMICAL MATERIALS - MICROBIOLOGY

Continued certification is contingent upon successful on-going compliance with the NELAC Standards and FAC Rule 64E-1 regulations. Specific methods and analytes certified are cited on the Laboratory Scope of Accreditation for this laboratory and are on file at the Bureau of Public Health Laboratories, P. O. Box 210, Jacksonville, Florida 32231. Clients and customers are urged to verify with this agency the laboratory's certification status in Florida for particular methods and analytes.

Date Issued: July 01, 2025 Expiration Date: June 30, 2026

Marie-Claire Rowlinson, PhD, D(ABMM)
Bureau of Public Health Laboratories
DH Form 1697, 7/04
NON-TRANSFERABLE E84167-76-07/01/2025
Supersedes all previously issued certificates

Winter Haven Laboratory NELAP Certification



State of Florida
Department of Health, Bureau of Public Health Laboratories
This is to certify that

E84567

BENCHMARK MID FLORIDA LABORATORY
1153 FIRST STREET SOUTH
WINTER HAVEN, FL 33880

has complied with Florida Administrative Code 64E-1,
for the examination of environmental samples in the following categories

DRINKING WATER - MICROBIOLOGY, DRINKING WATER - PRIMARY INORGANIC CONTAMINANTS, DRINKING WATER - SECONDARY INORGANIC CONTAMINANTS, NON-POTABLE WATER - GENERAL CHEMISTRY, NON-POTABLE WATER - MICROBIOLOGY, SOLID AND CHEMICAL MATERIALS - MICROBIOLOGY

Continued certification is contingent upon successful on-going compliance with the NELAC Standards and FAC Rule 64E-1 regulations. Specific methods and analytes certified are cited on the Laboratory Scope of Accreditation for this laboratory and are on file at the Bureau of Public Health Laboratories, P. O. Box 210, Jacksonville, Florida 32231. Clients and customers are urged to verify with this agency the laboratory's certification status in Florida for particular methods and analytes.

Date Issued: July 01, 2025 Expiration Date: June 30, 2026

Marie-Claire Rowlinson, PhD, D(ABMM)
Bureau of Public Health Laboratories
DH Form 1697, 7/04
NON-TRANSFERABLE E84567-43-07/01/2025
Supersedes all previously issued certificates

B. Brochure/Catalog of all Analyses the Participating Laboratories are Certified to Perform

The following scopes of accreditation outline the certified analytical capabilities of each participating laboratory facility.

Laboratory Scope of Accreditation

Attachment to Certificate #: E85086-32, expiration date June 30, 2026. This listing of accredited analytes should be used only when associated with a valid certificate.

State Laboratory ID: **E85086** **EPA Lab Code:** **FL00068** **(941) 625-3137**

E85086
Benchmark EA South
1001 Corporate Avenue, Suite 102
North Port, FL 34289

Matrix: **Drinking Water**

Analyte#	Analyte	Method/Tech	Method Code	Category	Effective Date
2525	Escherichia coli	SM 9223 B	20037676	Microbiology	2/7/2003
2525	Escherichia coli	SM 9223 B /QUANTI-TRAY	20211603	Microbiology	2/2/2018
2555	Heterotrophic plate count	SM 9215 B	20179811	Microbiology	1/26/2006
1855	Odor	EPA 140.1	10007406	Secondary Inorganic Contaminants	7/1/2016
1900	pH	SM 4500-H+-B	20105219	Primary Inorganic Contaminants	8/14/2007
2500	Total coliforms	SM 9223 B	20037676	Microbiology	2/7/2003
2500	Total coliforms	SM 9223 B /QUANTI-TRAY	20211603	Microbiology	2/2/2018

Clients and Customers are urged to verify the laboratory's current certification status with the Environmental Laboratory Certification Program.

Certification Type **NELAP**
Issue Date: 7/1/2025 **Expiration Date: 6/30/2026**

Laboratory Scope of Accreditation

Attachment to Certificate #: E85086-32, expiration date June 30, 2026. This listing of accredited analytes should be used only when associated with a valid certificate.

State Laboratory ID: **E85086** **EPA Lab Code:** **FL00068** **(941) 625-3137**

E85086
Benchmark EA South
1001 Corporate Avenue, Suite 102
North Port, FL 34289

Matrix: **Non-Potable Water**

Analyte#	Analyte	Method/Tech	Method Code	Category	Effective Date
2520	Enterococci	ENTEROLERT / QUANTI-TRAY	60030208	Microbiology	2/2/2018
2525	Escherichia coli	SM 9223 B /QUANTI-TRAY	20211603	Microbiology	2/2/2018
2530	Fecal coliforms	COLILERT®-18 (Fecal Coliforms)	60002688	Microbiology	7/1/2016
2530	Fecal coliforms	SM 9222 D	20209238	Microbiology	1/31/2003
1855	Odor	EPA 140.1	10007406	General Chemistry	7/1/2016
1900	pH	SM 4500-H+-B	20105219	General Chemistry	8/14/2007
2500	Total coliforms	SM 9222 B	20203401	Microbiology	1/31/2003
2500	Total coliforms	SM 9223 B /QUANTI-TRAY	20211603	Microbiology	2/2/2018

Clients and Customers are urged to verify the laboratory's current certification status with the Environmental Laboratory Certification Program.

Certification Type **NELAP**
Issue Date: 7/1/2025 **Expiration Date: 6/30/2026**

Laboratory Scope of Accreditation

Attachment to Certificate #: E84167-76, expiration date June 30, 2026. This listing of accredited analytes should be used only when associated with a valid certificate.

State Laboratory ID: **E84167** **EPA Lab Code:** **FL00289** **(941) 723-9986**

E84167
Benchmark EnviroAnalytical, Inc.
1711 12th Street East
Palmetto, FL 34221

Matrix: **Drinking Water**

Analyte#	Analyte	Method/Tech	Method Code	Category	Effective Date
1505	Alkalinity as CaCO3	SM 2320 B-2011	20045618	Primary Inorganic Contaminants	6/20/2022
1000	Aluminum	EPA 200.7	10013806	Secondary Inorganic Contaminants	5/25/2004
1515	Ammonia as N	EPA 350.1	10063602	Primary Inorganic Contaminants	3/7/2011
1005	Antimony	EPA 200.8	10014605	Primary Inorganic Contaminants	4/5/2024
1010	Arsenic	EPA 200.8	10014605	Primary Inorganic Contaminants	4/5/2024
1015	Barium	EPA 200.7	10013806	Primary Inorganic Contaminants	5/25/2004
1020	Beryllium	EPA 200.7	10013806	Primary Inorganic Contaminants	5/25/2004
1020	Beryllium	EPA 200.8	10014605	Primary Inorganic Contaminants	4/5/2024
1025	Boron	EPA 200.7	10013806	Secondary Inorganic Contaminants	3/7/2011
1535	Bromate	EPA 300.1	10275602	Primary Inorganic Contaminants	11/21/2008
1540	Bromide	EPA 300.0	10053200	Primary Inorganic Contaminants	5/25/2004
9312	Bromoacetic acid	EPA 552.2	10095804	Group I Unregulated Contaminants	3/7/2025
9315	Bromochloroacetic acid	EPA 552.2	10095804	Group I Unregulated Contaminants	3/7/2025
1030	Cadmium	EPA 200.7	10013806	Primary Inorganic Contaminants	5/25/2004
1030	Cadmium	EPA 200.8	10014605	Primary Inorganic Contaminants	4/5/2024
1035	Calcium	EPA 200.7	10013806	Primary Inorganic Contaminants	5/25/2004
1570	Chlorate	EPA 300.1	10275602	Secondary Inorganic Contaminants	11/21/2008
1575	Chloride	EPA 300.0	10053200	Secondary Inorganic Contaminants	4/22/2024
1580	Chlorine	SM 4500-Cl G	20081441	Primary Inorganic Contaminants	3/7/2011
1595	Chlorite	EPA 300.1	10275602	Primary Inorganic Contaminants	11/21/2008
9336	Chloroacetic acid	EPA 552.2	10095804	Group I Unregulated Contaminants	3/7/2025
1040	Chromium	EPA 200.7	10013806	Primary Inorganic Contaminants	5/25/2004
1040	Chromium	EPA 200.8	10014605	Primary Inorganic Contaminants	4/5/2024
1605	Color	SM 2120 B-2011	20039310	Secondary Inorganic Contaminants	6/20/2022
1610	Conductivity	SM 2510 B-2011	20048617	Primary Inorganic Contaminants	6/20/2022
1055	Copper	EPA 200.7	10013806	Primary Inorganic Contaminants,Secondary Inorganic Contaminants	5/25/2004
1055	Copper	EPA 200.8	10014605	Primary Inorganic Contaminants	4/5/2024
1620	Corrosivity (langlier index)	SM 2330 B	20003207	Secondary Inorganic Contaminants	3/7/2011
1635	Cyanide	EPA 335.4	10061402	Primary Inorganic Contaminants	1/7/2021
9357	Dibromoacetic acid	EPA 552.2	10095804	Group I Unregulated Contaminants	3/7/2025
9360	Dichloroacetic acid	EPA 552.2	10095804	Group I Unregulated Contaminants	3/7/2025
1710	Dissolved organic carbon (DOC)	SM 5310 B	20137819	Primary Inorganic Contaminants	11/21/2008
2525	Escherichia coli	SM 9223 B	20037676	Microbiology	1/3/2002
2525	Escherichia coli	SM 9223 B (Colilert Quanti-Tray)-2016	20211647	Microbiology	6/20/2022

Clients and Customers are urged to verify the laboratory's current certification status with the Environmental Laboratory Certification Program.

Certification Type **NELAP**
Issue Date: 7/1/2025 **Expiration Date: 6/30/2026**

Laboratory Scope of Accreditation

Attachment to Certificate #: E84167-76, expiration date June 30, 2026. This listing of accredited analytes should be used only when associated with a valid certificate.

State Laboratory ID: **E84167** **EPA Lab Code:** **FL00289** **(941) 723-9986**

E84167
Benchmark EnviroAnalytical, Inc.
1711 12th Street East
Palmetto, FL 34221

Matrix: **Drinking Water**

Analyte#	Analyte	Method/Tech	Method Code	Category	Effective Date
1730	Fluoride	EPA 300.0	10053200	Primary Inorganic Contaminants,Secondary Inorganic Contaminants	5/25/2004
1750	Hardness	SM 2340 B-2011	20046611	Secondary Inorganic Contaminants	6/20/2022
2555	Heterotrophic plate count	SM 9215 B	20179811	Microbiology	6/25/2024
3840	Hydrogen sulfide	SM 4500S= H (21st ed.)	20125057	Primary Inorganic Contaminants	3/7/2011
1070	Iron	EPA 200.7	10013806	Secondary Inorganic Contaminants	5/25/2004
1075	Lead	EPA 200.8	10014605	Primary Inorganic Contaminants	4/5/2024
1085	Magnesium	EPA 200.7	10013806	Primary Inorganic Contaminants	5/25/2004
1090	Manganese	EPA 200.7	10013806	Secondary Inorganic Contaminants	5/25/2004
1095	Mercury	EPA 245.1	10036609	Primary Inorganic Contaminants	1/3/2002
1100	Molybdenum	EPA 200.7	10013806	Secondary Inorganic Contaminants	3/7/2011
1105	Nickel	EPA 200.7	10013806	Primary Inorganic Contaminants	5/25/2004
1105	Nickel	EPA 200.8	10014605	Primary Inorganic Contaminants	4/5/2024
1810	Nitrate as N	EPA 300.0	10053200	Primary Inorganic Contaminants	5/25/2004
1840	Nitrite as N	EPA 300.0	10053200	Primary Inorganic Contaminants	5/25/2004
1855	Odor	EPA 140.1	10007406	Secondary Inorganic Contaminants	1/3/2002
1870	Orthophosphate as P	EPA 300.0	10053200	Primary Inorganic Contaminants	3/7/2011
1900	pH	SM 4500-H+ B-2011	20105220	Secondary Inorganic Contaminants	6/20/2022
1125	Potassium	EPA 200.7	10013806	Secondary Inorganic Contaminants	5/25/2004
1955	Residue-filterable (TDS)	SM 2540 C-2015	20050435	Secondary Inorganic Contaminants	6/20/2022
1140	Selenium	EPA 200.8	10014605	Primary Inorganic Contaminants	4/5/2024
1990	Silica as SiO2	EPA 200.7	10013806	Primary Inorganic Contaminants	5/25/2004
1150	Silver	EPA 200.7	10013806	Secondary Inorganic Contaminants	5/25/2004
1150	Silver	EPA 200.8	10014605	Secondary Inorganic Contaminants	4/5/2024
1155	Sodium	EPA 200.7	10013806	Primary Inorganic Contaminants	5/25/2004
2000	Sulfate	EPA 300.0	10053200	Primary Inorganic Contaminants,Secondary Inorganic Contaminants	5/25/2004
2005	Sulfide	SM 4500-S D/UV-VIS	20026204	Secondary Inorganic Contaminants	3/7/2011
2025	Surfactants - MBAS	SM 5540 C-2011	20145066	Secondary Inorganic Contaminants	6/20/2022
1165	Thallium	EPA 200.8	10014605	Primary Inorganic Contaminants	4/5/2024
1165	Thallium	EPA 200.9	10015404	Primary Inorganic Contaminants	1/3/2002
2500	Total coliforms	SM 9223 B	20037676	Microbiology	1/3/2002
2500	Total coliforms	SM 9223 B (Colilert Quanti-Tray)-2016	20211647	Microbiology	6/20/2022
1645	Total cyanide	EPA 335.4	10061402	Primary Inorganic Contaminants	1/7/2021
1825	Total nitrate-nitrite	EPA 300.0	10053200	Primary Inorganic Contaminants	5/25/2004

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Certification Type **NELAP**
Issue Date: 7/1/2025 **Expiration Date: 6/30/2026**

Laboratory Scope of Accreditation

Attachment to Certificate #: E84167-76, expiration date June 30, 2026. This listing of accredited analytes should be used only when associated with a valid certificate.

State Laboratory ID: **E84167** **EPA Lab Code:** **FL00289** **(941) 723-9986**

E84167
Benchmark EnviroAnalytical, Inc.
1711 12th Street East
Palmetto, FL 34221

Matrix: **Drinking Water**

Analyte#	Analyte	Method/Tech	Method Code	Category	Effective Date
2040	Total organic carbon	SM 5310 B-2014	20137831	Primary Inorganic Contaminants	6/20/2022
9642	Trichloroacetic acid	EPA 552.2	10095804	Group I Unregulated Contaminants	3/7/2025
2055	Turbidity	EPA 180.1	10011800	Secondary Inorganic Contaminants	1/9/2024
2060	UV 254	SM 5910 B	20146401	Primary Inorganic Contaminants	11/16/2016
1185	Vanadium	EPA 200.7	10013806	Secondary Inorganic Contaminants	3/7/2011
1190	Zinc	EPA 200.7	10013806	Secondary Inorganic Contaminants	5/25/2004

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Certification Type **NELAP**
Issue Date: 7/1/2025 **Expiration Date: 6/30/2026**

Laboratory Scope of Accreditation

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State Laboratory ID: **E84167** **EPA Lab Code:** **FL00289** **(941) 723-9986**

E84167
Benchmark EnviroAnalytical, Inc.
1711 12th Street East
Palmetto, FL 34221

Matrix: **Non-Potable Water**

Analyte#	Analyte	Method/Tech	Method Code	Category	Effective Date
1505	Alkalinity as CaCO3	SM 2320 B-2011	20045618	General Chemistry	6/20/2022
1000	Aluminum	EPA 200.7	10013806	Metals	5/25/2004
1000	Aluminum	EPA 6010D	10155950	Metals	3/1/2023
1515	Ammonia as N	EPA 350.1	10063602	General Chemistry	3/7/2011
1005	Antimony	EPA 200.7	10013806	Metals	5/25/2004
1005	Antimony	EPA 200.8	10014605	Metals	4/5/2024
1005	Antimony	EPA 6010D	10155950	Metals	3/1/2023
1010	Arsenic	EPA 200.7	10013806	Metals	5/25/2004
1010	Arsenic	EPA 200.8	10014605	Metals	4/5/2024
1010	Arsenic	EPA 6010D	10155950	Metals	3/1/2023
1015	Barium	EPA 200.7	10013806	Metals	5/25/2004
1015	Barium	EPA 6010D	10155950	Metals	3/1/2023
1020	Beryllium	EPA 200.7	10013806	Metals	5/25/2004
1020	Beryllium	EPA 200.8	10014605	Metals	4/5/2024
1020	Beryllium	EPA 6010D	10155950	Metals	3/1/2023
1530	Biochemical oxygen demand	SM 5210 B-2016	20135039	General Chemistry	6/20/2022
1025	Boron	EPA 200.7	10013806	Metals	5/25/2004
1025	Boron	EPA 6010D	10155950	Metals	3/1/2023
1540	Bromide	EPA 300.0	10053200	General Chemistry	5/25/2004
1030	Cadmium	EPA 200.7	10013806	Metals	5/25/2004
1030	Cadmium	EPA 200.8	10014605	Metals	4/5/2024
1030	Cadmium	EPA 6010D	10155950	Metals	3/1/2023
1035	Calcium	EPA 200.7	10013806	Metals	5/25/2004
1035	Calcium	EPA 6010D	10155950	Metals	3/1/2023
3755	Carbon dioxide	SM 4500-CO2 D	20100430	General Chemistry	3/7/2011
1555	Carbonaceous BOD (CBOD)	SM 5210 B-2016	20135039	General Chemistry	6/20/2022
1565	Chemical oxygen demand	EPA 410.4	10077404	General Chemistry	1/3/2002
1575	Chloride	EPA 300.0	10053200	General Chemistry	5/25/2004
9345	Chlorophylls	EPA 445	10081400	General Chemistry	1/3/2002
9345	Chlorophylls	SM 10200 H	20300225	General Chemistry	5/25/2004
1040	Chromium	EPA 200.7	10013806	Metals	5/25/2004
1040	Chromium	EPA 200.8	10014605	Metals	4/5/2024
1040	Chromium	EPA 6010D	10155950	Metals	3/1/2023
1045	Chromium VI	SM 3500-Cr B (20th/21st/22nd Ed.)/UV-VIS	20066255	General Chemistry	4/20/2009
1050	Cobalt	EPA 200.7	10013806	Metals	5/25/2004

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Certification Type **NELAP**
Issue Date: 7/1/2025 **Expiration Date: 6/30/2026**

Laboratory Scope of Accreditation

Attachment to Certificate #: E84167-76, expiration date June 30, 2026. This listing of accredited analytes should be used only when associated with a valid certificate.

State Laboratory ID: E84167 **EPA Lab Code: FL00289** **(941) 723-9986**

E84167
Benchmark EnviroAnalytical, Inc.
1711 12th Street East
Palmetto, FL 34221

Matrix: Non-Potable Water

Analyte#	Analyte	Method/Tech	Method Code	Category	Effective Date
1050	Cobalt	EPA 6010D	10155950	Metals	3/1/2023
1605	Color	SM 2120 B-2011	20039310	General Chemistry	6/20/2022
1610	Conductivity	SM 2510 B-2011	20048617	General Chemistry	6/20/2022
1055	Copper	EPA 200.7	10013806	Metals	5/25/2004
1055	Copper	EPA 200.8	10014605	Metals	4/5/2024
1055	Copper	EPA 6010D	10155950	Metals	3/1/2023
1620	Corrosivity (langlier index)	SM 2330 B	20003207	General Chemistry	3/7/2011
1635	Cyanide	EPA 335.4	10061402	General Chemistry	3/7/2011
2520	Enterococci	ENTEROLERT / QUANTI-TRAY	60030208	Microbiology	3/7/2011
2525	Escherichia coli	SM 9223 B-2016 (Colilert QT)	20037701	Microbiology	6/20/2022
2530	Fecal coliforms	COLILERT®-18 (Fecal Coliforms)	60002688	Microbiology	7/1/2016
2530	Fecal coliforms	SM 9221 E-2014	20227263	Microbiology	6/20/2022
2530	Fecal coliforms	SM 9222 D-2015	20210020	Microbiology	6/20/2022
2540	Fecal streptococci	SM 9230 C-2013	20217690	Microbiology	6/20/2022
1730	Fluoride	EPA 300.0	10053200	General Chemistry	5/25/2004
1750	Hardness	SM 2340 B-2011	20046611	General Chemistry	6/20/2022
1750	Hardness	SM 2340 C-2011	20047614	General Chemistry	6/20/2022
1760	Hardness (calc.)	EPA 200.7	10013806	Metals	5/25/2004
2555	Heterotrophic plate count	SM 9215 B	20179811	Microbiology	3/7/2011
3840	Hydrogen sulfide	SM 4500S= H (21st ed.)	20125057	General Chemistry	11/21/2008
1070	Iron	EPA 200.7	10013806	Metals	5/25/2004
1070	Iron	EPA 6010D	10155950	Metals	3/1/2023
1795	Kjeldahl nitrogen - total	EPA 351.2	10065404	General Chemistry	1/3/2002
1075	Lead	EPA 200.7	10013806	Metals	5/25/2004
1075	Lead	EPA 200.8	10014605	Metals	4/5/2024
1075	Lead	EPA 6010D	10155950	Metals	3/1/2023
1085	Magnesium	EPA 200.7	10013806	Metals	5/25/2004
1085	Magnesium	EPA 6010D	10155950	Metals	3/1/2023
1090	Manganese	EPA 200.7	10013806	Metals	5/25/2004
1090	Manganese	EPA 6010D	10155950	Metals	3/1/2023
1095	Mercury	EPA 245.1	10036609	Metals	1/3/2002
1100	Molybdenum	EPA 200.7	10013806	Metals	5/25/2004
1100	Molybdenum	EPA 6010D	10155950	Metals	3/1/2023
1105	Nickel	EPA 200.7	10013806	Metals	5/25/2004
1105	Nickel	EPA 200.8	10014605	Metals	4/5/2024

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Certification Type NELAP
Issue Date: 7/1/2025 **Expiration Date: 6/30/2026**

Laboratory Scope of Accreditation

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State Laboratory ID: E84167 **EPA Lab Code: FL00289** **(941) 723-9986**

E84167
Benchmark EnviroAnalytical, Inc.
1711 12th Street East
Palmetto, FL 34221

Matrix: Non-Potable Water

Analyte#	Analyte	Method/Tech	Method Code	Category	Effective Date
1105	Nickel	EPA 6010D	10155950	Metals	3/1/2023
1805	Nitrate	Systea Easy (1-Reagent) Nitrate Method/UV-VIS	90019117	General Chemistry	7/1/2016
1810	Nitrate as N	EPA 300.0	10053200	General Chemistry	5/25/2004
1835	Nitrite	SM 4500-$NO2^-$ B-2011	20113115	General Chemistry	6/20/2022
1840	Nitrite as N	EPA 300.0	10053200	General Chemistry	5/25/2004
1860	Oil & Grease	EPA 1664A	10127807	General Chemistry	1/3/2002
1865	Organic nitrogen	TKN minus AMMONIA	60034437	General Chemistry	11/21/2008
1870	Orthophosphate as P	EPA 300.0	10053200	General Chemistry	5/25/2004
1870	Orthophosphate as P	EPA 365.3	10070801	General Chemistry	1/3/2002
1900	pH	SM 4500-H+ B-2011	20105220	General Chemistry	6/20/2022
1910	Phosphorus, total	EPA 365.3	10070801	General Chemistry	1/3/2002
1125	Potassium	EPA 200.7	10013806	Metals	5/25/2004
1125	Potassium	EPA 6010D	10155950	Metals	3/1/2023
1945	Residual free chlorine	SM 4500-Cl G	20081441	General Chemistry	7/31/2007
1955	Residue-filterable (TDS)	SM 2540 C-2015	20050435	General Chemistry	6/20/2022
1960	Residue-nonfilterable (TSS)	SM 2540 D-2015	20051223	General Chemistry	6/20/2022
1975	Salinity	SM 2520 B	20004006	General Chemistry	6/25/2004
1140	Selenium	EPA 200.7	10013806	Metals	5/25/2004
1140	Selenium	EPA 200.8	10014605	Metals	4/5/2024
1140	Selenium	EPA 6010D	10155950	Metals	3/1/2023
1990	Silica as SiO2	EPA 200.7	10013806	Metals	5/25/2004
1990	Silica as SiO2	SM 4500-SiO2 C (20th/21st Ed.)/UV-VIS	20128603	General Chemistry	7/31/2007
1150	Silver	EPA 200.7	10013806	Metals	5/25/2004
1150	Silver	EPA 200.8	10014605	Metals	4/5/2024
1150	Silver	EPA 6010D	10155950	Metals	3/1/2023
1155	Sodium	EPA 200.7	10013806	Metals	5/25/2004
1155	Sodium	EPA 6010D	10155950	Metals	3/1/2023
8043	Specific Oxygen Uptake Rate (SOUR)	SM 2710 B	20005805	General Chemistry	1/3/2002
1160	Strontium	EPA 200.7	10013806	Metals	5/25/2004
2000	Sulfate	EPA 300.0	10053200	General Chemistry	5/25/2004
2005	Sulfide	SM 4500-$S2^-$ D-2011	20125864	General Chemistry	6/20/2022
2015	Sulfite-SO3	SM 4500-SO3 B	20026806	General Chemistry	3/7/2011
2025	Surfactants - MBAS	SM 5540 C-2011	20145066	General Chemistry	6/20/2022
1165	Thallium	EPA 200.7	10013806	Metals	5/25/2004
1165	Thallium	EPA 200.8	10014605	Metals	4/5/2024

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Issue Date: 7/1/2025 **Expiration Date: 6/30/2026**

Laboratory Scope of Accreditation

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E84167
Benchmark EnviroAnalytical, Inc.
1711 12th Street East
Palmetto, FL 34221

Matrix: **Non-Potable Water**

Analyte#	Analyte	Method/Tech	Method Code	Category	Effective Date
1165	Thallium	EPA 200.9	10015404	Metals	11/21/2008
1165	Thallium	EPA 6010D	10155950	Metals	3/1/2023
1175	Tin	EPA 200.7	10013806	Metals	5/25/2004
1175	Tin	EPA 6010D	10155950	Metals	3/1/2023
1180	Titanium	EPA 200.7	10013806	Metals	5/25/2004
1180	Titanium	EPA 6010D	10155950	Metals	3/1/2023
2500	Total coliforms	SM 9221 B-2014	20191289	Microbiology	6/20/2022
2500	Total coliforms	SM 9222 B-2015	20208439	Microbiology	6/20/2022
2500	Total coliforms	SM 9223 B-2016 (Colilert QT)	20037701	Microbiology	6/20/2022
1645	Total cyanide	EPA 9012B	10243228	General Chemistry	3/1/2023
1825	Total nitrate-nitrite	EPA 300.0	10053200	General Chemistry	5/25/2004
1825	Total nitrate-nitrite	Systea Easy (1-Reagent) Nitrate Method/UV-VIS	90019117	General Chemistry	7/1/2016
1827	Total Nitrogen	EPA 351.2 + EPA 353.2	10238309	General Chemistry	3/7/2011
2040	Total organic carbon	SM 5310 B-2014	20137831	General Chemistry	3/1/2024
2050	Total Petroleum Hydrocarbons (TPH)	EPA 1664A	10127807	General Chemistry	1/3/2002
1725	Total, fixed, and volatile residue	SM 2540 G-2015	20005281	General Chemistry	6/20/2022
2055	Turbidity	EPA 180.1	10011800	General Chemistry	1/3/2002
2058	Un-Ionized Ammonia	DEP SOP 10/03/83	90015842	General Chemistry	1/3/2002
1185	Vanadium	EPA 200.7	10013806	Metals	5/25/2004
1185	Vanadium	EPA 6010D	10155950	Metals	3/1/2023
1190	Zinc	EPA 200.7	10013806	Metals	5/25/2004
1190	Zinc	EPA 6010D	10155950	Metals	3/1/2023

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Certification Type **NELAP**
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E84167
Benchmark EnviroAnalytical, Inc.
1711 12th Street East
Palmetto, FL 34221

Matrix: **Solid and Chemical Materials**

Analyte#	Analyte	Method/Tech	Method Code	Category	Effective Date
1000	Aluminum	EPA 6010D	10155950	Metals	3/1/2023
1515	Ammonia as N	EPA 350.1	10063602	General Chemistry	10/20/2023
1005	Antimony	EPA 6010D	10155950	Metals	3/1/2023
1010	Arsenic	EPA 6010D	10155950	Metals	3/1/2023
1015	Barium	EPA 6010D	10155950	Metals	3/1/2023
1020	Beryllium	EPA 6010D	10155950	Metals	3/1/2023
1025	Boron	EPA 6010D	10155950	Metals	3/1/2023
1540	Bromide	EPA 9056A	10199607	General Chemistry	3/1/2023
1030	Cadmium	EPA 6010D	10155950	Metals	3/1/2023
1035	Calcium	EPA 6010D	10155950	Metals	3/1/2023
1575	Chloride	EPA 9056A	10199607	General Chemistry	3/1/2023
1040	Chromium	EPA 6010D	10155950	Metals	3/1/2023
1050	Cobalt	EPA 6010D	10155950	Metals	3/1/2023
1055	Copper	EPA 6010D	10155950	Metals	3/1/2023
2530	Fecal coliforms	SM 9221 E-2014	20227263	Microbiology	6/20/2022
1947	Fixed Residue	SM 2540 G-2015	20005281	General Chemistry	6/20/2022
1730	Fluoride	EPA 9056A	10199607	General Chemistry	3/1/2023
1070	Iron	EPA 6010D	10155950	Metals	3/1/2023
1795	Kjeldahl nitrogen - total	EPA 351.2	10065404	General Chemistry	9/11/2023
1075	Lead	EPA 6010D	10155950	Metals	3/1/2023
1085	Magnesium	EPA 6010D	10155950	Metals	3/1/2023
1090	Manganese	EPA 6010D	10155950	Metals	3/1/2023
1095	Mercury	EPA 7471B	10166457	Metals	3/1/2023
1100	Molybdenum	EPA 6010D	10155950	Metals	3/1/2023
1105	Nickel	EPA 6010D	10155950	Metals	3/1/2023
1805	Nitrate	EPA 9056A	10199607	General Chemistry	3/1/2023
1835	Nitrite	EPA 9056A	10199607	General Chemistry	3/1/2023
1870	Orthophosphate as P	EPA 9056A	10199607	General Chemistry	3/1/2023
1900	pH	EPA 9045D	10198455	General Chemistry	3/1/2023
1910	Phosphorus, total	EPA 365.3	10070801	General Chemistry	9/11/2006
1125	Potassium	EPA 6010D	10155950	Metals	3/1/2023
1950	Residue-total	SM 2540 G-2015	20005281	General Chemistry	6/20/2022
1970	Residue-volatile	SM 2540 G-2015	20005281	General Chemistry	6/20/2022
1140	Selenium	EPA 6010D	10155950	Metals	3/1/2023
1150	Silver	EPA 6010D	10155950	Metals	3/1/2023
1155	Sodium	EPA 6010D	10155950	Metals	3/1/2023

Clients and Customers are urged to verify the laboratory's current certification status with the Environmental Laboratory Certification Program.

Certification Type **NELAP**
Issue Date: 7/1/2025 **Expiration Date: 6/30/2026**

Laboratory Scope of Accreditation

Attachment to Certificate #: E84167-76, expiration date June 30, 2026. This listing of accredited analytes should be used only when associated with a valid certificate.

State Laboratory ID: **E84167** **EPA Lab Code:** **FL00289** **(941) 723-9986**

E84167
Benchmark EnviroAnalytical, Inc.
1711 12th Street East
Palmetto, FL 34221

Matrix: **Solid and Chemical Materials**

Analyte#	Analyte	Method/Tech	Method Code	Category	Effective Date
1160	Strontium	EPA 6010D	10155950	Metals	3/1/2023
2000	Sulfate	EPA 9056A	10199607	General Chemistry	3/1/2023
1460	Synthetic Precipitation Leaching Procedure (SPLP)	EPA 1312	10119003	General Chemistry	3/7/2011
1165	Thallium	EPA 6010D	10155950	Metals	3/1/2023
1175	Tin	EPA 6010D	10155950	Metals	3/1/2023
1466	Toxicity Characteristic Leaching Procedure (TCLP)	EPA 1311	10118806	General Chemistry	3/7/2011
1185	Vanadium	EPA 6010D	10155950	Metals	3/1/2023
1190	Zinc	EPA 6010D	10155950	Metals	3/1/2023

Laboratory Scope of Accreditation

Attachment to Certificate #: E84567-43, expiration date June 30, 2026. This listing of accredited analytes should be used only when associated with a valid certificate.

State Laboratory ID: **E84567** EPA Lab Code: **FL01095** **(863) 656-2020**

E84567
Benchmark Mid Florida Laboratory
1153 First Street South
Winter Haven, FL 33880

Matrix: **Drinking Water**

Analyte#	Analyte	Method/Tech	Method Code	Category	Effective Date
2525	Escherichia coli	SM 9222 G	20210199	Microbiology	10/25/2017
2525	Escherichia coli	SM 9223 B	20037676	Microbiology	3/18/2011
2525	Escherichia coli	SM 9223 B /QUANTI-TRAY	20211603	Microbiology	8/26/2020
2555	Heterotrophic plate count	SM 9215 B	20179811	Microbiology	4/23/2024
1855	Odor	EPA 140.1	10007406	Secondary Inorganic Contaminants	8/31/2020
1900	pH	SM 4500-H+-B	20105219	Primary Inorganic Contaminants	8/31/2020
2500	Total coliforms	SM 9222 B	20203401	Microbiology	11/21/2001
2500	Total coliforms	SM 9223 B	20037676	Microbiology	11/21/2001
2500	Total coliforms	SM 9223 B /QUANTI-TRAY	20211603	Microbiology	8/26/2020

Clients and Customers are urged to verify the laboratory's current certification status with the Environmental Laboratory Certification Program.

Certification Type NELAP
Issue Date: 7/1/2025 **Expiration Date: 6/30/2026**

Laboratory Scope of Accreditation

Attachment to Certificate #: E84567-43, expiration date June 30, 2026. This listing of accredited analytes should be used only when associated with a valid certificate.

State Laboratory ID: **E84567** EPA Lab Code: **FL01095** **(863) 656-2020**

E84567
Benchmark Mid Florida Laboratory
1153 First Street South
Winter Haven, FL 33880

Matrix: **Non-Potable Water**

Analyte#	Analyte	Method/Tech	Method Code	Category	Effective Date
1610	Conductivity	SM 2510 B	20048606	General Chemistry	11/21/2001
2520	Enterococci	ENTEROLERT / QUANTI-TRAY	60030208	Microbiology	8/26/2020
2525	Escherichia coli	SM 9223 B-2016 (Colilert QT)	20037701	Microbiology	11/30/2021
2530	Fecal coliforms	COLILERT®-18 (Fecal Coliforms)	60002688	Microbiology	8/26/2020
2530	Fecal coliforms	SM 9221 E-2014	20227263	Microbiology	1/17/2022
2530	Fecal coliforms	SM 9222 D-2015	20210020	Microbiology	11/30/2021
1900	pH	SM 4500-H+-B	20105219	General Chemistry	8/26/2020
2500	Total coliforms	SM 9221 B-2014	20191289	Microbiology	1/17/2022
2500	Total coliforms	SM 9223 B-2016 (Colilert QT)	20037701	Microbiology	11/30/2021

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Certification Type NELAP
Issue Date: 7/1/2025 **Expiration Date: 6/30/2026**

Laboratory Scope of Accreditation

Attachment to Certificate #: E84567-43, expiration date June 30, 2026. This listing of accredited analytes should be used only when associated with a valid certificate.

State Laboratory ID: **E84567** EPA Lab Code: **FL01095** **(863) 656-2020**

E84567
Benchmark Mid Florida Laboratory
1153 First Street South
Winter Haven, FL 33880

Matrix: **Solid and Chemical Materials**

Analyte#	Analyte	Method/Tech	Method Code	Category	Effective Date
2530	Fecal coliforms	SM 9221 E-2014	20227263	Microbiology	4/1/2022

Clients and Customers are urged to verify the laboratory's current certification status with the Environmental Laboratory Certification Program.

Certification Type NELAP
Issue Date: 7/1/2025 **Expiration Date: 6/30/2026**

C. Quality Manual and Quality System Information Compliant with FDEP SOP 001/01

BenchmarkEA has developed a Quality Manual which outlines a comprehensive framework that ensures all environmental data meet the standards required for scientific validity and is compliant with FDEP SOP 001/01. BenchmarkEA supports these objectives through a structured quality system that includes:

Precision and Accuracy: The laboratory employs matrix spikes, duplicates, and quality control check standards to assess and document precision and accuracy. These metrics are tracked using statistical methods and control charts to ensure consistent performance.

Representativeness and Comparability: Standardized sampling protocols, calibration procedures, and method validation practices are applied across both field and laboratory operations to ensure data are representative of actual conditions and comparable across datasets.

Method Detection Limits (MDLs) and Practical Quantitation Limits (PQLs): MDLs are determined in accordance with 40 CFR Part 136, Appendix B Rev. 2, and PQLs are verified quarterly to ensure sensitivity and reliability of reported results.

Data Validation and Reporting: A multi-tiered validation process is in place involving analysts, quality control officers, and project managers. This process ensures that all reported data meet project specifications and are supported by appropriate quality control documentation.

Benchmark also participates in external proficiency testing and blind sample programs to validate its analytical performance and maintain compliance with The NELAC Institute (TNI) Quality Systems Standards.

Please refer to Tab XII. Appendix (beginning on page 75) for BenchmarkEA's full quality manual.

D. Data Quality Objectives/Indicators for Laboratory and Field Measurement Data

All monitoring described herein shall meet the requirements conveyed in the FDEP's Quality Assurance Rule, 62-160 F.A.C. The Field and laboratory analytical results and associated information must meet these requirements and be submitted in an electronic format in accordance with accordance with Rule 62-40.540, 62-160.240, and 62-160.340, F.A.C., and as described within the Watershed Information Network Minimum Data Quality Standards (WIN MDQS). Kimley-Horn and BenchmarkEA have years of experience working with State water quality compliance projects and with this electronic filing system.

Laboratory samples will be compliant with the FDEP Rule 62-160 F.A.C and the BenchmarkEA full quality manual. BenchmarkEA will only analyze samples for analytes that they are certified for through the National Environmental Laboratory Accreditation Program (NELAP) for the submitted samples' analyses.

Field parameter DQOs will be determined in conjunction with FDEP and the County to mee the needs of all parties involved in the analysis of the data collected. The County has some DQOs related to field parameters.

VIII. VOLUME OF WORK – TOTAL OF PAYMENTS RECEIVED FROM COUNTY WITHIN THE PAST 24 MONTHS

VIII. VOLUME OF WORK – TOTAL OF PAYMENTS RECEIVED FROM COUNTY WITHIN THE PAST 24 MONTHS

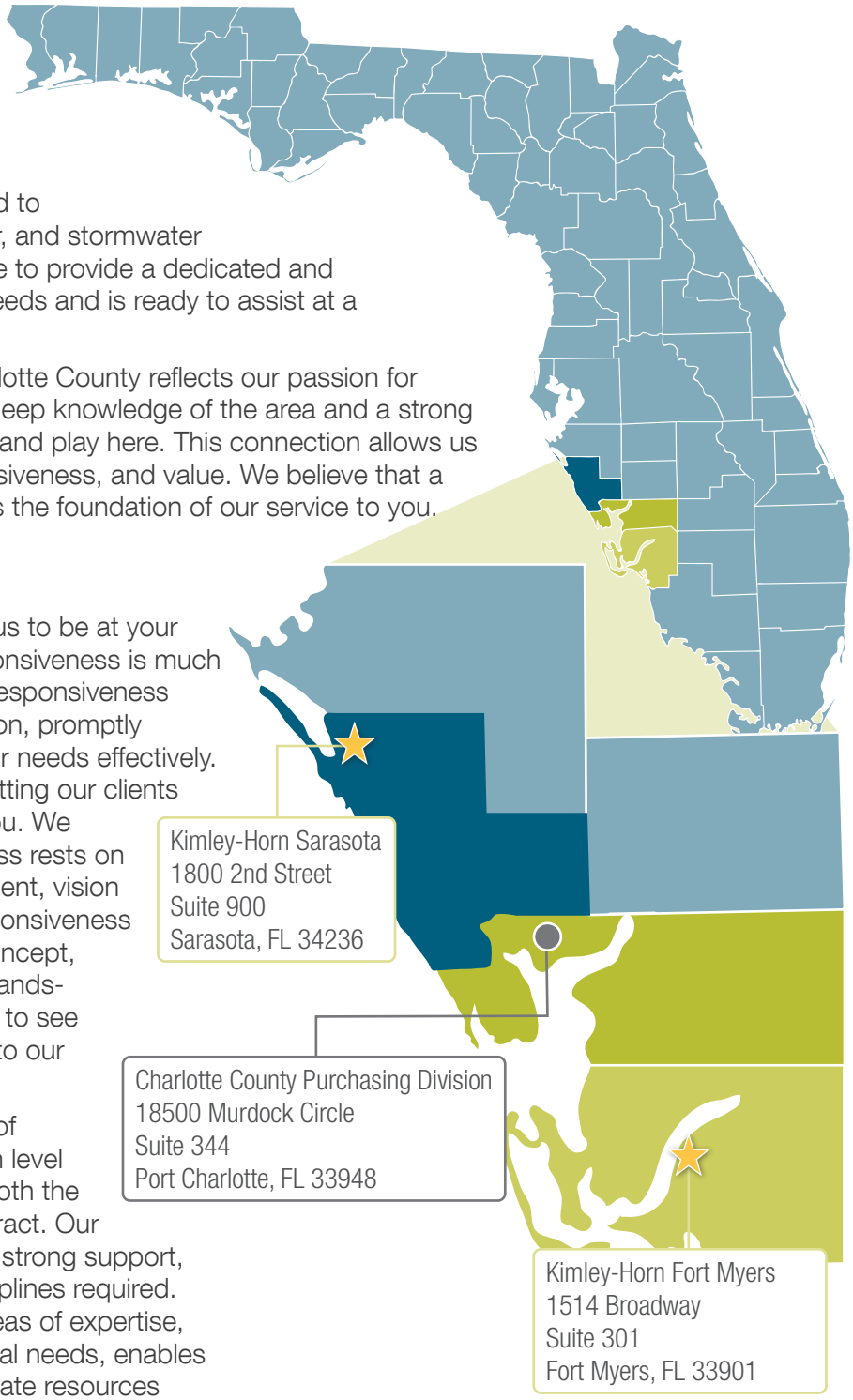
In the past 24 months, Kimley-Horn has received a total of $2,104,348 in payments from Charlotte County (based on executed contracts with the County). Kimley-Horn has 19 active projects with the County.

IX. LOCATION

IX. LOCATION

Our team remains committed to delivering the local quality and expertise that Charlotte County has come to expect from our Sarasota and Fort Myers offices. These offices are proud to actively support you on water, wastewater, and stormwater projects. With nearby locations, we're able to provide a dedicated and responsive team that understands your needs and is ready to assist at a moment's notice.

Our ongoing commitment to serving Charlotte County reflects our passion for enhancing the community we love. With deep knowledge of the area and a strong local presence, we're proud to live, work, and play here. This connection allows us to offer unmatched accountability, responsiveness, and value. We believe that a strong commitment to client satisfaction is the foundation of our service to you.



Responsiveness of Team

Our proximity to Charlotte County allows us to be at your office in less than an hour. However, responsiveness is much more than proximity or distance to you. Responsiveness means providing you with timely information, promptly returning phone calls, and addressing your needs effectively. At Kimley-Horn, we pride ourselves on putting our clients first. When you call, we will be there for you. We strongly believe that our continuing success rests on the strengths of our day-to-day management, vision for the firm, emphasis on quality, and responsiveness to you, our client. As part of our quality concept, Kimley-Horn leadership takes an active, hands-on role in the firm's day-to-day operations to see that our corporate commitments are met to our clients' satisfaction.

We have carefully assembled a key team of seasoned professionals who offer the high level of responsiveness you need throughout both the short- and long-term duration of this contract. Our team brings exceptional local knowledge, strong support, and extensive experience across the disciplines required. The depth of our staff in the necessary areas of expertise, combined with our familiarity with municipal needs, enables us to maximize coordination efforts, integrate resources effectively, adhere to project schedules, and manage budgets efficiently. With these processes in place, we are well-equipped to meet the technical and staffing demands anticipated for this contract.

Kimley-Horn will be performing all services for Charlotte County, led by our Fort Myers office and supported by our Sarasota and nearby offices. Statewide, there are over 1,500 professional support staff located in our 22 offices that can be called upon if needed.

X. LITIGATION – HAVE YOU BEEN NAMED AS A DEFENDANT OR CO-DEFENDANT IN A LAWSUIT IN THE LAST FIVE YEARS?

X. LITIGATION – HAVE YOU BEEN NAMED AS A DEFENDANT OR CO-DEFENDANT IN A LAWSUIT IN THE LAST FIVE YEARS?

Kimley-Horn and its subsidiaries have provided services in all 50 states and numerous countries. Because of the many and varied projects we have completed, we are subject to various legal proceedings from time to time and in the ordinary course of business. It is not practical to provide a complete list as part of this proposal. In the last five (5) years, Kimley-Horn has had more than 29,993 active projects in Florida, 32 of which had some form of litigation. Of these cases, 2 were dismissed, 21 were settled, and 9 are pending. This represents 0.1067% of all projects completed by Kimley-Horn in Florida over the past five years. None of the pending cases, if decided against Kimley-Horn, would have a material impact on our financial statements or impair in any way our ability to serve our clients. Generally, these matters are covered by insurance, and we consider them to be without merit. If you would like to discuss our legal matters in more detail, please contact Kimley-Horn's General Counsel, Richard Cook, at 919.677.2058.

LEGAL PROCEEDINGS IN FLORIDA WITHIN THE PAST FIVE (5) YEARS ARE AS FOLLOWS:	
CASE NAME	**OUTCOME**
3315 Tower Condominium Association, Inc., v. Tower 3315, LLC, et al;	11th Judicial Circuit Court, Miami-Dade County, FL; Cause No. 2020-019825-CA-01; filed 2020; alleged economic loss; settled; closed 2021.
Angela Briguglio v Palm Avenue Hospitality Holdings LLC, et al	In the Circuit Court of the 12th Judicial Circuit of Sarasota County, Florida; Cause No 2022-CA-3952-NC; filed 2022; served 2022; alleged personal injury; settled; closed 2023
Community Asphalt Corporation v. Wantman Group, Inc., et al; Florida Department of Transportation	11th Judicial Circuit Court, Miami-Dade County, FL; Cause No. 2018-029816-CA-01; filed 2018; alleged economic loss; settled; closed 2023
Cone & Graham, Inc. v. Kimley-Horn and Associates, Inc.	In the Circuit Court of Broward County, Florida; Cause No. CACE-21-014631; filed 2021; alleged economic loss; settled; closed 2022
Jennifer Curell v Florida Department of Transportation, et al	19th Judicial Circuit in and for St. Lucie County, Florida; Cause No. 562022CA001297AXXXXHC; alleged personal injuries claimed; settled; closed 2024
Florida Silt and Sod, Inc. v. City of Plant City, et al	13th Judicial Circuit Court, Hillsborough County, Florida; Case No. 22-CA-004094; filed 2022; alleged economic loss; settled; closed 2023
Irene Gomes v. Aldi, L.L.C., et al	In the Circuit Court of the 11th Circuit, Miami-Dade County, Florida; Cause No. 2020-009878-CA-01; filed 2020; served 2022; alleged personal injuries claimed; settled; closed 2022
Barbara Kline v. Simon Property, et al	15th Judicial Circuit Court Palm Beach; Case No. 502019CA009926; filed 2019; served 2021; personal injury claim; settled; closed 2022
Grande Oaks at Heathrow Association v Kolter Signature Homes, et al	18th Judicial Circuit Court, Seminole County; Case No. 2020-CA-003188; filed 2020; alleged economic loss; settled; closed 2023.

LEGAL PROCEEDINGS IN FLORIDA WITHIN THE PAST FIVE (5) YEARS ARE AS FOLLOWS:	
CASE NAME	**OUTCOME**
Heron Bay Community Association, Inc. vs. WCI Communities, LLC, et al	15th Judicial Circuit Court, Broward County; Case No.: CACE16003120; filed 2016; alleged economic loss; settled; closed 2020
Jennifer Lancaster v. VCC, LLC, et al	15th Judicial District Court of Palm Beach County, Florida; Cause No. 502019CA011526; filed 2019; served 2020; alleged personal injuries claimed; settled; closed 2021.
Medline Industries, Inc. V. McShane Construction Company, LLC v. Ware Malcomb, Inc., et al.;	10th Judicial Circuit Court, Polk County, FL; Case # 2020-CA-0022790; filed 2020; alleged economic loss; settled; closed 2023
Lawrence Milder v. RT GeoSolutions Inc., et al	In the Circuit Court of the 17th Judicial District Court, in and for Broward County, Florida; Case No. 20-020512(25); filed 2020; served 2023; alleged personal injuries claimed; Kimley-Horn dismissed; closed 2023
Harris Mitchell v. Frank Anderson, et al	15th Judicial Circuit Court, Palm Beach County, Florida; Case No. 50-2019-CA-006676; filed 2019, served 2020; alleged personal injuries claimed; settled; closed 2020
Yolanda Peaslee v The City of West Palm Beach, et al	Circuit Court of the 15th Judicial Circuit, Palm Beach County, Florida; Cause No. 502021CA004964XXXXMB; personal injury claim; settled; closed 2023
Sherri Reed v. Town Center Boca Raton Trust, et al	15th Judicial Circuit Court Palm Beach; Case No. 21CA005161; filed 2021; personal injury claim; settled; closed 2023
Christ Rose v. Wal-Mart Stores, Inc., et al	17th Judicial Circuit Court, Broward County, FL; Cause No. CACE-18-027255; filed 2018; served 2020; alleged personal injuries claimed; settled; closed 2021
Sema Construction, Inc. v. City of Altamonte Springs	18th Judicial Circuit Court, Seminole County; Case No. 2015-CA-002951-15-W; filed 2016; alleged economic loss; settled; closed 2024
Esther Silberman v Town Center at Boca Raton, et al	15th Judicial District Court of Palm Beach Co, Florida; Cause No. 50-2018-CA-009724-MB; filed 2018; served 2021; alleged personal injuries claimed; settled; closed 2021
Kevin Sona, et al v. Stone Creek Community Association, et al	Circuit Court of the Fifth Judicial Circuit, Marion County, FL; Case # 20CA0026; filed 2020; served 2021; alleged personal injuries claimed; settled; closed 2022
Terrazas Riverpark Village Condominium Association, Inc. v. Windmoor Project LLC, et al	11th Judicial Circuit Court, Miami-Dade County, FL; Cause No. 2020-017647-CA-01; filed 2020; alleged economic loss; settled; closed 2021

LEGAL PROCEEDINGS IN FLORIDA WITHIN THE PAST FIVE (5) YEARS ARE AS FOLLOWS:	
CASE NAME	**OUTCOME**
Morrison-Cobalt JV v. Kimley-Horn and Associates, Inc.	11th Judicial Circuit in and for Miami-Dade County, Florida; Cause No. 2021-013239-CA-01; alleged economic loss; settled; closed 2025
Maurico Suarez v Miami -Dade County, et al	11th Judicial Circuit Court, Miami-Dade County, FL; Cause No. 2024-011127-CA-01; filed 2024; served 2025; alleged personal injuries claimed; dismissed; closed 2025
Donald Stroman, Jr. v FDOT, et al; Cause No. 2023-CA-007165-O	In the Ninth Judicial District Court of Orange County, Florida; filed 2023; alleged personal injuries claimed; dismissed; closed 2025
Adrian E. Langford v. Suffolk Construction Co., et al	12th Judicial Circuit Court, Sarasota County, FL; Cause No. 582020CA005449XXXANC; filed 2020; served 2021; alleged personal injuries claimed; pending
Iconbrickell Master Association, Inc. v Complete Property Services, Inc., et al	11th Judicial Circuit, Miami-Dade County, Florida; Case No. 2023-028981-CA-0121; filed 2023; served 2024; alleged property damage claimed; pending
Acosta Tractors, Inc. v Biltmore Construction Co, Inc, et al	In the Circuit Court of the 11th Judicial Circuit of Miami-Dade, Florida; Cause No 18-020135-CA-25; filed 2018; served 2022; alleged economic loss; pending
Enrique R. Antezana, et al. v Kimley-Horn and Associates, Inc.; Applied Technical Services, LLC; and City of Miramar	17th Judicial Circuit for Broward County, Florida; Case No. CACE23012261; filed 2023; alleged property damage; pending
Royal Palm Polo Property Owners Association, Inc. v. Toll FL I, LLC, et al	In the Circuit Court of the 15th Judicial Circuit, Palm Beach County, Florida; Cause No. 50-2024-CA-006059XXXAMB; filed 2024; alleged economic loss, pending
Julington Lakes Homeowners Association, Inc. v Toll FL XIII Limited Partnership, et al	In the Circuit Court of the 7th Judicial Circuit, St. Johns County, Florida; Filed 2024; served 2025; alleged economic loss, pending
North Meridian Condominium Association, Inc. v North Meridian, LLC, et al	11th Judicial Circuit Court, Miami-Dade County, FL; Case No. 2025-001550-CA-01; filed 2025; alleged economic loss, pending
City of Sunrise v West Construction, Inc. v Kimley-Horn, et al	17th Judicial Circuit in and for Broward County, FL; Case No. 24-017627; filed 2024; served 2025; alleged economic loss, pending

XI. MINORITY BUSINESS

XI. MINORITY BUSINESS

Kimley-Horn is not a Minority-Owned Business Enterprise (MBE). However, we always look for opportunities to include small and disadvantaged businesses in our contracts and through teaming agreements. We believe this record of MBE firms utilized speaks well of Kimley-Horn's efforts to involve MBEs in our practice. Kimley-Horn will continue its long-standing practice of using MBE on current and future projects.

Kimley-Horn has a company policy of meeting or exceeding our clients' stated minority business participation goals. Through corporate policies and philosophy, the firm actively seeks to encourage and promote the use of MBE firms. We provide interested minority firms with the opportunity to serve as a subconsultant on our teams and throughout the year, actively seeking to increase and update our large database of qualified MBE firms to use on future projects. Our aggressive MBE utilization policy confirms that Kimley-Horn is furthering the positive economic development momentum that the state of Florida advocates using MBE businesses by its contractors.

Our commitment to retaining minority firms to partner with us on projects is demonstrated by the amounts Kimley-Horn has paid to minority businesses during the past 10 years:

YEAR	TOTAL PAID	NUMBER OF FIRMS
2024	**$123.2 million**	**774**
2023	$93.9 million	769
2022	$71.1 million	716
2021	$54.67 million	608
2020	$54.56 million	553
2019	$41.5 million	364
2018	$25.5 million	165
2017	$22.3 million	176
2016	$16.5 million	186
2015	$15.5 million	198

We believe this record of MBE firms utilized speaks well of Kimley-Horn's efforts to involve MBEs in our practice. Kimley-Horn will continue its long-standing practice of using MBE on current and future projects.

XII. APPENDIX

XII. APPENDIX

Kimley-Horn has provided our completed and executed forms on the following pages, along with BenchmarkEA's full quality manual. Per RFP No. 20250526, we have included the following forms:

- ✓ Proposal Submittal Signature Form
- ✓ Drug Free Workplace Form
- ✓ Human Trafficking Affidavit
- ✓ Certificate of Insurance
- ✓ BenchmarkEA's Quality Manual

PART IV - SUBMITTAL FORMS
PROPOSAL SUBMITTAL SIGNATURE FORM

1.	Project Team Name and Title	Years experience	City of office individual will work out of for this project	City individual's office is normally located	City of individual's residence
	Please see the personnel table following				
	this form for a list of all project personnel.				

2.	Magnitude of Company Operations	
	A) Total professional services fees received within last 24 months:	$ 4,473,638,615
	B) Number of similar projects started within last 24 months:	19
	C) Largest single project to date:	$ 132,794,926.28

3.	Magnitude of Charlotte County Projects	
	A) Number of current or scheduled County Projects	27
	B) Payments received from the County over the past 24 months (based upon executed contracts with the County).	$ 2,104,348

4.	Sub-Consultant(s) (if applicable)	Location	% of Work to be Provided	Services to be Provided
	Benchmark	North Port, Palmetto,	35%	Laboratory analysis
	EnviroAnalytical, Inc.	and Winter Haven, FL		

5. Disclosure of interest or involvement: List below all private sector clients with whom you have an active pending contract and who have an interest within the areas affected by this project. Also, include any properties or interests held by your firm, or officers of your firm, within the areas affected by this project.

	Firm	Address
	Phone #	Contact Name
	Start Date	Ending Date
	Project Name/Description	

NAME OF FIRM Kimley-Horn and Associates, Inc.

(This form must be completed and returned)

6. Minority Business: The County will consider the firm's status as an MBE or a certified MBE, and also the status of any sub-contractors or sub-consultants proposed to be utilized by the firm, within the evaluation process.	**Yes** _____ **No** X
Comments or Additional Information: Kimley-Horn has a policy of meeting or exceeding our clinets stated MBE participation goals.	
Kimley-Horn is not a certified MBE, but through corporate policies and philosophy, the firm actively seeks to encourage and promote the use of MBE firms. We provide interested minority firms with the opportunity to serve as subconsulants on our teams and Xthroughout the year, actively seeking to increase	
and update our large databas of qualified MBE firms to use on our future projects. Our aggressive MBE utlization policy helps ensure that Kimley-Horn is furthering the positive economic development momentum that the State of Florida advocates through the use of MBE businesses by its contractors.	

The undersigned attests to his/her authority to submit this proposal and to bind the firm herein named to perform as per contract, if the firm is awarded the Contract by the County. The undersigned further certifies that he/she has read the Request for Proposal, Terms and Conditions, Insurance Requirements and any other documentation relating to this request and this proposal is submitted with full knowledge and understanding of the requirements and time constraints noted herein.

By signing this form, the proposer hereby declares that this proposal is made without collusion with any other person or entity submitting a proposal pursuant to this RFP.

In accordance with section 287.135, Florida Statutes, the undersigned certifies that the company is not on the Scrutinized Companies with Activities in Sudan List, the Scrutinized Companies with Activities in the Iran Petroleum Energy Sector List, and does not have business operations in Cuba or Syria (if applicable) or the Scrutinized Companies that Boycott Israel List, or is not participating in a boycott of Israel.

As Addenda are considered binding as if contained in the original specifications, it is critical that the Consultant acknowledge receipt of same. The submittal may be considered void if receipt of an addendum is not acknowledged.

Addendum No. 1 Dated 7/9/25 Addendum No._____ Dated____ Addendum No._____ Dated_____

Addendum No. 2 Dated 7/11/25 Addendum No._____ Dated____ Addendum No._____ Dated_____

Type of Organization (please check one): INDIVIDUAL (_) PARTNERSHIP (_) CORPORATION (X) JOINT VENTURE (_)

Kimley-Horn and Associates, Inc. — Firm Name

919.677.2000 — Telephone

N/A — Fictitious or d/b/a Name

56-0885615 — Federal Employer Identification Number (FEIN)

421 Fayetteville Street, Suite 600 — Home Office Address

Raleigh, NC 27601 — City, State, Zip

58 Years — Number of Years in Business

151 Broadway Suite 301, Fort Myers, FL 33901 — Address: Office Servicing Charlotte County, other than above

Kellie Clark, PE, Project Manager, Vice President — Name/Title of your Charlotte County Rep.

239.271.2641 — Telephone

Kellie Clark, PE, Vice President — Name/Title of Individual Binding Firm (Please Print)

Kellie Clark — Signature of Individual Binding Firm

7/18/2025 — Date

kellie.clark@kimley-horn.com — Email Address

(This form must be completed & returned)

1. Project Team Name and Title	Years Experience	City of office individual will work out of for this project	City individual's office is normally located	City of individual's residence
Kellie Clark, PE – Project Manager	16	Fort Myers	Fort Myers	Babcock Ranch
Lewis Bryant, PE – Principal-in-Charge	25	Fort Myers	Fort Myers	Fort Myers
Alan Garri, PE – Technical Advisor	23	Ocala	Ocala	Ocala
Molly Williams, PE – Quality Control/Quality Assurance	29	Sarasota	Sarasota	Sarasota
Kira Hansen, PhD, PE – Surface Water Quality Monitoring; Regulatory Compliance/Quality Assurance; Statistical Analysis	9	Fort Myers	Fort Myers	Cape Coral
Ronnie Van Fleet, PWS – Surface Water Quality Monitoring; Statistical Analysis	37	Sarasota	Sarasota	Sarasota
Derick Bryant – Surface Water Quality Monitoring	20	Fort Myers	Fort Myers	Fort Myers
Kim Arnold, PG – Groundwater Monitoring and Hydrogeology Planning	22	Fort Myers	Fort Myers	Fort Myers
Bill Spinner, PG – Groundwater Monitoring and Hydrogeology Planning	21	Tampa	Tampa	Tampa
Chloe Johnson – Groundwater Monitoring and Hydrogeology Planning	2	Fort Myers	Fort Myers	Fort Myers
Jennifer Briggs, PMP – Regulatory Compliance/Quality Assurance	7	Sarasota	Sarasota	Sarasota
Jeff Goodwin – Regulatory Compliance/Quality Assurance	26	Sarasota	Sarasota	Sarasota
Chris Niforatos, PE – Statistical Analysis	31	St. Petersburg	St. Petersburg	Odessa
Dale Dixon, PhD – Laboratory Analysis	33	Palmetto	Palmetto	Palmetto

DRUG FREE WORKPLACE FORM

The undersigned vendor in accordance with Florida Statute 287.087 hereby certifies that Kimley-Horn and Associates, Inc. does:
(name of business)

1. Publish a statement notifying employees that the unlawful manufacture, distribution, dispensing, possession, or use of a controlled substance is prohibited in the workplace and specifying the actions that will be taken against employees for violations of such prohibition.

2. Inform employees about the dangers of drug abuse in the workplace, the business's policy of maintaining a drug-free workplace, any available drug counseling, rehabilitation, and employee assistance programs, and the penalties that may be imposed upon employees for drug abuse violations.

3. Give each employee engaged in providing the commodities or contractual services that are under bid a copy of the statement specified in subsection (1).

4. In the statement specified in subsection (1), notify the employees that, as a condition of working on the commodities or contractual services that are under bid, the employee will abide by the terms of the statement and will notify the employer of any conviction of, or plea of guilty or nolo contendere to, any violation of Chapter 893 or of any controlled substance law of the United States or any state, for a violation occurring in the workplace no later than five (5) days after such conviction.

5. Impose a sanction on or require the satisfactory participation in a drug abuse assistance or rehabilitation program if such is available in the employee's community, by any employee who is so convicted.

6. Make a good faith effort to continue to maintain a drug-free workplace through implementation of this section.

As the person authorized to sign the statement, I certify that this firm complies fully with the above requirements.

Kellie Clark
Proposer's Signature

7/18/205
Date

NAME OF FIRM Kimley-Horn and Associates, Inc.

(This form must be completed & returned)

HUMAN TRAFFICKING AFFIDAVIT
for Nongovernmental Entities Pursuant To FS. §787.06

Charlotte County Contract #20250526

The undersigned on behalf of the entity listed below, (the "Nongovernmental Entity"), hereby attests under penalty of perjury as follows:

1. I am over the age of 18 and I have personal knowledge of the matters set forth except as otherwise set forth herein.

2. I am an officer or representative of the Nongovernmental Entity and authorized to provide this affidavit on the Company's behalf.

3. Nongovernmental Entity does not use coercion for labor or services as defined in Section 787.06, Florida Statutes.

4. This declaration is made pursuant to Section 92.525, Florida Statutes. I understand that making a false statement in this declaration may subject me to criminal penalties.

Under penalties of perjury, I declare that I have read the foregoing Human Trafficking Affidavit and that the facts stated in it are true.

Further Affiant sayeth naught.

Signature

Kellie Clark, PE

Printed Name

Vice President

Title

Kimley-Horn and Associates, Inc.

Nongovernmental Entity

7/18/2025

Date

END OF PART IV

NAME OF FIRM Kimley-Horn and Associates, Inc.

(This form must be completed and returned)

CERTIFICATE OF LIABILITY INSURANCE

DATE (MM/DD/YYYY): 3/20/2025

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AFFIRMATIVELY OR NEGATIVELY AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW. THIS CERTIFICATE OF INSURANCE DOES NOT CONSTITUTE A CONTRACT BETWEEN THE ISSUING INSURER(S), AUTHORIZED REPRESENTATIVE OR PRODUCER, AND THE CERTIFICATE HOLDER.

IMPORTANT: If the certificate holder is an ADDITIONAL INSURED, the policy(ies) must have ADDITIONAL INSURED provisions or be endorsed. If SUBROGATION IS WAIVED, subject to the terms and conditions of the policy, certain policies may require an endorsement. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).

PRODUCER Edgewood Partners Insurance Agency 3780 Mansell Rd. Suite 370 Alpharetta GA 30022	**CONTACT NAME:** Jerry Noyola **PHONE (A/C, No, Ext):** 7702207699 **FAX (A/C, No):** **E-MAIL ADDRESS:** greylingcerts@greyling.com
INSURED KIMLASS Kimley-Horn and Associates, Inc. 421 Fayetteville Street, Suite 600 Raleigh, NC 27601	**INSURER(S) AFFORDING COVERAGE** — **NAIC #** **INSURER A :** National Union Fire Ins Co of Pittsburg — 19445 **INSURER B :** Allied World Assurance Co (U.S.) Inc. — 19489 **INSURER C :** New Hampshire Insurance Company — 23841 **INSURER D :** Lloyd's of London — 85202 **INSURER E :** **INSURER F :**

COVERAGES **CERTIFICATE NUMBER:** 1574569136 **REVISION NUMBER:**

THIS IS TO CERTIFY THAT THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

INSR LTR	TYPE OF INSURANCE	ADDL INSD	SUBR WVD	POLICY NUMBER	POLICY EFF (MM/DD/YYYY)	POLICY EXP (MM/DD/YYYY)	LIMITS	
A	X **COMMERCIAL GENERAL LIABILITY** [ ] CLAIMS-MADE [X] OCCUR X Contractual Liab GEN'L AGGREGATE LIMIT APPLIES PER: [ ] POLICY [X] PRO-JECT [X] LOC [ ] OTHER:			GL5268169	4/1/2025	4/1/2026	EACH OCCURRENCE DAMAGE TO RENTED PREMISES (Ea occurrence) MED EXP (Any one person) PERSONAL & ADV INJURY GENERAL AGGREGATE PRODUCTS - COMP/OP AGG	$ 2,000,000 $ 1,000,000 $ 25,000 $ 2,000,000 $ 4,000,000 $ 4,000,000
A A	**AUTOMOBILE LIABILITY** X ANY AUTO [ ] OWNED AUTOS ONLY [ ] SCHEDULED AUTOS X HIRED AUTOS ONLY [X] NON-OWNED AUTOS ONLY			CA4489663 (AOS) CA2970071 (MA)	4/1/2025 4/1/2025	4/1/2026 4/1/2026	COMBINED SINGLE LIMIT (Ea accident) BODILY INJURY (Per person) BODILY INJURY (Per accident) PROPERTY DAMAGE (Per accident)	$ 2,000,000 $ $ $
B	X **UMBRELLA LIAB** [X] OCCUR X **EXCESS LIAB** [ ] CLAIMS-MADE [ ] DED [X] RETENTION $ 10,000			03127930	4/1/2025	4/1/2026	EACH OCCURRENCE AGGREGATE	$ 5,000,000 $ 5,000,000
C C	**WORKERS COMPENSATION AND EMPLOYERS' LIABILITY** ANYPROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBER EXCLUDED? Y / N [N] **(Mandatory in NH)** If yes, describe under DESCRIPTION OF OPERATIONS below	N / A		WC067961230 (AOS) WC013711885 (CA)	4/1/2025 4/1/2025	4/1/2026 4/1/2026	X PER STATUTE [ ] OTH-ER E.L. EACH ACCIDENT E.L. DISEASE - EA EMPLOYEE E.L. DISEASE - POLICY LIMIT	 $ 2,000,000 $ 2,000,000 $ 2,000,000
D	Professional Liability			B0146LDUSA2504949	4/1/2025	4/1/2026	Per Claim Aggregate	$2,000,000 $2,000,000

DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES (ACORD 101, Additional Remarks Schedule, may be attached if more space is required)

Evidence of Coverage

CERTIFICATE HOLDER

Sample Certificate

CANCELLATION

SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, NOTICE WILL BE DELIVERED IN ACCORDANCE WITH THE POLICY PROVISIONS.

AUTHORIZED REPRESENTATIVE

Gregg Bachtel

Benchmark EnviroAnalytical, Inc.

Quality Manual

Palmetto Lab and North Port Lab (North and South Lab)

September 2024 Update

BENCHMARK ENVIROANALYTICAL, INC.
and
BENCHMARK ENVIROANALYTICAL SOUTH

Quality Manual
Revision May 2024

LABORATORY NAME:	Benchmark EnviroAnalytical, Incorporated (BEA) and Benchmark EnviroAnalytical South (BEAS)
LABORATORY ADDRESSES:	1711 12th Street East Palmetto, FL 34221 and 1001 Corporate Ave, Suite 102 North Port, FL 34289
Responsible Individual:	Dale D. Dixon Laboratory Director 1711 12th Street East Palmetto, FL 34221 (941) 723-9986
Laboratory/Technical Director (BEA): Laboratory/Technical Director (BEAS):	Dale D. Dixon Melinda Merchant
Quality Assurance Officer:	Haley Richardson Leah Lepore

Dale Dixon — Laboratory Director (BEA) — 9/9/24 — Date

Melinda Merchant — Laboratory Director (BEAS) — 9/9/24 — Date

Haley Rich — Quality Assurance Officer — 9/9/24 — Date

Quality Assurance Officer — Date

Note: The Effective Date of this revision to the Quality Manual for Benchmark EnviroAnalytical will be the date associated with the above approval signatures, if above signature dates are the same; if above signature dates are not the same, the most recent approval signature date [ie, the above signature date

of the last approver(s) to sign] will be the Effective Date of this revision to the Quality Manual for Benchmark EnviroAnalytical.

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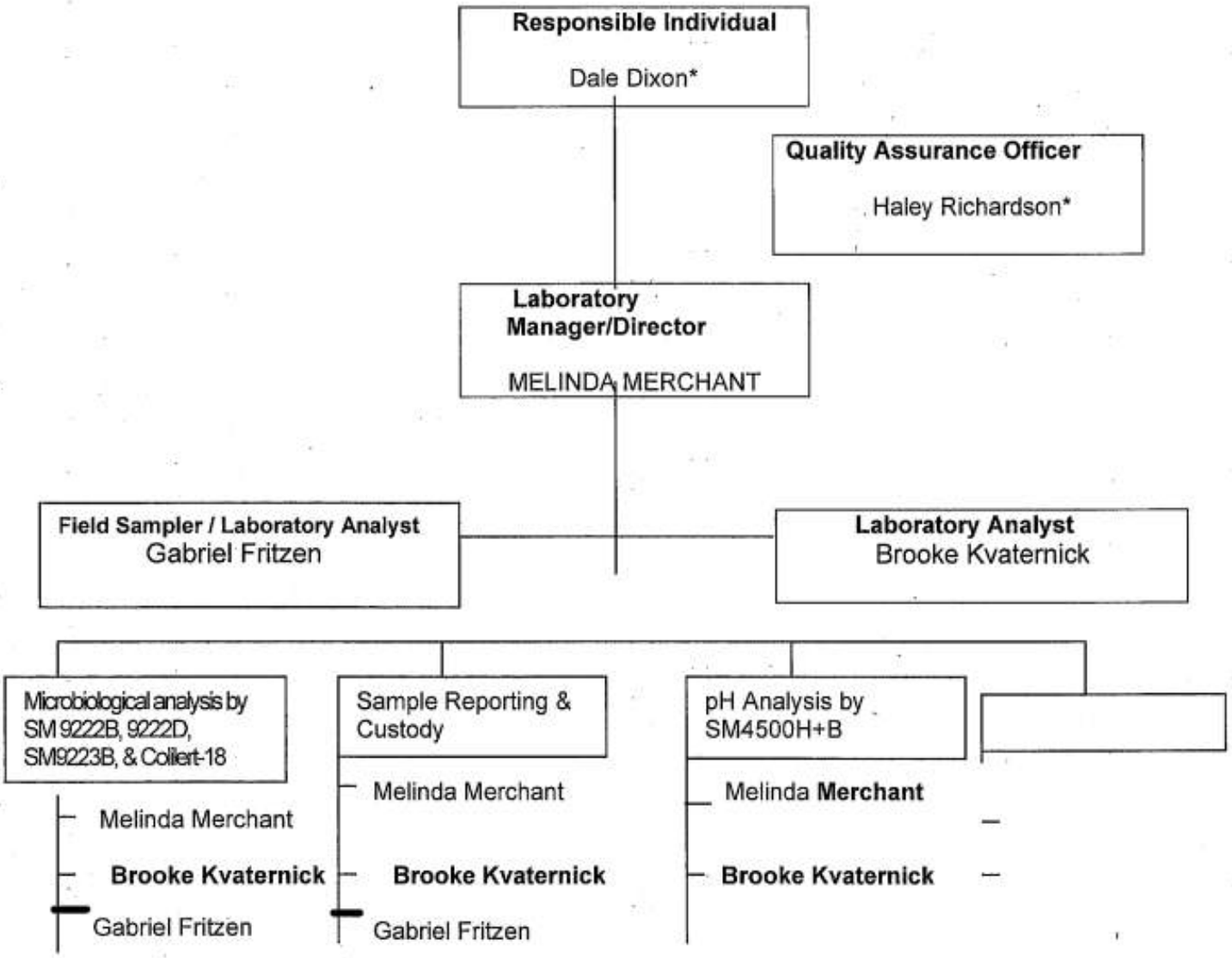
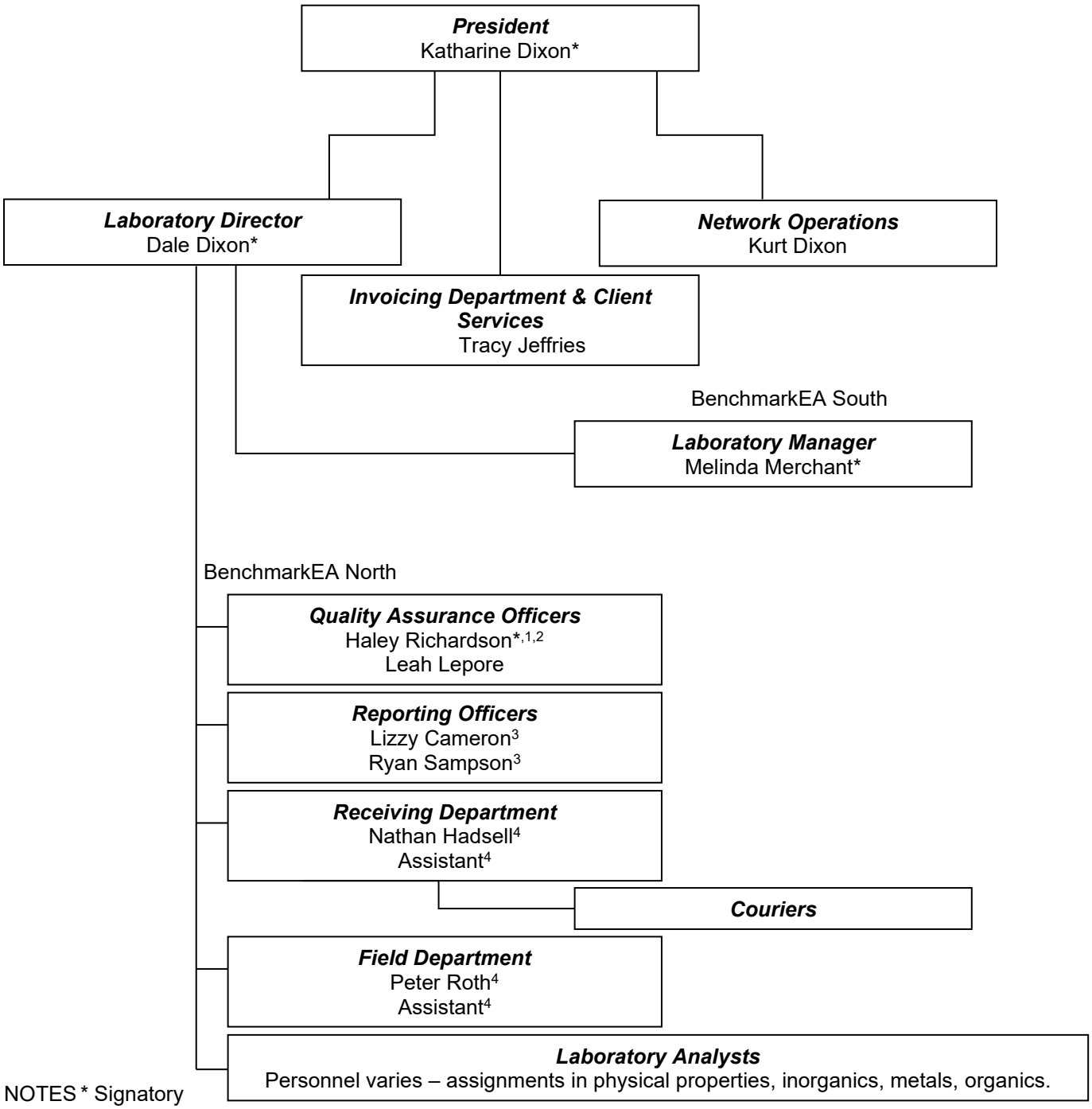
Table 1.3 LIST OF TABLES

2.1 B E A S Laboratory Organization



2.2 B E A Laboratory Organization



NOTES * Signatory
[1] Lab Director nominee
[2] QA nominee

[3] Reporting nominee
[4] Field/Receiving nominee

2.3 Job Description of Key Staff

Specific job descriptions are available for all positions and include minimum requirements for the position. A three ring binder containing job descriptions is kept in the Laboratory Director's office. Electronic copies are located at Z:\ADMINISTRATION\BEA N.E.L.A.C. SYSTEM -- DON'T MOVE OR RENAME\8) Job Descriptions. The following key staff members are also responsible for ensuring Benchmark EnviroAnalytical, Inc. compliance with the TNI standards.

BEA:

1) Dale D. Dixon, Ph.D. - Laboratory Director.
   Responsible for management of all laboratory functions. Directly supervises technical operations and implementation of the quality plan, including corrective actions and changes to the quality plan.

2) Tracy Jeffries - Invoicing department & Client Services
   Responsible for managing the billing and collections for client laboratory reports in addition to managing general client services.

4) Nathan Hadsell - Receiving.
   Responsible for managing sample kit preparation and delivery, sample pick-ups and sample custody procedures.

5) Lizzy Cameron & Ryan Sampson - Reporting.
   Responsible for construction of final analytical reports.

6) Haley Richardson/Leah Lepore - Quality Assurance Officers.
   Responsible for data validation, data acceptance, approval of final reports, corrective action, compilations of control charts, production of quality control reports and maintaining the quality manual.

7) Job descriptions of other personnel are summarized in 2.1 BEA Laboratory Organization. Specific job descriptions are kept on file.

BEAS:

1) Melinda Merchant- Laboratory Manager/Director
   Responsible for management of all laboratory functions. Approves all final reports. Directly supervises technical operations and implementation of the quality plan, including corrective actions.

2) Melinda Merchant/ Brooke Kvaternick/Gabriel Fritzen- Analysts
   Responsible for conducting analysis according to TNI Standards including development of SOP's and compilation of control chart.

3) Melinda Merchant/ Brooke Kvaternick/Gabriel Fritzen- Sample Custody and Reporting
   Responsible for coordinating sample kit preparation and delivery, sample pick-ups, sample custody procedures and construction of final analytical reports.

4) Haley Richardson- Quality Assurance Officer
   Responsible for data validation, data acceptance, corrective action, compilations of control charts, and production of quality control reports.

Per TNI V1M2 4.1.7.2.e: The laboratory's technical manager(s), however named, and/or his/her designee(s) shall have duties that include: if absent for a period of time exceeding fifteen (15) consecutive calendar days shall designate another full-time staff member meeting the qualifications of the technical manager(s) to temporarily perform this function. If this absence exceeds thirty-five (35) consecutive calendar days, the primary accreditation body shall be notified in writing. See Sections 2.1 and 2.2 of Quality manual for lab manager/director nominees that may fill this role.

3.0 STATEMENT OF QUALITY POLICY

a) Policy

Laboratory management is committed to good professional practice and to the quality of its environmental testing services for clients to ensure compliance with their permit and project requirements. This commitment is intended to:

- Produce data of known and documented quality that is scientifically valid
- Meet method specifications
- Satisfy regulatory requirements
- Accomplish the data quality objectives of the client

b) Our *Standards of Service*:

- Client satisfaction
- Results meet client's quality and accuracy requirements
- Turn-around time commitments are achieved

c) Our *Motto*:

- *Do it right the first time, on time, and assume nothing*

d) Objectives of the Quality System:

A comprehensive Quality Control Program is in place to monitor the quality of test results. This program includes:

- Analysis and evaluation of internal quality control samples with every batch. (These samples include blanks, duplicate samples, standard reference materials, and spiked samples)
- Participation in external quality control programs including:
    1. Proficiency Testing
    2. RAMP Studies
    3. Client blind samples
- Tracking, review, and corrective action to exceptions.
- Data integrity training

e) Personnel:

Management's policy is to ensure the information within quality documentation is communicated to, implemented, and understood by all lab personnel. They are provided with the knowledge, training, and tools necessary to perform laboratory operations and testing.

f) Commitment:

Laboratory management is committed to comply with its quality system and the guidelines within the TNI Quality Systems Standard.

Laboratory Manager / Technical Director: _____

4.0 ORGANIZATION ABILITIES

Table 4.1

List of Certified Analytes

BEAS: E85086

DRINKING WATER:

Escherichia coli SM 9223 B
Escherichia coli SM 9223 B / QUANTI-TRAY
Heterotrophic plate count SM 9215 B
Odor EPA 140.1
pH SM 4500-H+-B
Total coliforms SM 9223 B
Total coliforms SM 9223 B / QUANTI-TRAY

NON-POTABLE WATER:

Enterococci ENTEROLERT / QUANTI-TRAY
Enterococci EPA 1600
Escherichia coli SM 9223 B / QUANTI-TRAY
Fecal coliforms COLILERT®-18
Fecal coliforms SM 9222 D
Odor EPA 140.1
pH SM 4500-H+-B
Total coliforms SM 9222 B
Total coliforms SM 9223 B / QUANTI-TRAY

BEA: E84167

DRINKING WATER:

1,1,1-Trichloroethane EPA 524.
1,1,2-Trichloroethane EPA 524.2
1,1-Dichloroethylene EPA 524.2
1,2,4-Trichlorobenzene EPA 524.2
1,2-Dibromo-3-chloropropane (DBCP) EPA 504.1
1,2-Dibromoethane (EDB, Ethylene dibromide) EPA 504.1
1,2-Dichlorobenzene EPA 524.2
1,2-Dichloroethane EPA 524.2
1,2-Dichloropropane EPA 524.2
1,4-Dichlorobenzene EPA 524.2
Alkalinity as CaCO3 SM 2320 B
Aluminum EPA 200.7
Ammonia as N EPA 350.1
Antimony SM 3113 B
Arsenic SM 3113 B
Barium EPA 200.7
Benzene EPA 524.2
Beryllium EPA 200.7
Boron EPA 200.7
Bromate EPA 300.1
Bromide EPA 300.0
Bromoacetic acid EPA 552.2
Bromodichloromethane EPA 524.2
Bromoform EPA 524.2
Cadmium EPA 200.7
Calcium EPA 200.7
Carbon tetrachloride EPA 524.2
Chlorate EPA 300.1
Chloride EPA 300.0
Chlorine SM 4500-Cl G
Chlorite EPA 300.1
Chloroacetic acid EPA 552.2
Chlorobenzene EPA 524.2
Chloroform EPA 524.2
Chromium EPA 200.7
cis-1,2-Dichloroethylene EPA 524.2
Color SM 2120 B
Conductivity SM 2510 B
Copper EPA 200.7
Corrosivity (langlier index) SM 2330 B
Cyanide EPA 335.4
Dibromoacetic acid EPA 552.2
Dibromochloromethane EPA 524.2
Dichloroacetic acid EPA 552.2
Dissolved organic carbon (DOC) SM 5310 B
Escherichia coli SM 9223 B
Orthophosphate as P EPA 300.0
pH SM 4500-H+-B
Potassium EPA 200.7
Escherichia coli SM 9223 B /QUANTI-TRAY
Ethylbenzene EPA 524.2
Fluoride EPA 300.0
Hardness SM 2340 B
Heterotrophic plate count SM 9215 B
Hydrogen sulfide, un-ionized (calculation) SM 4500-S H (21st Ed.)
Iron EPA 200.7
Lead SM 3113 B
Magnesium EPA 200.7
Manganese EPA 200.7
Mercury EPA 245.1
Methylene Chloride 524.2
Molybdenum EPA 200.7
Nickel EPA 200.7
Nitrate EPA 353.2
Nitrate as N EPA 300.0
Nitrite as N EPA 300.0
Nitrite as N EPA 353.2
Odor EPA 140.1
Selenium SM 3113 B
Silica as SiO2 EPA 200.7
Silver EPA 200.7
Sodium EPA 200.7
Styrene EPA 524.2
Sulfate EPA 300.0
Sulfide SM 4500-S D/UV-VIS
Surfactants - MBAS SM 5540 C
Tetrachloroethylene (Perchloroethylene) EPA 524.2
Thallium EPA 200.9
Toluene EPA 524.2
Total coliforms SM 9223 B
Total coliforms SM 9223 B /QUANTI-TRAY
Total dissolved solids SM 2540 C
Total haloacetic acids (HAA5) EPA 552.2
Total nitrate-nitrite EPA 300.0
Total nitrate-nitrite EPA 353.2
Total organic carbon SM 5310 B
Total trihalomethanes EPA 524.2
trans-1,2-Dichloroethylene EPA 524.2
Trichloroacetic acid EPA 552.2
Trichloroethene (Trichloroethylene) EPA 524.2
Turbidity EPA 180.1
UV 254 SM 5910 B
Vanadium EPA 200.7
Vinyl chloride EPA 524.2
Xylene (total) EPA 524.2
Zinc EPA 200.7

NON-POTABLE WATER

1,1,1,2-Tetrachloroethane EPA 8260 D
1,1,1-Trichloroethane EPA 624.1
1,1,1-Trichloroethane EPA 8260 D
1,1,2,2-Tetrachloroethane EPA 624.1
1,1,2,2-Tetrachloroethane EPA 8260 D
1,1,2-Trichloroethane EPA 624.1
1,1,2-Trichloroethane EPA 8260 D
1,1-Dichloroethane EPA 624.1
1,1-Dichloroethane EPA 8260 D
1,1-Dichloroethylene EPA 624.1
1,1-Dichloroethylene EPA 8260 D
1,1-Dichloropropene EPA 8260 D
1,2,3-Trichlorobenzene EPA 8260 D
1,2,3-Trichloropropane EPA 8260 D
1,2-Dibromo-3-chloropropane (DBCP) EPA 8260 D

1,2-Dichlorobenzene EPA 624.1
1,2-Dichlorobenzene EPA 8260 D
1,2-Dichloroethane EPA 624.1
1,2-Dichloroethane EPA 8260 D
1,3-Dichlorobenzene EPA 624.1
1,3-Dichlorobenzene EPA 8260 D
1,3-Dichloropropane EPA 8260 D
1,4-Dichlorobenzene EPA 624.1
1,4-Dichlorobenzene EPA 8260 D
2,2-Dichloropropane EPA 8260 D
2-Butanone (Methyl ethyl ketone, MEK) EPA 8260 D
2-Chloroethyl vinyl ether EPA 624.1
2-Chloroethyl vinyl ether EPA 8260 D
2-Chlorotoluene EPA 8260 D
2-Hexanone EPA 8260 D
4-Chlorotoluene EPA 8260 D
4-Methyl-2-pentanone (MIBK) EPA 8260 D
Acetone EPA 8260 D
Acetonitrile EPA 8260 D
Acrolein (Propenal) EPA 624.1
Acrolein (Propenal) EPA 8260 D
Acrylonitrile EPA 624.1
Acrylonitrile EPA 8260 D
Alkalinity as CaCO3 SM 2320 B
Allyl chloride (3-Chloropropene) EPA 8260 D
Aluminum EPA 200.7
Aluminum EPA 6010 D
Ammonia as N EPA 350.1
Antimony EPA 200.7
Antimony EPA 6010 D
Antimony SM 3113 B
Arsenic EPA 200.7
Arsenic EPA 6010 D
Arsenic SM 3113 B
Barium EPA 200.7
Barium EPA 6010 D
Benzene EPA 624.1
Benzene EPA 8260 D
Beryllium EPA 200.7
Beryllium EPA 6010 D
Beryllium SM 3113 B
Biochemical oxygen demand SM 5210 B
Boron EPA 200.7 Metals
Boron EPA 6010 D
Bromide EPA 300.0
Bromobenzene EPA 8260 D
Bromochloromethane EPA 8260 D
Bromodichloromethane EPA 624.1
Bromodichloromethane EPA 8260 D
Bromoform EPA 624.1
Bromoform EPA 8260 D
Cadmium EPA 200.7
Cadmium EPA 6010 D
Cadmium SM 3113 B
Calcium EPA 200.7
Calcium EPA 6010 D
Carbon dioxide (calc.) SM 4500-CO2 D
Carbon disulfide EPA 8260 D
Carbon tetrachloride EPA 624.1
Carbon tetrachloride EPA 8260 D
Carbonaceous BOD (CBOD) SM 5210 B
Chemical oxygen demand EPA 410.4
Chloride EPA 300.0
Chlorobenzene EPA 624.1
Chlorobenzene EPA 8260 D
Chloroethane EPA 624.1
Chloroethane EPA 8260 D
Chloroform EPA 624.1
Chloroform EPA 8260 D
Chlorophylls EPA 445
Chlorophylls SM 10200 H
Chloroprene EPA 8260 D
Chromium EPA 200.7
Chromium EPA 6010 D
Chromium SM 3113 B
Chromium VI SM 3500-Cr B (20th/21st/22nd
cis-1,2-Dichloroethylene EPA 8260 D
cis-1,3-Dichloropropene EPA 624.1
cis-1,3-Dichloropropene EPA 8260 D
Cobalt EPA 200.7
Cobalt EPA 6010 D
Color SM 2120 B
Conductivity SM 2510 B
Copper EPA 200.7
Copper EPA 6010 D
Copper SM 3113 B
Corrosivity (langlier index) SM 2330 B
Cyanide EPA 335.4
Dibromochloromethane EPA 624.1
Dibromochloromethane EPA 8260 D
Dibromomethane EPA 8260 D
Dichlorodifluoromethane EPA 8260 D
Enterococci ENTEROLERT/ QUANTI-TRAY
Enterococci EPA 1600
Escherichia coli SM 9223 B /QUANTI-TRAY
Ethylbenzene EPA 624.1
Ethylbenzene EPA 8260 D
Fecal coliforms COLILERT®-18
Fecal coliforms SM 9221 E
Fecal coliforms SM 9222 D
Fecal streptococci SM 9230 C
Fluoride EPA 300.0
Hardness SM 2340 B
Hardness SM 2340 C
Hardness (calc.) EPA 200.7
Heterotrophic plate count SM 9215 B
Hexachlorobutadiene EPA 8260 D
Hexachloroethane EPA 8260 D
Hydrogen sulfide, un-ionized (calculation) SM 4500-S H (21st Ed.)
Iodomethane (Methyl iodide) EPA 8260 D
Iron EPA 200.7
Iron EPA 6010 D
Isopropylbenzene EPA 8260 D
Kjeldahl nitrogen - total EPA 351.2
Lead EPA 200.7
Lead EPA 6010 D
Lead SM 3113 B
m/p-Xylenes EPA 8260 D
Magnesium EPA 200.7
Magnesium EPA 6010 D
Manganese EPA 200.7
Manganese EPA 6010 D
Mercury EPA 245.1
Methacrylonitrile EPA 8260 D
Methyl bromide (Bromomethane) EPA 624.1
Methyl bromide (Bromomethane) EPA 8260 D
Methyl chloride (Chloromethane) EPA 624.1
Methyl chloride (Chloromethane) EPA 8260 D
Methyl tert-butyl ether (MTBE) EPA 8260 D
Methylene chloride EPA 624.1
Methylene chloride EPA 8260 D
Molybdenum EPA 200.7
Molybdenum EPA 6010 D
n-Butylbenzene EPA 8260 D
Nickel EPA 200.7

Nickel EPA 6010 D
Nickel SM 3113 B
Nitrate Systea Easy (1-Reagent) Nitrate Method/UV-VIS
Nitrate as N EPA 300.0
Nitrate as N EPA 353.2
Nitrate-nitrite EPA 353.2
Nitrite as N EPA 300.0
Nitrite as N SM 4500-NO2-B
Nitrobenzene EPA 8260 D
n-Propylbenzene EPA 8260 D
Oil & Grease EPA 1664A
Organic nitrogen TKN minus AMMONIA
Orthophosphate as P EPA 300.0
Orthophosphate as P EPA 365.3
o-Xylene EPA 8260 D
pH SM 4500-H+-B
Phosphorus, total EPA 365.3
p-Isopropyltoluene EPA 8260 D
Potassium EPA 200.7
Potassium EPA 6010 D
Propionitrile (Ethyl cyanide) EPA 8260 D
Residual free chlorine SM 4500-Cl G
Residue-filterable (TDS) SM 2540 C
Residue-nonfilterable (TSS) SM 2540 D
Salinity SM 2520 B
sec-Butylbenzene EPA 8260 D
Selenium EPA 200.7
Selenium EPA 6010 D
Selenium SM 3113 B
Silica as SiO2 EPA 200.7
Silica as SiO2 SM 4500-SiO2 C/UV-VIS
Silver EPA 200.7
Silver EPA 6010 D
Silver SM 3113 B
Sodium EPA 200.7
Sodium EPA 6010 D
Specific Oxygen Uptake Rate (SOUR) SM 2710 B
Strontium EPA 200.7
Sulfate EPA 300.0
Sulfide SM 4500-S D/UV-VIS
Sulfite-SO3 SM 4500-SO3 B
Surfactants - MBAS SM 5540 C
tert-Butylbenzene EPA 8260 D
Tetrachloroethylene (Perchloroethylene) EPA 624.1
Tetrachloroethylene (Perchloroethylene) EPA 8260 D
Thallium EPA 200.7
Thallium EPA 200.9
Thallium EPA 6010 D
Tin EPA 200.7
Tin EPA 6010 D
Titanium EPA 200.7
Titanium EPA 6010 D
Toluene EPA 624.1
Toluene EPA 8260 D
Total coliforms SM 9221 B
Total coliforms SM 9222 B
Total coliforms SM 9223 B QUANTI-TRAY
Total cyanide EPA 9012 B
Total nitrate-nitrite EPA 300.0
Total nitrate-nitrite Systea Easy (1-Reagent)
Total nitrogen EPA 351.2 + EPA 353.2
Total organic carbon SM 5310 B
Total Petroleum Hydrocarbons (TPH) EPA 1664A
Total, fixed, and volatile residue SM 2540 G
trans-1,2-Dichloroethylene EPA 624.1
trans-1,2-Dichloroethylene EPA 8260 D
trans-1,4-Dichloro-2-butene EPA 8260 D
Trichlorofluoromethane EPA 624.1
Trichlorofluoromethane EPA 8260 D
Turbidity EPA 180.1
Un-ionized Ammonia DEP SOP 10/03/83
Vanadium EPA 200.7
Vanadium EPA 6010 D
Vinyl acetate EPA 8260 D
Vinyl chloride EPA 624.1
Vinyl chloride EPA 8260 D
Xylene (total) EPA 8260 D
Zinc EPA 200.7
Zinc EPA 6010 D

Soil and Chemical Materials

Aluminum EPA 6010 D
Ammonia as N EPA 350.1
Antimony EPA 6010 D
Arsenic EPA 6010 D
Barium EPA 6010 D
Beryllium EPA 6010 D
Boron EPA 6010 D
Bromide EPA 9056 A
Cadmium EPA 6010 D
Calcium EPA 6010 D
Chloride EPA 9056 A
Chromium EPA 6010 D
Cobalt EPA 6010 D
Copper EPA 6010 D
Fecal coliforms SM 9221 E
Fluoride EPA 9056 A
Iron EPA 6010 D
Kjeldahl nitrogen - total EPA 351.2
Lead EPA 6010 D
Magnesium EPA 6010 D
Manganese EPA 6010 D
Mercury EPA 7471 B
Molybdenum EPA 6010 D
Nickel EPA 6010 D
Nitrate EPA 9056 A
Nitrite EPA 9056 A
Orthophosphate as P EPA 9056 A
pH EPA 9045 D
Phosphorus, total EPA 365.3
Potassium EPA 6010 D
Residue-fixed SM 2540 G
Residue-total SM 2540 G
Residue-volatile SM 2540 G
Selenium EPA 6010 D
Silver EPA 6010 D
Sodium EPA 6010 D
Strontium EPA 6010 D
Sulfate EPA 9056 A
Synthetic Precipitation Leaching Procedure EPA 1312
Thallium EPA 6010 D
Tin EPA 6010 D
Total cyanide EPA 9012 B
Total nitrate-nitrite EPA 353.2
Toxicity Characteristic Leaching Procedure EPA 1311
Vanadium EPA 6010 D
Zinc EPA 6010 D

Table 4.2
Field Analytes

Method No.	Matrix	Analyte/Component
SM4500CI-G	WW,SW, GW, DW, HW, SA	Residual Chlorine
SM4500-OC	WW,SW, GW, DW, HW, SA	Dissolved Oxygen
SM4500H+B	WW,SW, GW, DW, HW, SA	pH
SM2510B	WW,SW, GW, DW, HW, SA	Specific Conductance
EPA 170.1	WW,SW, GW, DW, HW, SA	Temperature
EPA 180.1	WW,SW, GW, DW, HW, SA	Turbidity

Table 4.3 (A & B)

Laboratory Instrumentation, Equipment & Software

A. Laboratory Instrumentation and Equipment

(ML): Metals Laboratory Area
(GL): General Laboratory Area
(OL): Organic Laboratory Area
(Micro): Microbiological Laboratory Area
(SL): Solids Laboratory Area

BEA S LABORATORY INSTRUMENTATION AND EQUIPMENT LIST

Lab ID No.	Equipment	Manufacturer	Model	Serial No.	Began Use
1	Water Bath, Circulating	Blue M Electric Co	MW-1120A-1	15364	5/13/02
2	Culture Incubator	Fisher Scientific	650D(Isotemp)	50300110	5/13/02
3	Refrigerator	Estate/Whirlpool	TTDKXBW10	EE0619154	5/13/02
4	Autoclave	Market Forge	STM-E	163345	7/12/02
5	pH Meter	Markson	88	JC000707	5/13/02
6	Analytical Balance	Fischer Scientific	A-250	B027062	9/20/02
8	Colony Counter, Dark Field	American Optical, Inc.	N/A	N/A	5/13/02
9	Hot/Stir Plate	Corning	PC-420	230597335183	5/13/02
10	Long Wave UV Lamp	Spectronics Corp.	Sepctroline EA-160	941515	5/13/02
11	Pump, Vacuum	CMS/GE	5KH33DN16GX	NJL141395	5/13/02
12	Conductivity Meter	YSI Environmental	EC300	JC00952	8/1/07
14	Pipettes	Eppendorf,Oxford,VWR	Various	N/A	5/13/02
15	Mechanical Convection Oven	Precision	STM 40	24AX-2	11/22/04
16	Desiccator	Labconco	N/A	N/A	11/22/04
17	Refrigerator	Whirlpool	ET18JKXMNLO	S415 28908	11/27/02
18	DI System	Purification Technologies	Various	Various	11/19/02
19	Stir Plate	VWR	200	6675	9/15/03
20	Thermometers	Fischer, ERTCO, ASTM, Vee Gee Grande	Various	N/A	5/13/02
21	Water Bath, Isotemp	Fisher Scientific	28L-M	505038	5/24/06
22	Balance	Denver Instrument Co	100A	37477	4/5/05
28	Vacuum Pump	Gast	0211-V45N-G8CX	1292	4/14/16
32	Field Multi-Meter	Hydrolab	Quanta	QD04071	1/3/13
33	Field Turbidimeter	Hach	46500-00	961000012176	1/3/13
36	Microscope	Sargent-Welch	Compound	30401437	1/2/16
37	Dry Block Incubator	Crosstech	Dry Block	77272	7/7/16
38	Circulating Water Bath	Precision	2	603051658	7/26/16
39	Digital Verification Thermometer	Digi Sense	91210-45	170585605	10/18/18
40	Pocket Field Colorimeter	Hach	N/A	18060E359903	10/18/18
41	Hand Held pH Meter	Milwaukee	MI 106	D0106789	11/06/18
42	Incubator	Barnstead International	310	1433060458390	5/2/19
43	Field pH Meter	Milwaukee	NA	H0026718	12/6/21
44	Quanti-tray Sealer	Idexx	Plus	QTP13215001065	1/17/22
45	Incubator	Shell Lab	SM16s	02005223	10/25/23

BEA N LABORATORY INSTRUMENTATION AND EQUIPMENT LIST

Lab ID No.	Equipment	Manufacturer	Model	Serial No.	Location
3	Water bath	Lindberg/Blue M	MW1110A-1	MW6990	Micro
4	Thermometer 0 to 50	VWR Scientific	61013-017	N/A	Walk-in
5	Refrigerator	Gerald	GR-65	910900270	Micro
6	Autoclave	Market Forge	STM-E	20072909	Micro
8	Desiccator, Cabinet	Labconco Auto Dry	N/A	3929	SL
9	Oven	VWR Scientific	1370GD	0701592	SL
10	Oven	VWR Scientific	1370GD	0701692	SL
15	Furnace, Muffle	Thermolyne	F30400	5449205863694	GL
16	Spectrophotometer	Milton Roy	Spectronic 20D	3322114040	GL
17	Meter, Dissolved Oxygen	YSI	58	95L43679	GL
19	Conductivity Meter	Orion	160	22945024	GL
20	Auto titrator	Schott Instruments	Titronic basic	530426	ML
26	Digester, Metals (Hot Block)	Env. Express	SC 154	944CECO978	OL
28	Gas Chrom (ECD)	HP	5890	2750A18894	GL
31	Digester (Reactor), COD	HACH	45600-00	9.206E+11	GL
34	Centrifuge	Becton Dickinson	DYNAC 420101	271127	SL
35	Desiccator, Cabinet	Labconco Auto Dry	1342	232587C	SL
36	Desiccator, Cabinet	Labconco Auto Dry	1342	232588C	OL
37	Gas Chrom (M.S.)	HP	5890 II Plus	3336A50594	SL
38	Desiccator, Cabinet	Labconco Auto Dry	N/A	N/A	Micro
39	Colony Counter, Dark Field	Reichert Jung	QUEBEC	11228-1	GL
40	Meter, Dissolved Oxygen	YSI	58	95L43679	GL
42	Digestion/Distillation Apparatus	Electrothermal	MQ3868	10016111	GL-Fe
44	Spectrophotometer	Milton Roy	Spectronic 501	1183116G	GL
45	Pump, Vacuum	Gast	522V4BG180DX	692	GL
48	Spectrophotometer, UV-VIZ	Milton Roy	1201	3720166003	GL
56	Hot Plate	Corning	PC-101	N/A	GL
58	Thermometer, NIST Traceable	ERTCO	1007	D97-227	Office
59	Mass. Spec.	HP	5972	3329A00810	OL
60	Walk-in Cooler	Eskimo Panels	2000	N/A	GL

65	Autoanalyzer, Discrete	Seal Analytical	AQ 2 E	90388	GL
69	Incubator, Culture	Lab-Line Instruments	600	0485-0006	Micro
70	Balance, Analytical	Mettler	AE100	38630 / SV-23315	GL
71	Oven	Sheldon Manufacturing	1350FM	202104	SL
74	Incubator, BOD (low-temperature)	Precision Scientific	MFU20F3GW1	WB81030345	GL
75	Autotitrator	Schott Instruments	Titronic universal	695751	GL
78	Desiccator, Micro	NIKKO	N/A	N/A	Micro
85	Blender	Hamilton Beach	57199 Type B02	B-230013012	Micro
101	Purge and Trap	O-I-Analytical Eclipse	4660	E924466713P	OL
102	Purge and Trap	O-I-Analytical Eclipse	4660	E924466709P	OL
104	Autosampler, GC/MS	O-I-Analytical Eclipse	4551-A	E92545B163	OL
105	Mass. Spec.	HP	5972	3341A01001	OL
106	Gas Chrom (M.S.)	HP	5890 II	3336A53486	OL
111	Thermometer, Digital	Control Company	4126	91096807	OL
112	Digester, Cyanide (Hot Block)	Env. Express	SC6002	5873DIS1031	GL
113	Rotator (or agitation apparatus)	N/A	N/A	N/A	GL
114	Evaporator	TurboVap	N/A	N/A	GL
115	Pressure Filter	Millipore	N/A	N/A	GL
117	Thermometer, Digital	Cole Parmer	Cole Parmer	101852139	SL
123	Incubator, BOD	VWR Scientific	VWR Scientific	900100	GL
124	Digester, Metals (Hot Block)	Env. Express	Env. Express	7021CECW3308	ML
125	Probe, Dissolved Oxygen	YSI	YSI	11M100178	GL
126	PC-BOD Autosampler	Mantech	Mantech	261A0N020	GL
127	Desiccator, Cabinet	Boekel	Boekel	N/A	SL
128	Desiccator, Cabinet	Boekel	Boekel	N/A	SL
129	Desiccator, Cabinet	Boekel	Boekel	N/A	SL
130	ICP Spectrophotometer	Perkin Elmer	Perkin Elmer	078S1208281	ML
131	ICP Autosampler	Perkin Elmer	Perkin Elmer	102S12083514	ML
132	Incubator, BOD	VWR Scientific	VWR Scientific	400296	GL
133	Fluorometer	Turner Designs	Turner Designs	720000908	GL
135	Stirring Hotplate	Fisher Scientific	Fisher Scientific	71003547	Micro
138	Quanti-Tray Sealer	IDEXX	IDEXX	6451-09-345	Micro
139	TKN Autoanalyzer	N/A	N/A	N/A	GL
140	Oil & Grease/TPH Extraction Manifold	N/A	N/A	N/A	GL

141	Desiccator, Cabinet	Fischer Scientific	Fischer Scientific	N/A	SL
142	Water Bath	VWR Scientific	VWR Scientific	10010305	Micro
143	Thermometer, Digital	Cole Parmer	Cole Parmer	130160050	SL
144	Thermometer, Digital	Cole Parmer	Cole Parmer	122505056	SL
145	Thermometer	Thermco.	Thermco.	2943	Micro
146	Digestor, Block (TKN)	Seal	Seal	5146V00318	GL
147	Digestor, Block (TKN)	Westco	Westco	1562	GL
148	Refrigerator	Haier	Haier	K2003606334	OL
149	Thermometer -10 to 260	H-B Instrument Company	H-B Instrument Company	ACC11312	GL
150	Thermometer -25 to 45	H-B Instrument Company	H-B Instrument Company	6672	GL
152	Thermometer -20 to 70	Thomas (Control Company)	9338E75	130146515	GL
153	Distillation Mantle	Glas-Col	TM114	169023A	GL
155	Thermometer 123 to 177	Thermco.	ACC102C	1579	COD
158	Thermometer -20 to 70	Thomas (Control Company)	9338E75	130619991	Micro
159	Spectrometer	Milton Roy	1201	37C4124001	GL
160	Thermometer -20 to 70	Thomas (Control Company)	9338E75	140174036	Micro
161	Thermometer -20 to 70	Thomas (Control Company)	9338E75	140174042	OL
164	Timer	Thomas (Control Company)	1235D47	140710195	GL
165	Timer	Thomas (Control Company)	1235D47	140710186	ML
166	Timer	Thomas (Control Company)	1235D47	140710197	GL
167	Timer	Thomas (Control Company)	1235D48	140710179	GL
168	Timer	Thomas (Control Company)	1235D47	140710199	GL
169	Meter, pH (Pocket-sized)	Hanna	HI98103	M2 (15623)	ML
170	Thermometer 15 to 30	Thermco.	ACCI300S	2476	GL
171	Turbidimeter	HACH	2100N	940700000663	GL
174	XYZ Sampler	Bran+Luebbe	AIM 1250	950934	GL-Gas Diff.
175	Thermometer -50 to 70	Thomas (Control Company)	1235D07	150338489	OL -Prep
176	Miniature Water Bath	Fisher Scientific	2LS	307435	OL
177	Corded Hand-Held UV Lamp	Spectroline	EA-160	1081721	Micro
180	FIA Analyzer	Lachat	Quikchem 800	A83000-658	GL-Gas Diff.
181	FIA Analyzer	Lachat	Quikchem 800	A83000-1179	GL-NOX
182	FIA Analyzer	Lachat	Quikchem 800	A83000-1828	GL-TKN
185	Microscope	AmScope	M600	G014036532	Micro
186	Thermometer -30 to 50	Baxter	T2008-1	#2	GL

187	Thermometer -30 to 50	Baxter	T2008-1	#1	GL
188	General Refrigerator / Freezer	Hotpoint	HTR18ABMDRWW	ZA787588	GL
189	Thermometer -20 to 70	Thomas (Control Company)	9338E75	150543214	GL
190	TKN Manifold Thermometer 35 to 55	N/A	N/A	157-0283-08	GL-TKN
195	Thermometer -35 to 50	VWR Scientific	61013-017	N/A	Micro
196	Thermometer 80 to 135	Kessler	Max Regr	autoclave	Micro
199	Incubator, Culture	Lab Line Instruments	305	0598-0316	Micro
200	Analog Vortex Mixer	Thomas Scientific	945700	1306117002	GL-TKN
201	Stir Plate (pH Station)	Cole Parmer	4810	408662	GL
202	Stir Plate (Solids)	Fisher Scientific	N/A	A242680	SL
203	Stir Plate (BOD)	Thermolyne	Nuova II (S18525)	30717052	GL
204	Tissue Grinder	Jiangsu Jinyi Instrument	N/A	N/A	GL
206	Autosampler (ECD)	Hewlett Packard	18593B	3120A26994	OL
209	Upright Freezer (Chlorophyll Standards)	IGLOO	FRF110	A1511156030000238	GL
210	Chest Freezer (Chlorophyll Samples)	IGLOO	FRF4341-B	A1508149140006074	GL
211	Thermometer -30 to 50	Baxter	T2008-1	#4	GL
215	Spore Dry-block Incubator	Nemko / McKesson	Dry-block Inc.	73-2320	Micro
216	Dry-block Thermometer 18 to 60	SP Scienceware	607010100	3848	Micro
217	Water Bath	Precision Scientific	51221035	603041717	Micro
219	Multi Pulse Vortexer	Glas-Col	099A-VB4	276819	GL-TKN
220	Evaporator, O&G (Hot Block)	VWR Scientific Products	13259-052 / 949036	1671	GL
221	Autoanalyzer, Discrete	Seal Analytical	AQ 2	90411	GL
222	Thermometer, Digital (-20 to 70 deg C)	Thomas Scientific (Control Company)	9338E75	160722613	Micro
224	Thermometer, Digital (-20 to 70 deg C)	Thomas Scientific (Control Company)	9338E75	N/A	Micro
226	Thermometer, Digital (-20 to 70 deg C)	Thomas Scientific (Control Company)	9338E75	160722630	Micro
227	Meter, pH (Pocket-sized)	HANNA Instruments	HI98103 Checker	H02072622	Receiving
228	NIST - Digital Thermometer (-50 to 1300 deg C)	Cole-Parmer (Control Company)	91210-45	170585605	SL
229	Thermometer, Digital (-20 to 70 deg C)	Thomas Scientific (Control Company)	9338E75	170748348	Micro
231	Thermometer, Digital (-20 to 70 deg C)	Thomas Scientific (Control Company)	9338E75	170748353	Micro
232	Thermometer (-10 to 150 deg C)	Thomas (HB Instrument)	Easy-Read	Q00070	Micro
233	Autoanalyzer, Discrete	Seal Analytical	AQ 2	90700	GL
234	Ion Chromatography Unit	Metrohm	930 Compact IC Flex	1930200043107	GL
235	Spectrophotometer	Thermo Spectronic	BioMate 3	2K3F017006	GL

236	NIST - Thermometer (0 - 60 deg C)	ThermCo Products	ACC10613S	1068	QA Officer
238	Thermometer, Digital (-20 to 70 deg C)	Thomas Scientific (Control Company)	9338E75	181158646	Micro
239	Incubator	Imperial III	306M	0199-0089	Micro
240	AA Spectrophotometer	Perkin Elmer	PinAAcle 900Z	PZAS15041001	ML
241	pH Meter	Thermo Scientific	Orion Star A211	X45843	GL
242	Oven	VWR Scientific	1350F	600396	GL
243	NIST - Digital Thermometer (-50 to 1300 deg C)	Cole-Parmer (Control Company)	91210-45	181363715	Office
244	VWR Waterbath	VWR	2LS	2H1250591	GL-EZ Nox
245	Thermometer, Digital (-20 to 70 deg C)	Thomas Scientific (Control Company)	9338E75	181691810	Micro
246	Autosampler, GC/MS	Centurion	none	CENTW672121718	OL
247	Thermometer, Digital (-20 to 70 deg C)	Thomas Scientific (Control Company)	9338E75	192093408	Micro
248	Thermometer, Digital (-20 to 70 deg C)	Thomas Scientific (Control Company)	9338E75	1902093411	Micro
249	pH/mV/Termperature Meter	Milwaukee	MI106	H0026732	Field (#F24)
250	NIST - Digital Thermometer (-50 to 1300 deg C)	Cole-Parmer (Control Company)	91210-45	191915560	QA Officer
251	Thermometer (0 - 150 deg C)	Thermo Scientific	9313A38	T80440	Odor
252	Thermometer (0 - 150 deg C)	Thermo Scientific	9313A38	T80489	Metals
253	Ion Chromatography Unit	Thermo Scientific (Dionex)	Integrion	19080012	GL-IC
254	Compact Refrigerator	Magic Chef	HMR330WE	THD1810HMR330WE00424	OL
255	Balance, Analytical	Sartorius	Entris 124-ISUS	38007982	GL
256	Hot Block	Fisher Scientific	2054FS	1.65107E+12	GL
257	Large Capacity Mixer	Gals-Col	099A-LC1012100	472270	GL
258	Raytek MiniTemp IR Thermometer	Raytek	N/A	RAYL000570277	Receiving
259	Quanti-Tray Sealer PLUS	IDEXX	89-0003936-00	QTP13185104603	Micro
260	Oven	ThermoScientific (Precision)	6530	603823	Solids
262	Autoanalyzer, Discrete	Seal Analytical	AQ 2	90749	GL
263	Lotix TOC Autoanalyzer	Teledyne, Tekmar	Lotix 15-1600-000	US20219001	TOC
264	pH Meter, hand-held	Hanna	HI98107	HA04203313	Metals
265	BOD Incubator	ThermoElectron Corporation	815 Precision-3721	305780	BOD
266	Thermometer, Digital (-20 to 70 deg C)	Thomas Sci (Control Company)	9338E75	200738841	Micro
267	Thermometer, Digital (-40 to 185 deg C) Log Tag	Log Tag	Trix-8	2000043029	Metals
268	pH Meter, hand-held	Hanna	HI98103	H05481429	Receiving
269	pH Meter	Thermo Scientific	Orion Star A111	J27181	GL
271	Water Bath Incubator	Thermo Sci	TSCIR35	300494082	Micro
270(A)	TKN Digestion Block	Environmental Express	2021TKN221	054RB	TKN

270(B)	TKN Digestion Controller	Environmental Express	2021TKN221	054RB	TKN
261(A)	Stable Weigh Filling Station	Environmental Express	N/A	N/A	SOLIDS
261(B)	Static Line	HAUG	N/A	A91204A	SOLIDS
261(C)	Static Transformer	HAUG	EN-C	200516	SOLIDS
253(A)	Ion Chromatorgraphy Autosampler	Thermo Scientific (Dionex)	Dionex AS-AP	12070978	GL-IC
234 (A)	Ion Chromatorgraphy Autosampler	Metrohm	930 Compact IC Flex	1930200043107	GL
240 (A)	AA Autosampler	Perkin Elmer	AS 900	AS9C18120201	ML
240 (B)	AA Cooling System	Perkin Elmer	N/A	319S15041303	ML
174 (A)	Peristaltic Pump	Lachat	2200-000	2000-272	GL-Gas Diff.
130 (A)	ICP Chiller Unit	Polyscience	N0772046	1D12B0414	ML
134 (A)	Mercury Analyzer	Nippon Instruments	NIC RA-3A	12400994	GL
134 (B)	Mercury Sample Changer	Nippon Instruments	NIC SC-3	12410525	GL
134 (C)	Mercury Reagent Dispenser	Nippon Instruments	NIC RD-3	12420764	GL
137 (B)	XYZ Sampler	Bran+Luebbe	AIM 1250	4421A2498	GL
139 (A)	Autoanalyzer, Digital Colorimeter	Bran+Luebbe	AutoAnalyzer3	9532061	GL-NOX
139 (B)	XYZ Sampler	Bran+Luebbe	EZkem	246603	GL-TKN
139 (C)	Technicon II TKN Maniofld	Technicon	N/A	C60388	GL-TKN
139 (D)	Technicon III Presistalic Pump	Technicon	133-A-014-01	02151101	GL-TKN
153 (A)	Distillation Controller	Glas-Col	104A-PL120	276481	GL
153 (B)	Distillation Recirculator	Neslab	N/A	N/A	GL
180 (A)	Peristaltic Pump	Lachat	RP100 Series	A82000-604	GL-NOX
182 (A)	Peristaltic Pump	Lachat	IPS-12	A82000-473	GL
272	NIST -Digital Thermometer	Cole-Parmer	4425, 91210-45	210535323	GL
273	Autoanalyzer, Discrete	Seal Analytical	AQ 400	341252	GL
274	Spectrometer	Biomate 3	335904P	2K1H337002	GL
275	Refrigerator	Danby	DAR044ABDD-6	4.32109E+12	Micro
276	Spectrometer	Thermo Spectronic	4001/4	3SGG007002	GL
278	Stir Plate/Hot Plate	Barnstead/Thermolyne	SP46925	1069980928203	GL
279	Autoanalyzer, Discrete	Seal Analytical	AQ400	341320	GL
280	Autoanalyzer, Discrete	Seal Analytical	AQ400	341252	GL
281	Balance, Top Loading	Ohaus	SJX1502N/E	C203428141	GL
282	Balance, Analytical	Ohaus	EX224	C312870813	GL (SOLIDS)
286	Vortex Mixer	Cole-Parmer	S0100A-CP	23157171	GL (TKN)

287	Stirring Hotplate	Corning	PC-420	4.00502E+11	GL
288 A/B	Temperature Data Logger	ThermoWorks	THS-292-501	D23211548	GL (TKN)
289	Nesslerizer	Lovibond	N/A	25533	GL
290	Agilent 7850 ICP-MS	Agilent	7850	SG20470812	ML
290A	Agilent SPS 4 Autosampler	Agilent	G8410A-SPS4	AU20208655	ML
291	Environmental Control System	PolyScience	N0772046	2005-01815	ML
292	6890N Series Gas Chromatograph	Hewlett Packard (Agilent)	6890N	US10228129	OL
292A	6890N Series Gas Chromatograph	Hewlett Packard (Agilent)	6890N	CN10249006	OL
293	7683 Series Autosampler	Agilent	G2614A	US93205814	OL
293A	7683 Series Auto-injector	Agilent	G2613A	CN12020360	OL
294	5973 Series Mass Spectrometer	Hewlett Packard (Agilent)	G2589A	US21884844	OL
295	WaterBath	VWR	1225	1105101	GL
296	Digestor, Controller (TKN)	Environmental Express	TKN100	2021TKNBC196	GL
297	Digestor, Controller (TKN)	Environmental Express	TKN100	2021TKNBC194	GL

B. Laboratory Software

Instrument/Equipment	Software Name	Software Version	Version Date	Publisher
Lotix Organic Carbon Analyzer	Tek Link	3.3.7431-18150	2020	Teledyne Advanced Chemistry
SEAL AQ2 Discrete Analyzer	AQ Software	2.1.6	2016	SEAL Analytical,Inc
SEAL AQ400 Discrete Analyzer	AQ Software	2.4.13	2023	SEAL Analytical,Inc
Mercury Autoanalyzer	RA-3AWin	1.1.6	2008	Nippon Instruments
Ion Chromatograph	MagIC Net	3.2	2017	Metrohm
Ion Chromatograph	Chromeleon	7.2.10	2019	Dionex
PC-BOD	PC-BOD	3.0.0.142	2011	ManTech, Inc
ICP Autoanalyzer	WinLab32 ICP	5.3.0.0656	2011	Perkin Elmer
AA Spec. (furnace)	Syngistix for AA	3.1.0.1682	2017	Perkin Elmer
Gas Chrom. / ECD	GC ChemStation	B.04.03-SP1 [87]	2012	Agilent
Gas Chrom. / Mass Spec.	MSD ChemStation	E.02.02.1431	2011	Agilent
General Solids area	BalanceLink	4.0.2	2007	Mettler Toledo
Dissolved Oxygen Probe	YSI Data Manager	1.1.8	2009	YSI, Inc
LimsLink	LimsLink	4.1	2009	Labtronics, Inc
Laboratory LIMS System	Alpha Five Professional Ed.	Version 11, Build 3381	2013	Alpha Software, Inc
ICP-MS 7850	Agilent ICP-MS MassHunter 5.1	5.1	2020	Agilent Technologies

Table 4.4 (A & B)

REFERENCE MEASUREMENT STANDARDS & CALIBRATION SERVICES

A. Reference Measurement Standards

BEA (Palmetto)

No.	Reference Standards	Manufacturer	Model	Serial No.	Calibrated By:
R-1.	NIST Reference Thermometer	Thermco	ACC10613S	1068	Thermco Products Inc.
R-2.	Class S Equivalent Weights	Troemner	1kg – Calibration Weight	13626	Troemner
R-3.	Class S-1 Equivalent Weights	Troemner	9 Weight Set, 1g – 100g	22435	Troemner

BEA S

No.	Reference Standards	Manufacturer	Model	Serial No.	Calibrated By:
R-1.	NIST Reference Thermometer	Thermco	ACC10613S	1068	Thermco Products Inc.
R-2.	Class 1 Equivalent Weights	Fisher Scientific	ASTM E617-97	22141	Troemner
R-3.	Traceable Workhorse Thermometer	Control Company	1230N26	191915560	Control Company

B. Calibration Services

Service Provider	Representative	Phone No.	Account No.	Equipment Serviced:
Mettler Toledo	Jason Butehko	(800) METTLER (800) 786-0034 x7127 Fax: (614) 438-4525	011533	Balances
Perkin Elmer	Richard Green	(800) 762-4000 Fax: (813) 741-0152	Not applicable	ICP/GFAA
Purification Technologies	Jane Coldiron/Mark	(813) 620-3922	32080	De-ionized Water System
Troemner	Joann Scull	856-686-4213 856-686-1601 FAX	Not applicable	Weights (which are used to check Laboratory Balances)
Thermco Products, Inc.	Susan Datria	(973) 300-9100 Fax: (973) 255-1000	Not applicable	NIST Reference Thermometers (which are used to check Laboratory Thermometers)
Commercial Appliance	Not applicable	(941) 429-1536	Not applicable	Autoclave

5.0 SAMPLE CUSTODY AND DOCUMENTATION

The following discussions outline the minimum record keeping requirements as they relate to sample collection, sample handling and sample analysis activities. The protocols and requirements outlined in this section emphasize the use of unequivocal, accurate and methodical records to document all activities affecting sample data.

There are two levels of custody: 1) Sample custody or tracking and 2) Legal or evidentiary chain of custody.

1. Sample custody or tracking is required. It includes all records and documentation necessary to trace a sample from point of origin through final report and sample disposal. Sample custody requires that each event or procedure to which the sample is subjected be documented. These include, but are not limited to: sample collection, field preservation, sample receipt and log in, sample preparation, sample analysis and sample disposal. In addition, those tasks or activities that relate to each of the above-mentioned events (e.g. reagent preparation, calibration, preventative maintenance, quality control measures, etc.) must be documented. The history of the sample must be readily understood through the documentation. The required documentation that is associated with sample custody is outlined in Sections 5.1 through 5.5.

2. Legal or Evidentiary Chain of Custody (COC) is a special type of sample custody which requires that the physical possession, transport and storage of a sample be documented in writing. The records must account for all periods of time from sample container acquisition through sample disposal. COC protocols are not required, but are recommended. If implemented, the minimum documentation requirements outlined in Section 5.6 must be followed.

5.1 GENERAL REQUIREMENTS FOR CUSTODY AND DOCUMENTATION

5.1.1 RECORD KEEPING SYSTEM DESIGN - GENERAL REQUIREMENTS

The laboratory shall design and maintain a record keeping system that is succinct and efficient:

1. All records shall be maintained in a manner which facilitates documentation tracking and allows historical reconstruction of all analytical events and ancillary procedures that produced the resultant sample analytical data.

2. The system shall unequivocally link all documentation associated with a sampling event from sample collection through the final analytical result and sample disposal. This may be accomplished through either direct or cross-references to specific documentation.

3. The system shall be straightforward and shall facilitate the retrieval of all working files and archived records for inspection and verification purposes.

4. Final reports, data summaries, or other condensed versions of data that have been prepared by external parties shall be linked to internal records by an unequivocal cross-referencing mechanism (usually field and/or laboratory ID numbers).

5.1.2 DOCUMENTATION CRITERIA

1. The history of a sample must be clearly evident from the retained records and documentation. Copies or originals of all documentation which are associated with the analysis or sample collection event must be kept. This includes the documentation that is sent to or received from all sampling and analysis organizations.

2. All applicable documentation specified in this section shall be available for inspection during any sampling-site, facility (laboratory or offices) or data audit conducted by authorized representatives of compliance agencies.

3. The records must contain enough information so that excessive clarifications, interpretations or explanations of the data are not required from the originator.

4. All documentation and record entries shall clearly indicate the nature and intent of each entry.
   a. All documentation entries shall be signed or initialed by responsible staff. The reason for the signature or initials shall be clearly indicated in the records (e.g. sampled by; prepared by; reviewed by, etc.).

   b. Often, documentation requirements can be met by making brief references to procedures written in internal SOPs or approved methodology promulgated by external sources. If these standard procedures are routinely repeated in your operations (e.g., sample preparation procedures, decontamination protocols, analytical method, etc.), then citing these references may be appropriate. Such citations must specifically identify the document, method or SOP (e.g. sample preparation by 3010; field decontamination per internal SOP for Teflon sampling equipment, etc.), and must include the revision number or revision date. Copies of all revisions must be retained as part of the laboratory documentation.

5.1.3 RECORD-KEEPING PROTOCOLS

1. Entries into all records shall be made with waterproof ink.

2. **Entries on records shall not be obliterated by erasures or markings. All corrections to record-keeping errors shall be made by one line marked through the error. The individual making the correction shall sign (or initial) and date the correction.**

3. All laboratory records must be kept for a period of 5 years; this includes any TNI related documentation.

5.2 CONTENT REQUIREMENTS FOR SAMPLING KIT DOCUMENTATION

The contents of each prepared sampling kit (see Appendix A for definition) shall be documented. A packing list or similar record shall be transmitted to the receiving party with the sampling kit and a copy or other record shall be retained by the preparing party.

5.2.1.1 The following information shall be transmitted to the receiving party:
- a. Quantity, description and material composition of all containers, container closures or closure liners (if method specified) and all sampling equipment
- b. Intended application for each container type indicated by approved analytical method or method group
- c. Type and concentration of preservative added to clean sample containers and/or shipped as additional preservative
- d. Intended use of any additional preservatives or reagents
- e. Description of any analyte-free water (i.e. deionized, organic-free, etc.)
- f. Types and number of any quality control blanks (e.g., trip blanks)
- g. Date of kit preparation
- h. Description and material composition of all reagent transfer implements, i.e. pipettes, shipped in the kit.

This information may be in the form of a packing slip (e.g., 6-125 ml plastic containers for metals, 12 VOC vials for 601/602, etc.) or included on the chain of custody.

5.2.1.2 In addition to maintaining records of the above information, the preparing party shall maintain records or cross reference links of the following information:

a. Lot numbers of any commercially obtained sources of analyte-free water (if provided)
b. Material composition of all reagent and analyte-free water containers (if provided)
c. A code or reference (i.e. lot numbers) to dates in container and/or equipment cleaning logs;
d. A code or reference that links preservatives to preparation logs for preservatives or vendor lots
e. Name of receiver of kit
f. Project name for kit use, if known
g. Name of individual(s) preparing the kit
h. Date the kit was shipped or provided

5.2.1.3 If the sampling kits are prepared for internal use (i.e. they will not be shipped to any external party, including branch offices of the same organization) and the sampling kits are used for collecting routine (i.e. daily, weekly or monthly monitoring) samples, the records in 5.2.1.1 and 5.2.1.2 may be reduced to the following:

a. The cleaning records for sampling equipment and/or sample containers shall indicate who received the cleaned containers or equipment and the date of receipt.
b. The preservation and/or reagent preparation records shall indicate that the preservative or reagent was prepared for use in the field.

5.2.2 DOCUMENTATION FOR PRESERVATIVES

Sample preservatives and other reagent preparations shall be traceable to preparation dates and vendor sources and/or lot numbers.

5.3 CUSTODY AND DOCUMENTATION REQUIREMENTS

5.3.1 GENERAL PROTOCOLS

1. Copies of all COC forms (if applicable) or sample transmittal forms shall be maintained with project records. If the sampling and analysis activities are performed by the same organization at the same physical location (e.g. wastewater sampling and analysis) and if all records are maintained in a central location, a single copy of the COC form (if used) or the laboratory transmittal form may be retained.

2. Entries into all field records shall be made with waterproof ink.

3. Errors in all documents shall be deleted with one line then initialed and dated by the person making the correction (see Section 5.1.3.2).

4. All documentation/logs shall be signed/initialed by the appropriate personnel.

5. All time shall be recorded using 24 hour notation (i.e., 2:00 PM is 1400 hours).

5.3.2 REQUIRED INFORMATION

5.3.2.1 Sample Transmittal Records

All samples that are submitted to a laboratory must be accompanied by a sample transmittal or Chain of Custody record (see Section 5.6). This record may be designed as individual forms for each sample or a summary form for a set of samples. AT A MINIMUM, the information transmitted to the laboratory shall include:

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1. Client name, address and phone number
2. Sample identification (i.e. site name)
3. Sample location (i.e. specific address or field #)
4. Date and time of collection
5. Collector's name and phone number
6. Preservation type
7. Sample type (sample matrix)
8. Number of samples
9. Intended analyses
10. Any special remarks concerning the sample (i.e. exceptions)

5.3.3 SAMPLE TRANSPORT:

1. All sample transmittal forms shall be placed in waterproof bags and sealed in the transport containers with the samples.
2. If shipped by common carrier, transport containers should be securely sealed with strapping tape or other means to prevent lids from accidentally opening. COC Seals (if used) shall be applied after containers have been secured.
3. All shipping bills from common carriers shall be kept with the COC or transmittal forms.

5.4 SAMPLE CUSTODY TRACKING AND DATA DOCUMENTATION FOR LABORATORY OPERATIONS

5.4.1 INITIAL CHECK OF SAMPLES AND DOCUMENTATION

When samples are received by the laboratory the following checks shall be made upon receipt:

1. Verify the integrity and condition of all sample containers.

   a. Check for leakage, cracked or broken closures or containers, evidence of grossly contaminated container exteriors or shipping cooler interiors, and obvious odors, etc.
   b. Check for air headspace or bubbles in VOC containers.
2. Verify receipt of complete documentation for each container. At a minimum the following shall be included:
   A. A unique identifier that can be cross-referenced with the COC or sample transmittal form (site name, specific address or field #). If a container can not be cross-referenced with the COC, then it will be rejected.
   B. Date and time of collection
   C. Collector's name
   D. Intended analyses
   E. Preservation type
3. All information on sample containers must be in indelible ink and labels (if applicable) must be water-resistant.
4. Samples must be received in sufficient quantity for analysis. Reference Table 5.5.

5.4.2 VERIFICATION OF SAMPLE PRESERVATION

1. Samples that require chemical preservation shall be checked upon arrival. In some cases, it may be the choice of the laboratory to issue sample containers without preservative (for the safety of

the customer). In this case, the laboratory must preserve the sample container upon arrival. Reference Table(s) 5.1, 5.2, 5.3 and 5.4 of this manual for type of preservation. If proper preservation can not be established the sample will be rejected.

2. Samples which require thermal preservation shall be considered acceptable if the arrival temperature is within +/-2°C of the required temperature. Reference Table(s) 5.1, 5.2, 5.3 and 5.4 of this manual for preservation temperatures. Samples that are hand delivered to the laboratory immediately after collection may not meet these criteria. In these cases, the samples shall be considered acceptable if there is evidence that the chilling process has begun. The following alternate techniques may be used to verify the actual sample temperature:

   a. The temperature may be verified by determining the temperature of a surrogate water sample which has been shipped with the samples or placed in the transport containers with the samples after arrival in the laboratory. In the latter case, the surrogate sample must be allowed to equilibrate to the temperature of the samples in the cooler.

   b. The temperature of incoming samples may also be verified by a non-invasive temperature probe.

UNDER NO CONDITIONS SHALL A THERMOMETER OR OTHER TEMPERATURE MEASURING DEVICE BE PLACED INTO THE COLLECTED SAMPLE CONTAINER.

5.4.3 Rejection of Received Samples

1. Rejection Criteria - Samples shall be rejected according to the following criteria.
   a. Samples do not arrive with in the approved holding time.
   b. The integrity of sample containers is compromised as described in 5.4.1
   b. The identification of a container cannot be verified
   c. The proper preservation of the container cannot be established
   d. VOC vials contain bubbles of sizes greater than 1% of the vial volume (usually a bubble size of 5 mm in diameter). Note: the presence of any bubbles in VOC vials must be documented and reported with the final results.

2. The laboratory shall obtain concurrence or further instruction from the sample submitter regarding any proposed rejection. All correspondence and/or conversations concerning the final disposition of the samples shall be documented in the appropriate exception log.

3. Any decision to proceed with the analysis of compromised samples shall be fully documented including correspondence with the customer.
   a. The condition of these samples shall be noted in all documentation associated with the sample.
   b. The analysis data shall be appropriately qualified as estimated on all internal documentation and on the final report (see Data Qualifiers, Table 10.2).

4. Rejected samples shall be logged in the laboratory sample receipt log per Section 5.4.4 below with appropriate comments.

5. See also SOP# GM-1 (BEA) or GMS-7 (BEAS), Sample Acceptance Policy.

5.4.4 Sample Receipt Logging

1. The laboratory shall employ a logical system for assigning a unique identification code to EACH SAMPLE CONTAINER received in the laboratory. Multiple aliquots of a sample that have been received for different analytical tests (e.g., nutrients, metals, VOCs, etc.) shall be assigned a different ID code.
   a. This laboratory code shall maintain an unequivocal link with the unique field ID assigned each container.
   b. The identification of containers by container shape or size is not adequate.
   c. Sample containers will be labeled with the unique code upon assignment of the code.
   d. The unique code must consist of:
      1) The submission number:
         A) The year (i.e. 2006 as 6).
         B) The month in two digits (i.e. January as 01).
         C) A consecutive number starting with 000 1 at the beginning of each month.
         NOTE: BEAS Submission numbers all begin with an 'S' (Designating South).

      2) Sub-categories to the submission number:
         A) Each sample identified in numerical order.
         B) Each bottle identified by preservative in alphabetical order.
         C) Each analyte identified by full name or accepted abbreviation (Reference Table 5.5).

2. A sample receipt log shall be employed to document receipt of all sample containers. The following information will be recorded in the laboratory sequential log:
   a. Client name, address and phone number
   b. Sample identification (i.e. site name)
   c. Sample location (i.e. specific address or field #)
   d. Date and time of collection
   e. Collector's name and phone number
   f. Preservation type
   g. Sample type (sample matrix)
   h. Number of samples
   i. Intended analyses, including method number
   j. Any special remarks concerning the sample (i.e. exceptions)
   k. Received date and time
   l. Laboratory sample submission number
   m. Field ID code supplied by sample submitter
   n. Signature or initials of logger
   o. Comments or references resulting from sample integrity inspection (Section 5.4.1) or sample rejection (Section 5.4.3).
   p. Sampling kit code (if applicable)

3. Smaller laboratories whose function is to analyze on-site samples that have been collected by the laboratory staff (e.g. in-house domestic wastewater treatment laboratories) may use the sample transmittal forms as the sample log provided:
   a. The information in 5.4.4.2 above is included on the forms; and
   b. The sheets are maintained in chronological order as a permanent laboratory record.

In these cases, the laboratory ID number may be the same as the field ID number, subject to the requirements listed in Sections 5.4.4.1 and 5.4.4.2 above.

4. Retain all documentation that is transmitted to the laboratory by the sample transmitter for a period of five years.

5.4.5 SAMPLE STORAGE

1. Parent samples, sample replicates and subsamples received in the laboratory shall be stored under approved conditions as described in Tables 5.2, 5.3, 5.4 and 5.5. See also SOP# GM-2 (BEA) or GMS-8 (BEAS), Sample Handling and Storage.

2. Sample fractions, extracts, eluates, leachates, digestates, etc. shall be stored according to requirements of 5.4.5.1 above or according to guidance found in the approved preparation or analytical method used to prepare or analyze the subsample, as applicable. In cases of conflicting guidance, the storage/preservation requirements specified in 5.4.5.1 above shall supersede method guidance. No specific requirements apply to other cases not comprised by the above.

3. Samples and all subsamples, sample fractions, extracts, eluates, leachates and digestates shall be stored separately from all standards, reagents, cleaning supplies, fuels, food, etc.

4. VOC samples shall be stored separately from all other samples.

5. The manner in which samples and subsamples are stored shall be documented. This may be recorded in the sample receipt log or other linked documentation.

5.4.6 Sample Disposal

At a minimum, record the date of sample and/or subsample disposal and either the name (or initials) of the individual authorizing the disposal or the person who is responsible for the disposal.

5.4.7 Intralaboratory Distribution of Samples for Analysis

1. The laboratory shall utilize a proactive procedure to ensure that all samples and subsamples are analyzed within allowed maximum holding times (specified in 5.4.5.1 above).

2. All distribution of samples and subsamples for preparation and analysis shall be documented as to task assignment and analysis date deadline.

5.4.8 Laboratory Preparation of Samples for Analysis

Record all sample preparation procedures that may impact the analytical results.

5.4.8.1 Preparation Records

a. Sample preparation records shall include, but are not limited to:
   1. digestions
   2. filtrations
   3. distillations
   4. extractions
   5. leachings
   6. sample extract cleanup procedures

b. The specific sample processing protocol shall be identified. Where the procedure is routinely performed according to approved methodology or internal SOPs, preparation records may refer to the specific method or SOP (see 5.1.2.4.b)

5.4.8.2 Required information.

a. All parameters associated with the preparation technique shall be recorded. These data shall include, but are not limited to:

1. Sample or subsample ID number
2. Duration times for processes (e.g., extraction cycles, digestions, distillations, sonications, etc.) if the method specifies a time limitation
3. Volumes or weights of subsamples, reagents or dilution water
4. Dilution factors
5. Meter and other instrument readings
6. Chromatography column elution profile retention times
7. Adsorption column efficiency or breakthrough determinations
8. pH checks

b. Where specific materials or supplies are explicitly required by the approved method, record description and the material composition of such equipment, labware or supplies. This information may be by reference to internal standard operating procedures (see 5.1.2.4.b).

c. Record all calculations associated with the preparation procedure.

d. Retain all elution profile chromatograms, pH meter recorder charts or other products of automatic instrument data recordings associated with the procedure.

e. Link all reagents that are used in the procedure to the applicable reagent preparation records.

5.4.8.3 pH Checks of Samples and Subsamples

a. The pH of all pH-preserved samples is verified before any sample preparation or sample analysis procedure. Additional pH checks and adjustments, where required by the approved method, shall be documented.
b. Record the results of pH checks on samples and subsamples.
c. The proper pH value as stipulated by approved preservation protocols or approved sample preparation methods shall follow the method prescribed procedures. If none are specified, the pH shall be determined as follows:
    1. Use narrow-range pH paper.
    2. Do not contaminate the sample or subsample by contact with pH paper or pH electrode.
    3. Use non-contaminating transfer implements, if necessary, to obtain a sample portion for use in the pH check procedure.
    4. Check pH of VOC samples after taking aliquot for analysis, or check pH on duplicate sample that can be destroyed for this purpose
    5. Pour a portion of the sample on the pH paper, unless the sample is an analytical portion that cannot suffer significant quantitative loss. In this case, transfer a test specimen with disposable pipet or other implement to the pH paper (see 5.4.8.3.c.3 above)

5.4.9 TRACKING FOR INTERLABORATORY TRANSFER OF SAMPLES/SUBSAMPLES

If samples or sample extracts/digestates are sent to another laboratory, the information transmitted to the receiving laboratory must include, at a minimum:

a. Clear identification of subcontracted work by approved method designation
b. Subcontract Lab Information (Legal name, certification no., address, phone no. & contact name)
c. Originating Lab Information (Legal name, certification no., address, phone no. & contact name)
d. Date and time of sample collection
e. Method of preservation

f. Comments about sample or sample container (if applicable)
g. Date of sample preparation (if applicable)
h. Originating Laboratory ID number (if applicable)

5.4.10 SAMPLE ANALYSES DOCUMENTATION REQUIREMENTS

All sample analyses shall be completely documented by retaining all associated records. These records shall include, but are not limited to the following:

5.4.10.1 Information concerning all sample data:
a. All sample identifications
b. Dates and times of analyses
c. Instrumentation ID and instrumentation parameters affecting the analytical run
d. Approved method numbers for the analyses performed
e. All raw and reduced analytical data
f. All calculations
g. Analyst's initials or signature

5.4.10.2 GC/MS analyses:
a. Retain all electronically generated records (including the tune file and calibration date) on a write-protected diskette or tape in an orderly, logical manner; OR
b. Retain the hard copy records of all data in the analytical run (blanks, QC samples, standards, samples, etc.) which must include:
1. A copy of the total ion chromatogram, normalized to the highest non-solvent base peak;
2. Complete quantitation report;
3. Confirmation of all hits (mass spectra from the sample and library); and
4. Mass spectra from all unidentified compounds that exceed 5% of the highest base peak (excluding solvent fronts). This includes retention time, tabulation of mass abundances, and mass spectra of the 5 most probable library hits.

5.4.10.3 Assure that all analysis data is linked with records for ancillary data and procedures (e.g. sample preparation).

5.4.11 DOCUMENTATION REQUIREMENTS FOR OTHER LABORATORY OPERATIONS

The following activities, which are not specifically discussed in this Section, shall be documented according to the requirements found in the cited sections.

1. Preparation of Reagents and Analyte-Free Water - Section 6.2
2. Preparation of Analytical Calibration Standards - Section 7.2
3. Analytical Calibrations and Standardizations - Section 7.5 and 7.8
4. Preventative Maintenance - Section 8.0
5. Quality Control - Section 9.4
6. Corrective Actions - Section 11.6

5.5 ELECTRONIC DATA DOCUMENTATION

These requirements apply to all laboratory and field records which are generated or stored electronically.

5.5.1 RETENTION OF AUTOMATIC DATA RECORDING PRODUCTS

1. All products or outputs of automatic data recording devices, such as chart strip recorders, integrators and computers, shall be retained either in electronic, magnetic or paper form.

2. All such records shall be properly identified as to purpose, analysis date, and field and/or lab ID number. The information in Section 5.4.10.1 shall be recorded for all laboratory and all applicable field analyses.

5.5.2 ELECTRONIC DATA SECURITY

1. Controlled or secured access to levels of data-editing capability are recommended. Software should provide prompts to the user for double-checking entries before executing deletions or changes to data. User-interaction or data-alteration tracking software is recommended, if available.

2. Raw data that is electronically collected from instrumentation shall not be altered in any fashion. Software that allows an analyst to correct raw data (e.g. change baseline) is acceptable.

5.5.3 ELECTRONIC DATA STORAGE AND DOCUMENTATION

1. Electronically or magnetically stored data shall be easily retrievable for printing to paper.

2. All electronic/magnetic data files shall be coded, indexed, cross-referenced, etc., to allow linkage to sample data, analytical events and other laboratory procedural records. These file designations shall allow easy retrieval of the record.

3. All software algorithms employed to perform calculations required by the approved methodology or procedures shall be verified for accuracy and conformance with the methodology protocols, formulas, etc. This verification shall be documented.
   a. This requirement applies to all automatic calculations and automatic data collection affecting calibrations, analyses, QC determinations, spread sheets, etc.
   b. The vendor literature for software products may fulfill this requirement, if sufficiently detailed.

4. All software problems and their resolution shall be documented in detail, where these problems affect the correctness of laboratory data documented per this Custody SOP or where problems affect the cross-indexing of records. Record the calendar date, time, responsible personnel and relevant

technical details of all affected data and software files. Indicate which files have been affected. All software changes, updates, installations, etc. shall be similarly documented per the above concerns. File and link all associated service records supplied by vendors or other service personnel.

5.6 LEGAL OR EVIDENTIARY CUSTODY PROCEDURES

The use of Legal Chain-of-Custody (COC) protocols are not required by DEP. The following procedures are designed to document and track all time periods and the PHYSICAL POSSESSION AND/OR STORAGE of sample containers and samples from point of origin through the final analytical result and sample disposal.

This type of documentation is useful in establishing the evidentiary integrity of samples and/or sample containers. It can be used to demonstrate that the samples and/or sample containers were handled and transferred in such a manner to eliminate possible tampering. As such, these protocols are advantageous if data is to be used in legal cases such as law suits, criminal actions, enforcement actions, etc.

In addition to the records listed in Sections 5.1 through 5.5, the following protocols shall be incorporated IF legal COC is implemented by the organization:

5.6.1 General Requirements

1. The Chain of Custody records shall establish an intact, contiguous record of the physical possession, storage and disposal of sample containers; collected samples; sample aliquots; and sample extracts or digestates. For ease of discussion, the above-mentioned items shall be referred to as "samples":
   a. The COC records shall account for all time periods associated with the samples.
   b. The COC records shall include signatures of all individuals who were actively involved with physically handling the samples.
      1. The signature of any individual on any record that is designated as part of the Chain of Custody is their assertion that they personally handled or processed the samples identified on the record.
      2. Each signature shall be accompanied by a short statement which describes the activity of the signatory (i.e. received by, relinquished by, etc.).
   c. In order to simplify record-keeping, the number of people who physically handle the sample should be minimized.
   d. The COC records are not limited to a single form or document. However, the lab will attempt to limit the number of documents that would be required to establish COC.
      1. Grouping activities on documents (e.g., a sample transmittal form to document field activities and laboratory receipt; a sample storage and disposal form to document storage; etc.).
      2. A COC Form shall document all sample transmittals from one party to another (see 5.6.3).
      3. The laboratory records such as initial sample log records, sample preparation logs, analyst's run logs, etc. shall also be considered as part of the chain of custody unless the organization has established other records or protocols to document these laboratory functions.

2. Legal chain of custody shall begin when the pre-cleaned sample containers are dispatched to the field.
   a. A COC form must be signed by the person relinquishing the prepared sample kits or containers and by the individual who receives the sample kits or containers.
   c. Thereafter, all parties handling the sample are responsible for sample custody (i.e. relinquishing and receiving) and documentation EXCEPT when the samples or sampling kits are relinquished to a common carrier.

3. The common carrier should not sign COC forms.
   a. The COC form shall indicate the name of a common carrier, when used. The shipping bill or other documents must be retained.
   b. All other transferor and transferee signatures associated with common carrier transfers are required. This shall include laboratory, field and other personnel releasing or accepting materials from the common carrier.
   c. COC will be relinquished by the party who seals the shipping container and accepted by the party who opens it. The COC form shall indicate the date and time that the transport container was sealed for shipment.
   d. Transport containers shall be sealed with strapping tape and a tamper proof custody seal. The custody seal must have space for the signature of the person who affixed the seal along with the date and time.

4. The COC forms shall remain with the samples during transport or shipment. They must be put in a waterproof closure inside the sealed cooler or shipping chest.

5.6.2 Required Contents for Custody Records

Tracking records shall include, by direct entry or linkage to other records:

1. Time of day and calendar date of each transfer or handling procedure
2. Signatures of transferors and transferees
3. Location of samples (if stored in the field or laboratory)
4. Handling procedures (e.g. sample preparation, sample analysis, etc.) performed on the samples
5. Storage conditions for the samples, including chemical and thermal preservation
6. Unique identification for all samples
7. History of access to samples by all personnel, with personnel names recorded
8. Final disposition of physical sample
9. Common carrier documents

5.6.3 Required Information to be Included on COC Forms Used for Sample Transmittal

A Chain-of-Custody record or form shall accompany all evidentiary samples and sub-samples that are transmitted and received by any party. The COC record or form shall specifically contain the following information:

1. Client name, address and phone number
2. Sample identification (i.e. site name)
3. Sample location (i.e. specific address or field #)
4. Date and time of collection
5. Collector's name and phone number
6. Preservation type
7. Sample type (sample matrix)
8. Number of samples
9. Intended analyses, including method number
10. Signatures of all transferors and transferees
11. Time and date of all custody transfers
12. Common carrier usage, if applicable (see 5.6.1.3)
13. Any special remarks concerning the sample (i.e. exceptions)
14. Received date and time
15. Laboratory sample submission number
16. Field ID code supplied by sample submitter
17. Signature or initials of logger
18. Sampling kit code (if applicable)

5.6.4 Chain-of-Custody Seals

At a minimum, tamper-indicating tape or seals shall be affixed to all shipping container closures when transferring or shipping sample container kits, or samples to another party.

1. The seal shall be placed so that the transport container cannot be opened without breaking the seal.
2. The time, calendar date and signatures of responsible personnel affixing and breaking all seals shall be recorded on the seals.
3. Seals shall be retained as a part of the COC documentation.
4. While not required, organizations may elect to apply seals to individual containers. This establishes the history of each individual sample. The requirements specified for transport container seals shall be followed.

5.6.5 Controlled Access to Samples

1. Access to all evidentiary samples and subsamples shall be controlled and documented. The number of individuals who physically handle the samples should be limited to those responsible for sample collection, initial laboratory receipt, sample preparation and sample analysis (see 5.6.1.1.c) and sample disposal.

2. Samples and subsamples shall be placed in locked storage (e.g., locked vehicle, locked storeroom etc.) at all times when not in the possession or view of authorized personnel.
   a. Some organizations maintain restricted access to their facilities and contend that storage under these conditions should constitute secure storage. This practice is acceptable as long as non-laboratory personnel (i.e. janitors, security guards, etc.) are not able to gain access to the samples after business hours.
   b. Field personnel shall not leave samples in unoccupied motel or hotel rooms.

5.6.6 Transfer of Samples to Another Party

Transfer of samples, subsamples, digestates or extracts to another party are subject to all of the requirements of Section 5.6.

5.7 Sample Disposal

1. Disposal of the physical sample shall occur only with the concurrence of the affected legal authority, sample data user and/or submitter of the sample.
2. All conditions of disposal and all correspondence between all parties concerning the final disposition of the physical sample shall be recorded and retained.
3. Records shall indicate the date of disposal, the nature of disposal (i.e. sample depleted, sample flushed into sewer, sample returned to client, etc.), and the name of the individual who performed the task. Note: if samples are transferred to another party, custody transfer shall be documented in the same manner as other transfers (see 5.6.3 above).

Table 5.1

40 CFR Part 136 TABLE II: REQUIRED CONTAINERS, PRESERVATION TECHNIQUES, AND HOLDING TIMES (WATER/WASTEWATER SAMPLES)

PARAMETER #	PARAMETER NAME	CONTAINER[1]	PRESERVATION[2,3]	MAX HOLD TIME[4]
Table 1A - Bacterial Tests:				
1-5.	Coliform, total, fecal and *E. coli*	PA, G	Cool <10°C, 0.008% $Na_2S_2O_3$[5]	6 hours[22, 23]
6.	Fecal streptococci	PA, G	Cool <10°C, 0.008% $Na_2S_2O_3$[5]	6 hours[22]
7.	Enterococci	PA, G	Cool <10°C, 0.008% $Na_2S_2O_3$[5]	6 hours[22]
Table 1H – Protozoan Tests:				
8.	Cryptosporidium	LDPE; field filtration	0-8°C	96 hours[21]
9.	Giarida	LDPE; field filtration	0-8°C	96 hours[21]
Table 1B - Inorganic Tests:				
1.	Acidity	P, FP, G	Cool ≤6°C[18]	14 days
2.	Alkalinity	P, FP, G	Cool ≤6°C[18]	14 days
4.	Ammonia	P, FP, G	Cool ≤6°C[18], H_2SO_4 to pH<2	28 days
9.	Biochemical oxygen demand	P, FP, G	Cool ≤6°C[18]	48 hours
11.	Bromide	P, FP, G	None required	28 days
14.	Biochemical oxygen demand carbonaceous	P, FP, G	Cool ≤6°C[18]	48 hours
15.	Chemical oxygen demand	P, FP, G	Cool ≤6°C[18], H_2SO_4 to pH<2	28 days
16.	Chloride	P, FP, G	None required	28 days
17.	Chlorine, total residual	P, G	None required	Analyze within 15 mins.
21.	Color	P, FP, G	Cool ≤6°C[18]	48 hours
23-24.	Cyanide, total and amenable to chlorination	P, FP, G	Cool ≤6°C[18], NaOH to pH>12[6], reducing agent[5]	14 days
25.	Fluoride	P	None required	28 days
27.	Hardness	P, FP, G	HNO_3 or H_2SO_4 to pH<2	6 months
28.	Hydrogen ion (pH)	P, FP, G	None required	Analyze within 15 mins.
31, 43.	Kjeldahl and organic nitrogen	P, FP, G	Cool ≤6°C[18], H_2SO_4 to pH<2	28 days
38.	Nitrate	P, FP, G	Cool ≤6°C[18]	48 hours
39.	Nitrate-nitrite	P, FP, G	Cool ≤6°C[18], H_2SO_4 to pH<2	28 days
40.	Nitrite	P, FP, G	Cool ≤6°C[18]	48 hours
41.	Oil and grease	G	Cool ≤6°C[18], H_2SO_4 or HCl to pH<2	28 days
42.	Organic carbon	P, FP, G	Cool ≤6°C[18], HCl or H_2SO_4 to pH<2	28 days
44.	Orthophosphate	P, FP, G	Cool ≤6°C[18]	Filter within 15 mins; Analyze within 48 hours
46.	Oxygen, Dissolved Probe	G (Bottle & top)	None required	Analyze within 15 mins.
47.	Oxygen, Winkler	G (Bottle & top)	Fix on site and store in dark	8 hours
48.	Phenols	G	Cool ≤6°C[18], H_2SO_4 to pH<2	28 days
49.	Phosphorus (elemental)	G	Cool ≤6°C[18]	48 hours
50.	Phosphorus, total	P, FP, G	Cool ≤6°C[18], H_2SO_4 to pH<2	28 days
53.	Residue, total	P, FP, G	Cool ≤6°C[18]	7 days
54.	Residue, Filterable	P, FP, G	Cool ≤6°C[18]	7 days

Table 5.1, cont.

PARAMETER #	PARAMETER NAME	CONTAINER[1]	PRESERVATION[2,3]	MAX HOLD TIME[4]
55.	Residue, Nonfilterable (TSS)	P, FP, G	Cool ≤6°C[18]	7 days
56.	Residue, Settleable	P, FP, G	Cool ≤6°C[18]	48 hours
57.	Residue, volatile	P, FP, G	Cool ≤6°C[18]	7 days
61.	Silica	P or Quartz	Cool ≤6°C[18]	28 days
64.	Specific conductance	P, FP, G	Cool ≤6°C[18]	28 days
65.	Sulfate	P, FP, G	Cool ≤6°C[18]	28 days
66.	Sulfide	P, FP, G	Cool ≤6°C[18] add zinc acetate plus sodium hydroxide to pH>9	7 days
67.	Sulfite	P, FP, G	EDTA	Analyze within 15 mins.
68.	Surfactants (MBAS)	P, FP, G	Cool ≤6°C[18]	48 hours
69.	Temperature	P, FP, G	None required	Analyze immediately
73.	Turbidity	P, FP, G	Cool ≤6°C[18]	48 hours
Table 1B - Metals:				
18.	Chromium VI	P, FP, G	Cool ≤6°C[18], pH = 9.3-9.7[20]	28 days
35.	Mercury (CVAA)	P, FP, G	HNO_3 to pH<2	28 days
35.	Mercury (CVAFS)	FP, G; and FP-lined cap[17]	5 mL/L 12N HCl or 5 mL/L BrCl[17]	90 days[17]
3, 5-8, 12, 13, 19, 20, 22, 26, 29, 30, 32-34, 36, 37, 45, 47, 51, 52, 58-60, 62, 63, 70-72, 74, 75.	(All other Metals besides chromium VI and mercury)	P, FP, G	HNO_3 to pH<2, or at least 24 hours prior to analysis[19]	6 months
Table 1C – Organic Tests[8]				
13, 18-20, 22, 24-28, 34-37, 39-43, 45-47, 56, 76, 104, 105, 108-111, 113.	Purgeable Halocarbons	G, FP-lined septum	Cool ≤6°C[18], 0.008% $Na_2S_2O_3$[5]	14 days
6, 57, 106.	Purgeable Aromatic Hydrocarbons	G, FP-lined septum	Cool ≤6°C[18], 0.008% $Na_2S_2O_3$[5], HCl to pH 2[9]	14 days
3, 4.	Acrolein and Acrylonitrile	G, FP-lined septum	Cool ≤6°C[18], 0.008% $Na_2S_2O_3$[5], pH to 4-5[10]	14 days[10]
23, 30, 44, 49, 53, 77, 80, 81, 98, 100, 112.	Phenols [11]	G, FP-lined cap	Cool ≤6°C[18], 0.008% $Na_2S_2O_3$[5]	7 days until extraction, 40 days after extraction
7, 38.	Benzidines [11, 12]	G, FP-lined cap	Cool ≤6°C[18], 0.008% $Na_2S_2O_3$[5]	7 days until extraction[13]
14, 17, 48, 50-52.	Phthalate esters [11]	G, FP-lined cap	Cool ≤6°C[18]	7 days until extraction, 40 days after extraction
82-84.	Nitrosamines [11, 14]	G, FP-lined cap	Cool ≤6°C[18], store in dark, 0.008% $Na_2S_2O_3$[5]	7 days until extraction, 40 days after extraction
88-94.	PCBs [11]	G, FP-lined cap	Cool ≤6°C[18]	1 year until extraction, 1 year after extraction
54, 55, 75, 79.	Nitroaromatics and Isophorone [11]	G, FP-lined cap	Cool ≤6°C[18], store in dark,	7 days until extraction, 40 days

Table 5.1, cont.

PARAMETER #	PARAMETER NAME	CONTAINER[1]	PRESERVATION[2,3]	MAX HOLD TIME[4]
1, 2, 5, 8-12, 32, 33, 58, 59, 74, 78, 99, 101.	Polynuclear Aromatic Hydrocarbons [11]	G, FP-lined cap	Cool ≤6°C[18], store in dark, 0.008% $Na_2S_2O_3$[5]	7 days until extraction, 40 days after extraction
Table 1D-Pesticides Tests:				
1-70.	Pesticides [11]	G, FP-lined cap	Cool ≤6°C[18], pH 5-9[15]	7 days until extraction, 40 days after extraction
Table 1E-Radiological Tests:				
1-5.	Alpha, beta and radium	P, FP, G	HNO_3 TO pH<2	6 months
Table 1H – Protozoan Tests:				
8.	Cryptosporidium	LDPE; field filtration	0-8 °C	96 hours[21]
9.	Giardia	LDPE; field filtration	0-8 °C	96 hours[23]

[1] "P" is polyethylene; "FP" is fluoropolymer (polytetrafluoroethylene (PTFE; Teflon®), or other fluoropolymer, unless stated otherwise in this table; "G" is glass; "PA" is any plastic that is made of sterilizable material (polypropylene or other autoclaveable plastic); "LDPE" is low density polyethylene.

[2] Add a reducing agent only if an oxidant (e.g. chlorine) is present. Reducing agents shown to be effective are sodium thiosulfate ($Na_2S_2O_3$), ascorbic acid, sodium arsenite ($NaAsO_2$), or sodium borohydride ($NaBH_4$). Be careful not to add excess reducing agent. For ascorbic acid, add approximately 0.1-0.6g of crystals, and then an additional 0.06g for each liter of sample volume.

[3] Except where noted in this table and the method for the parameter, preserve each grab sample within 15 minutes of collection. For a composite sample collected with an automated sampler, refrigerate the sample at ≤6°C during collection unless specified otherwise in this table or in the method(s). For a composite sample to be split into separate aliquots for preservation and/or analysis, maintain the sample at ≤6°C, unless specified otherwise in this table or in the method(s), until collection, splitting, and preservation has been completed. Add the preservative to the sample container prior to sample collection, as long as the integrity of the sample is maintained, otherwise add preservative to the sample within 15 minutes of collection. If a composite measurement is required but sample integrity would be compromised, individual grab samples may be collected at prescribed intervals and analyzed separately and the concentrations averaged. Alternatively, grab samples may be collected in the field and composited in the laboratory of the compositing procedure produces results equivalent to results produced by arithmetic averaging of the analysis results.

[4] When any sample is to be shipped by common carrier or sent via the U.S. Postal Service, it must comply with the Dept. of Transportation Hazardous Materials Regulations (49 CFR Part 172). The person offering such material for transport is responsible for compliance. The Hazardous Materials Regulations do not apply to the following in this table: HCl in water solutions at concentrations of 0.04% by weight or less; HNO_3 in water solutions at concentrations of 0.15% by weight or less; H_2SO_4 in water solutions at concentrations of 0.35% by weight or less; and NaOH in water solutions at concentrations of 0.080% by weight or less.

[5] Samples should be analyzed as soon as possible after collection. The times listed are the maximum times that samples may be held before the start of analysis and still be considered valid. For a grab samples, the holding time begins at the time of collection. For composite samples, the holding time begins at the end of collection of the composite sample.

[6] Sample collection and preservation: Collect a volume of sample appropriate to the analytical method in a bottle of the material specified. If the sample can be analyzed within 48 hours and sulfide is not present, adjust the pH to >12 with sodium hydroxide solution (5% of the weight per volume), refrigerate as specified, and analyze within 48 hours. Otherwise, to extend the holding time to 14 days and mitigate interferences, treat the sample immediately using any or all of the following techniques, as necessary, followed by adjustment of the sample pH to >12 and refrigeration as specified.

1. Sulfur: To remove elemental sulfur, filter the sample immediately. If the filtration time will exceed 15 minutes, use a larger filter or a method that requires a smaller sample volume. Adjust the pH of the filtrate to >12 with NaOH, refrigerate the filter and filtrate, and ship or transport to the laboratory. In the laboratory, extract the filter with 100mL of 5% NaOH for a minimum of 2 hours. Filter the extract and discard the solids. Combine the 5% NaOH-extracted filtrate with the initial filtrate, lower the pH to approximately 12 with concentrated HCl or H_2SO_4, and analyze the combined filtrate. Because the detection limit for cyanide will be increased by dilution by the filtrate from the solids, test the sample with and without the solids procedure if a low detection limit for cyanide is necessary. Do not use the solids procedure if a higher cyanide concentration is obtained without it. Alternatively, analyze the filtrates from the sample and the solids

separately, add the amounts determined (in ug or mg) and divide by the original sample volume to obtain the cyanide concentration.

2. Sulfide: If the sample contains sulfide, as determined by lead acetate paper, or if sulfide is known or suspected to be present, immediately conduct one of the following volatilization treatments or the precipitation treatment as follows: Volatilization – Headspace expelling: In a fume hood or well-ventilated area, transfer 0.75 liter of sample to a 4.4 L collapsible container. Acidify with concentrated HCl to pH <2. Cap the container and shake vigorously for 30 seconds. Remove the cap and expel the headspace into the fume hood or open area by collapsing the container without expelling the sample. Refill the headspace by expanding the container. Repeat expelling a total of 5 headspace volumes. Adjust the pH to >12, refrigerate, and transport to the lab. Scaling to a smaller or larger sample volume must maintain the air to sample volume ratio. Dynamic stripping: In a fume hood or well, ventilated area, transfer 0.75 L of sample to a container of the material specified and acidify with concentrated HCl to pH <2. Using a calibrated air sampling pump or flowmeter, purge the acidified sample into the fume hood or open area through a fritted glass aerator at a flow rate of 2.25 L/min for 4 minutes. Adjust the pH to >12, refrigerate, and transport to the lab. Keep volume ratios the same if scaling. Precipitation: If the sample contains particulate matter that would be removed by filtration, filter the sample prior to treatment to assure that cyanide associated with the particulate matter is include in the measurement. Once in the lab, extract the filter with 100mL of 5% NaOH for a minimum of 2 hours. Filter the extract and discard the solids. Combine the 5% NaOH-extracted filtrate with the initial filtrate, lower the pH to approximately 12 with concentrated HCl or H2SO4, and analyze the combined filtrate. (See the last three sentences of footnote 6(1.) above.) For removal of sulfide by precipitation, raise the pH of the sample to >12 with NaOH, then add approximately 1 mg of powdered cadmium chloride for each mL of sample. Cap and shake the container to mix. Allow the precipitate to settle and test the sample with lead acetate paper. If necessary, add cadmium chloride, but avoid adding an excess. Finally, filter through a 0.45 micron filter. Cool the sample as specified and transport the filter and the filtrate to the lab. For lab procedure, reference footnote 6(1.). If a ligand-exchange method is used (e.g. ASTM D6888), it may be necessary to increase the ligand-exchange reagent to offset any excess of cadmium chloride.
3. Sulfite, thiosulfate, or thiocyanate: If these interferences are known or suspected to be present, use UV digestion with a glass coil (Method Kelada-01) or ligand exchange (Method OIA-1677) to preclude cyanide loss or positive interference.
4. Aldehyde: If formaldehyde, acetaldehyde, or another water-soluble aldehyde is known or suspected to be present, treat the sample with 20mL of 3.5% ethylenediamine solution per liter of sample.
5. Carbonate: Carbonate interference is evidenced by noticeable effervescence upon acidification in the distillation flask, a reduction in the pH of the absorber solution, and incomplete cyanide spike recovery. When significant carbonate is present, adjust the pH to ≥12 using calcium hydroxide instead of sodium hydroxide. Allow the precipitate to settle and decant or filter the sample prior to analysis (also see SM4500-CN.B.3.d).
6. Chlorine, hypochlorite, or other oxidant: Treat a sample known or suspected to contain these interferences as described in fotenote 5.

[7] For dissolved metals, filter grab samples within 15 minutes of collection and before adding preservatives. For a composite sample collected with an automated sampler, filter the sample within 15 minutes of completion of collection and before adding preservatives. If it is known or suspected that dissolved sample integrity will be compromised during collection of a composite sample collected automatically over time (e.g. by interchange of a metal between dissolved and suspended forms), collect and filter grab samples to be composited (footnote 2) in place of a composite sample collected automatically.

[8] Guidance applies to samples to be analyzed by GC, LC, or GC/MS for specific compounds.

[9] If the sample is not adjusted to pH 2, then the sample must be analyzed within 7 days of sampling.

[10] The pH adjustment is not required if acrolein will not be measured. Samples for acrolein receiving no pH adjustment must be analyzed within three days of sampling.

[11] When the extractable analytes of concern fall within a single chemical category, the specified preservative and maximum holding times should be observed for optimum safeguard of sample integrity. When the analytes of concern fall within two or more chemical categories, the sample may be preserved by cooling to ≤ 6°C, reducing residual chlorine with 0.008% sodium thiosulfate, storing in the dark, and adjusting the pH to 6-9. Samples preserved in this manner may be held for 7 days before extraction and for 40 days after extraction. Exception to this optional preservation and holding time procedure are noted in footnote 5 (regarding the requirement for thiosulfate reduction), and footnotes 12 and 13 (regarding the analysis of benzidine).

[12] If 1,2-diphenylhydrazine is likely to be present, adjust the pH of the sample to 4.0 ± 0.2 to prevent rearrangement to benzidine.

[13] Extracts may be stored up to 30 days at <0°C.

[14] For the analysis of diphenylnitrosamine, add 0.008% $Na_2S_2O_3$ and adjust pH to 7-10 with NaOH within 24 hours of sampling.

[15] The pH adjustment may be performed upon receipt at the laboratory and may be omitted if the samples are extracted within 72 hours of collection. For the analysis of aldrin, add 0.008% $Na_2S_2O_3$.
[16] Sufficient ice should be placed with the samples in the shipping container to ensure that ice is still present when the samples arrive at the laboratory. However, even if ice is present when the samples arrive, it is necessary to immediately measure the temperature of the samples and confirm that the preservation temperature maximum has not been exceeded. In the isolated cases where it can be documented that this holding temperature cannot be met, the permitee can be given the option of on-site testing or can request a variance. The request for a variance should include supportive data which show that the toxicity of the effluent samples is not reduced because of the increased holding temperature.
[17] Samples collected for the determination of trace level mercury (<100 ng/L) using EPA method 1631 must be collected in tightly-capped fluoropolymer or glass bottles and preserved with BrCl or HCl solution within 48 hours of sample collection. The time to preservation may be extended to 28 days if a sample is oxidized in the sample bottle. A sample collected for dissolved trace level mercury should be filtered in the laboratory within 24 hours of the time of collection. However, if circumstances preclude overnight shipment, the sample should be filtered in a designated clean area in the field in accordance with procedures given in Method 1669. If sample integrity will not be maintained by shipment to and filtration in the laboratory, the sample must be filtered in a designated clean area in the field with the time period necessary to maintain sample integrity. A sample that has been collected for determination of total or dissolved trace level mercury must be analyzed within 90 days of sample collection.
[18] Aqueous samples must be preserved at ≤ 6°C, and should not be frozen unless data demonstrating that sample freezing does not adversely impact sample integrity is maintained on file and accepted as valid by the regulatory authority. Also, for purposes of NPDES monitoring, the specification of "≤ °C" is used in place of the "4 °C" and "< 4 °C" sample temperature requirements listed in some methods. It is not necessary to measure the sample temperature to three significant figures (1/100th of a degree); rather, three significant figures are specified so that rounding down to 6 °C may not be used to meet the ≤ 6°C requirement. The preservation temperature does not apply to samples that are analyzed immediately (within 15 minutes).
[19] An aqueous sample may be collected and shipped without acid preservation. However, acid must be added at least 24 hours before analysis to dissolve any metals that absorb to the container walls. If the sample must be analyzed within 24 hours of collection, add the acid immediately (see footnote 2). Soil and sediment samples do not need to be preserved with acid. The allowances in this fotenote supersede the preservation and holding time requirements in the approved metals methods.
[20] To achieve the 28-day holding time, use the ammonium sulfate buffer solution specified in EPA Method 218.6. The allowance in this footnote supersedes preservation and holding time requirements in the approved hexavalent chromium, unless measurement is compromised.
[21] Holding time is calculated from time of sample collection to elution for samples shipped to the laboratory in bulk and calculated from the time of sample filtration to elution for samples filtered in the field.
[22] Sample analysis should begin immediately, preferably within 2 hours of collection. The maximum transport time to the laboratory is 6 hours, and samples should be processed within 2 hours of receipt at the laboratory. (Table II of 40 CFR Part 136.3 was amended in May 2007. An additional 2 hours of laboratory preparation time has been added to the 6 hour transport holding time for water samples collected for bacterial analyses. Joint memorandum attached at the end of Section 5 of this Quality Manual.)
[23] For fecal coliform samples for sewage sludge (biosolids) only, the holding time is extended to 24 hours for the following sample types using either EPA Method 1680 (LTB-EC) or 1681 (A-1); Class A composted, Class B aerobically digested, and Class B anaerobically digested.

Table 5.2

APPROVED WATER AND WASTEWATER PROCEDURES, CONTAINERS, PRESERVATION AND HOLDING TIMES FOR PARAMETERS NOT FOUND IN 40 CFR 136 **

PARAMETER	METHOD	REFERENCE[1]	CONTAINER[2]	PRESERVATION[3]	MAXIMUM HOLDING TIME[4]
Bromine	DPD Colorimetric [5]	SM 4500-Cl-G	P, G	None required	Analyze immediately
Bromates	Ion Chromatography	EPA-300.0 B [6]	P, G	Cool, 6°C	30 days
Chlorophylls	Spectrophotometric	SM 10200H	P, G [7]	Unfiltered, dark 6°C Filtered, dark -20°C	48 hrs chilled until filtration [8], and analyze immediately or 28 days after filtration if frozen
Corrosivity	Calculated ($CaCO_3$ Stability, Langelier Index)	SM 2330 ASTM D513-82	P, G	Cool, 6°C [9]	7 days [9]
Odor	Human Panel	SM 2150 EPA 140.1	G only	Cool, 6°C	6 hours
Salinity	Electrometric [10] Hydrometric [10]	SM 2420 B SM 2520 C	G, wax seal	Analyze immediately or use wax seal	30 days [10]
Taste	Human Panel	SM 2160 B SM 2160 C SM 2160 D ASTM E679-91	G only	Cool, 6°C	24 hours
Total Dissolved Gases	Direct-Sensing Membrane-Diffusion Method	SM 2810	---	---	Analyze in-situ
Transparency	Irradiometric [11]	62-302.200(6), FAC	---	---	Analyze in-situ
Un-ionized Ammonia	Calculated [12]	DEP-SOP [13]	P, G	Cool, 6°C $Na_2S_2O_3$ [12]	8 hours unpreserved 28 days preserved [12]
UV 254	Spectrophotometric	SM 5910 B	G	Cool, 6°C	48 hours
Organic Pesticides [14]	GC and HPLC	EPA(600-series)[14]	[15]	[15]	[15]

**Reference: 62-160.700, F.A.C., Table 4 and DEP-SOP-001/01, FS 1000, Table FS 1000-5 March 31, 2008

[1] SM XXXX = procedures from "Standard Methods for the Examination of Water and Wastewater", APHA-AWWA-WPCF, 20th Edition, 1998 and Standard Methods Online.

ASTM XXXX-YY= procedure from "Annual Book of ASTM Standards", Volumes 11.01 and 11.02 (Water I and II), 1999.

[2] P= plastic, G= glass.

[3] When specified, sample preservation should be performed immediately upon sample collection.

[4] The times listed are the maximum times that samples may be held before analysis and still be considered valid.

[5] The approved procedure is for residual chlorine. However, in the absence of chlorine, the DPD colorimetric procedure can be adapted to measure bromine content of the sample. In such case, the validity of this assumption must be verified by using another procedure for chlorine which is not affected by the presence of bromine (i.e. negligible interference).

[6] "The Determination of Inorganic Anions in Water Ion Chromatography", EPA Method 300.0 B, Revision 2.1, August 1993, by John D. Pfaff, Carol A. Brockoff and James W. O'Dell, U.S. EPA, Cincinnati, Ohio 45268.

[7] Collect samples in opaque bottles and process under reduced light. Samples on filter taken from water having a pH $\geq$ 7 may be placed in airtight plastic bags and stored frozen for up to three weeks. Samples from acidic water must be processed promptly to prevent chlorophyll degradation.

[8] Samples must be filtered within 48 hours of collection. Add magnesium carbonate to the filter while the last of the sample passes through the filter.

[9] Temperature and pH must be measured on site at the time of sample collection. 7 days is the maximum time for laboratory analysis of total alkalinity, calcium ion, and total solids.

[10] Samples collected for laboratory analysis, when properly sealed with a paraffin wax stopper, may be held indefinitely. The maximum holding time of 30 days is recommended as a practical regulatory limit.

[11] Transparency in surface waters is defined as a compensation point for photosynthetic activity, i.e., the depth at which one percent of the light intensity entering at the water surface remain unabsorbed. The DEP Chapter 62-302, FAC requires that the light intensities at the surface and subsurface be measured simultaneously by irradiance meters such as the Kahlsico Underwater Irradiometer, Model No. 268 WA 310, or an equivalent device having a comparable spectral response.

[12] The results of the measurement of pH, temperature, salinity (if applicable) and the ammonium ion concentration in the sample are used to calculate the concentration of ammonia in the unionized state. Temperature, pH, and salinity must be measured on-site at the time of collection. Laboratory analysis of the ammonium ion concentration should be conducted within 8 hours of sample collection. If prompt analysis of ammonia is impossible, preserve samples with H_2SO_4 to pH between 1.5 and 2. Acid preserved samples, stored at 4C, may be held up to 28 days for ammonia determination. Sodium thiosulfate should only be used if fresh samples contain residual chlorine.

[13] DEP Central Analytical Laboratory, Tallahassee, FL, Revision No. 1, October 3, 1983. The 1983 draft is available from the DEP Bureau of Laboratories.

[14] Other pesticides listed in approved EPA methods (608.1, 608.2, 614, 614.1, 615, 617, 618, 619, 622, 622.1, 627, 629, 631, 632, 632.1, 633, 642, 643, 644 and 645) that are not included in Table ID of 40 CFR Part 136 (March 2007).

[15] Container, preservation and holding time, as specified in each individual method, must be followed.

Table 5.3

RECOMMENDED SAMPLE CONTAINERS, SAMPLE VOLUMES, PRESERVATION TECHNIQUES AND HOLDING TIMES FOR RESIDUALS, SOIL AND SEDIMENT SAMPLES

PARAMETER	METHODS	REFERENCES	CONTAINER	PRESERVATION[1]	MAX HOLDING TIMES
Volatile Organics	Purge-and-Trap GC and GC-MS	8015, 8021, 8260, 5035	Glass (40 ml vial or 4 oz. wide-mouth) with Teflon® -lined lid	Cool 6°C	14 days
Semivolatile Organics	GC, HPLC, and GC-MS	8041, 8061, 8070, 8081, 8082, 8091, 8111, 8121, 8131, 8141, 8151, 8270, 8275, 8280, 8290, 8310, 8315, 8316, 8318, 8321, 8325, 8330, 8331, 8332, 8410, 8430, 8440, FL-PRO	Glass, 8 oz. widemouth with Teflon® -lined lid (50g sample)	Cool 6°C	14 days until extraction, 40 days after extraction
Dioxins		8290		Cool 6°C	30 days until extraction, 45 days after extraction
Total Metals-except mercury and chromium VI	Flame AA, Furnace AA, Hydride and ICP	All 7000-series methods (except 7195, 7196, 7197, 7198, 7470, and 7471) and 6010 (ICP)	Glass or plastic, 8 oz. widemouth (200g sample)	None	6 months
Chromium VI	Colorimetric, Chelation with Flame AA	7196 and 7197 (prep 3060)	Glass or plastic, 8 oz. widemouth (200g sample)	Cool 6°C ± 2°C	24 hours
Mercury	Manual Cold Vapor AA	7471	Glass or plastic, 8 oz. widemouth (200g sample)	Cool 6°C ± 2°C	28 Days

Reference: 62-160.700, F.A.C., Table 5 and DEP-SOP-001/01, FS 1000, Table FS 1000-6 March 31, 2008

[1] Keep soils, sediments, and sludges cool at 4°C from collection time until analysis. No preservation is required for concentrated waste samples.

Table 5.4

PRESERVATION METHODS AND HOLDING TIMES FOR DRINKING WATER SAMPLES THAT DIFFER FROM 40 CFR PART 136, TABLE II

PARAMETER	PRESERVATION [1]	HOLDING TIME [2]	HOLDING TIME FOR EXTRACT [3]	CONTAINER [4]
Microbiologicals	Cool < 8°C, NaS_2O_3 [5]	30 hours [6]	---	P, G
Heterotropic Plate Count	Cool < 8°C, NaS_2O_3[5]	8 hours	---	P, G
Radiologicals				
Group A	HCl or HNO_3 pH<2 [7,8,9]	6 months	---	P, G
Cesium-134	HCl pH <2 [8,9]	6 months	---	P, G
Iodine-131	None	8 days	---	P, G
Tritium	None	6 months	---	G
Asbestos	Cool 6°C	48 hours	---	P, G
Bromate	Ethylenediamine (50 mg/L)	28 days	---	P, G
Cyanide	Cool 6°C, Ascorbic acid (if chlorinated), NaOH pH >12	14 days	---	P, G
Nitrate				
Chlorinated	Cool 6°C	28 days	---	48 hours
Nonchlorinated	Cool 6°C	48 hours	---	48 hours
Odor	Cool 6°C	24 hours	---	G
502.2	$Na_2S_2O_3$ or Ascorbic acid, 6°C, HCl pH <2 if Ascorbic acid is used	14 days	---	Glass with PFTE -Lined Septum
504.1	$Na_2S_2O_3$, Cool 6°C	14 days	6°C, 24 hours	Glass with PFTE -Lined Septum
505	$Na_2S_2O_3$, Cool 6°C	14 days (7 days for Heptachlor)	6°C, 24 hours	Glass with PFTE -Lined Septum
506	$Na_2S_2O_3$, Cool 6°C, Dark	14 days	6°C, Dark, 14 days	Amber Glass with PFTE - Lined Cap
507	$Na_2S_2O_3$, Cool 6°C, Dark	14 days (see method for exceptions)	6°C, Dark, 14 days	Amber Glass with PFTE - Lined Cap
508	$Na_2S_2O_3$, Cool 6°C, Dark	7 days (see method for exceptions)	6°C, Dark, 14 days	Amber Glass with PFTE - Lined Cap
508A	Cool 6°C	14 days	30 days	Glass with PFTE -Lined Cap

Table 5.4, cont.

PARAMETER	PRESERVATION [1]	HOLDING TIME [2]	HOLDING TIME FOR EXTRACT [3]	CONTAINER [4]
508.1	Sodium Sulfite, HCl pH <2, Cool 6°C	14 days (see method for exceptions)	30 days	Glass with PFTE -Lined Cap
515.1	$Na_2S_2O_3$, Cool 6°C, Dark	14 days	6°C, Dark, 28 days	Amber Glass with PFTE - Lined Cap
515.2	$Na_2S_2O_3$, Cool 6°C, HCl pH <2, Dark	14 days	≤ 6°C, Dark, 14 days	Amber Glass with PFTE - Lined Cap
515.3	$Na_2S_2O_3$, Cool 6°C, HCl pH <2, Dark	14 days	≤ 6°C, Dark, 14 days	Amber Glass with PFTE - Lined Cap
515.4	Sodium Sulfite, HCl pH <2, Cool ≤ 10°C for 1st 48 hours ≤ 6°C thereafter, Dark	14 days	≤ 0°C, 21 days	Amber Glass with PFTE - Lined Cap
524.2	Ascorbic acid, HCl pH <2, Cool 6°C	14 days	---	Glass with PFTE -Lined Septum
525.2	Sodium Sulfite, Dark, HCl pH <2, Cool 6°C	14 days (see method for exceptions)	≤ 6°C, 30 days from collection	Glass with PFTE -Lined Cap
531.1, 6610	Sodium Sulfite, Monochloroacetic acid pH <3, Cool 6°C	28 days	---	Glass with PFTE -Lined Septum
531.2	Sodium Thiosulfate, Potassium Dihydrogen Citrate buffer to pH 4, Dark, ≤ 10°C for first 48 hrs, ≤ 6°C thereafter	28 days	---	Glass with PFTE -Lined Septum
547	Sodium Thiosulfate, Cool 6°C	14 days (18 months frozen)	---	Glass with PFTE -Lined Septum
548.1	Sodium Thiosulfate (HCl pH 1.5-2 if high biological activity), Cool 6°C, Dark	7 days	≤ 6°C, 14 days	Amber Glass with PFTE - Lined Septum
549.2	Sodium Thiosulfate (H_2SO_4 pH <2 if biologically active), Cool 6°C, Dark	7 days	21 days	High Density Amber Plastic or Silanized Amber Glass

Table 5.4, cont.

PARAMETER	PRESERVATION [1]	HOLDING TIME [2]	HOLDING TIME FOR EXTRACT [3]	CONTAINER [4]
550, 550.1	Sodium Thiosulfate, Cool 6°C, HCl pH <2	7 days	550, 30 days 550.1, 40 days Dark, 6°C	Amber Glass with PFTE - Lined Cap
551.1	Sodium Thiosulfate, Sodium Sulfite, Ammonium Chloride, pH 4.5-5.0 with phosphate buffer, Cool 6°C	14 days	---	Glass with PFTE -Lined Septum
552.1	Ammonium Chloride, Cool 6°C, Dark	14 days	≤ 6°C, dark 48 hours	Amber Glass with PFTE - Lined Cap
555	Sodium Sulfite, HCl, pH ≤ 2, Dark, Cool 6°C	14 days	---	Glass with PFTE -Lined Cap
1613B	Sodium Thiosulfate, Cool 0-6C, Dark		Recommended 40 days	Amber Glass with PFTE - Lined Cap

Reference: 62-160.700, F.A.C., Table 6 and DEP-SOP-001/01, FS 1000, Table FS 1000-8, March 31, 2008

1 Preservation, when required, must be done immediately upon sample collection.

2 Stated values are the maximum regulatory holding times. Sample processing must begin by the stated time.

3 Stated time is the maximum time a prepared sample extract may be held before analysis.

4 (P) polyethylene or (G) glass. For microbiology, plastic sample containers must be made of sterilizable materials (poly-propylene or other autoclavable plastic).

5 Addition of sodium thiosulfate is only required if the sample has a detectable amount of residual chlorine, as indicated by a field test using EPA Method 330.4 or 330.2 or equivalent.

6 If samples are analyzed after 30 hours, but within 48 hours of collection, the laboratory is to indicate in the analytical report that the data may be invalid because of excessive delay in sample processing. No samples received after 48 hours are to be accepted or analyzed for compliance with the regulations of the Department of Environmental Protection or the Department of Health.

7 Group A parameters are: Gross Alpha, Gross Beta, Strontium-89, Strontium-90, Radium-226, Radium-228, Uranium, and Photon Emitters.

8 It is recommended that the preservative be added at the time of collection unless suspended solids activity is to be measured. It is also recommended that samples be filtered, if suspended or settable solids are present, prior to adding preservative, at the time of collection. However, if the sample has to be shipped to a laboratory or storage area, acidification of the sample (in its original container) may be delayed for a period not to exceed 5 days. A minimum of 16 hours must elapse between acidification and analysis.

9 If HCl is used to acidify samples, which are to be analyzed for gross alpha or gross beta activities, the acid salts must be converted to nitrate salts before transfer of the samples to planchets.

Table 5.5

List of Analytes , Acceptable Abbreviations & Sample Quantity Required in Water & Solid

Analyte	Abbreviation	Sample Quantity in ml/g
Alkalinity, Total	Alka., T-Alka	100
Bicarbonate Alkalinity	BiCarb Alk, B-Alka	calculation
Carbonate Alkalinity	Carb Alk., C-Alka	calculation
Aluminum	Al	150/100
Ammonia	NH_3	150/100
Antimony	Sb	150/100
Arsenic	As	150/100
Barium	Ba	150/100
Beryllium	Be	150/100
Biochemical Oxygen Demand	BOD, BOD5	400
Boron	B	150/100
Bromate	BrO3-	100
Bromide	Br	100
Cadmium	Cd	150/100
Calcium	Ca	150/100
Carbonaceous BOD	CBOD, CBOD5	400
Chemical Oxygen Demand	COD	50
Chlorate	ClO3-	100
Chloride	Cl	150
Chlorite	ClO2-	100
Chlorophyll	Chloro a; chloro a, b, c	500
Chlorine, Residual	Cl_2	50
Chromium	Cr	150/100
Chromium VI	CrVI; Cr6+	200/200
Cobalt	Co	150/100
Color	Color	100
Conductivity	Cond., Specific Conductance	50
Copper	Cu	150/100
Copper in Drinking Water	Cu	500
Dissolved Oxygen	DO	300

Dissolved Organic Carbon	DOC	15
E. coli	E-coli (MPN)	100
Enterococci	Enterococcus, Entero	100/100
Fecal Coliform	FC (MF), FC (MPN)	100/100
Fecal Streptococci	F Strep (MF), F Strep (MPN)	100
Fluoride	F	150
Gross Alpha	Gross Alpha; Gross α	900
Haloacetic Acids	HAA(5)'s	950
Hardness, Total Hardness (calc)	T-Hard, C-Hardness, Mg-Hard, Fe-Hard	100 calculation
Heterotrophic Plate Count	HPC, Standard Plate Count	100
Iron	Fe	150/100
Kjeldahl Nitrogen, Total	TKN	20/100
Lead	Pb	150/100
Lead in Drinking Water	Pb	500
Magnesium	Mg	150/100
Manganese	Mn	150/100
Mercury	Hg	100/100
Mixed Liquor Suspended Solids	MLSS	20
Mixed Liquor Volatile Suspended Solids	MLVSS	20
Molybdenum	Mo	150/100
Nickel	Ni	150/100
Nitrate as N	NO_3	100
Nitrate-Nitrite	NOX	10/100
Nitrite as N	NO_2	100
Nitrogen, Total	T-N	calculation
Odor	Odor	250
Oil & Grease	O & G	950
Organic Nitrogen	O-N	calculation
Ortho-phosphorous	O-P; ortho-Phos; σ-phos; ortho-phosphate	20
Oxidation Reduction Potential	ORP	Field Measure
pH	pH	50
Phosphorous, Total	T-P, Total Phos, Phos, Phosphate, Total Phosphate	10/100
Potassium	K	150/100
Radium 226	Rad 226	900

Radium 228	Rad 228	900
Salinity	Salinity	20
Selenium	Se	150/100
Silica	Silica	20
Silver	Ag	150/100
Sodium	Na	150/100
Specific Oxygen Uptake Rate	SOUR	1500
Sulfate	SO_4	200
Sulfide	Sulfide	300
Surfactants	MBAS	300
Temperature	Temp	25
Thallium	Tl	150/100
Tin	Sn	150/100
Titanium	Ti	150/100
Total Coliform	TC (MF), TC (MPN), TC (MMO-MUG),(READYCULT)	100/100
Total Dissolved Solids	TDS	50
Total Fixed Solids	TFS	calculation
Total Organic Carbon	TOC	15
Total Petroleum Hydrocarbons	TPH	950
Total Phenolics	Phenol	950
Total Solids	TS; %TS	10
Total Suspended Solids	TSS	950
Total Trihalomethanes	T-THM'S	120
Total Volatile Solids	TVS	20
Trihalomethanes	THM'S	120
Turbidity	ntu, Turbid.	100
Unionized Ammonia	Un-Ion Ammonia; Un-NH_3	calculation
UV-254	UV-254	20
Vanadium	V	150/100
Volatile Organic Compounds	VOC's	120
Volatile Suspended Solids	VSS	950
Zinc	Zn	150/100

6.0 ANALYTICAL PROCEDURES

6.1 LABORATORY GLASSWARE CLEANING PROCEDURES

In the analysis of samples, the preparation of scrupulously clean glassware is mandatory. Lab glassware cleaning procedures must follow specific written method requirements. If procedures are not listed then the method of cleaning should be adapted to both the substances that are to be removed, and the determinations (tests) to be performed. Recommendations for such cleaning procedures are listed below.

If documentation through an active quality control program using spiked samples and reagent blanks can demonstrate that certain steps in the cleaning procedure are not required for routine samples, then those steps may be eliminated from the procedure.

Lab Glassware Cleaning Procedures

Analysis/Parameter	Cleaning Procedure (in order specified)
ORGANICS	
Semi-Volatile: (Pesticides, Herbicides, HPLC, Oil & Grease, TRPH & Total Recoverable Phenolics)	Solvents: 5, 1-4, 5 or 6, 13, 15 OR Muffle: 5, 1-4, 12, 13, 15 OR Oxidizer: 5, 1-3, 14, 3-5, 13, 15
Volatile or Purgeable: (and EDB, DBCP, THMS)	1-4, (6 optional), 10 OR 1-4 (5 & 7 optional), 10
TOC, POX, TOX:	14, 1-4, 12
INORGANICS	
Trace Metals:	1-4, 9, 8 (optional), 4
Nutrients, Minerals:	1-4, 8, 4
Analysis/Parameter	Cleaning Procedure (in order specified)
Solids:	1-4, 11 (Volatile Solids 16)
Non-Metals, Physical Properties: (Cyanide, BOD, COD)	1-4, (14 optional BOD)
MICROBIOLOGY	1-4, (Sterilize per approved method)

Analysis/Parameter	Cleaning Procedure (in order specified)
BIOASSAY	
Freshwater:	18, 2, 3, 9 or 8, 4, 5, 4, 20
Marine & Estuarine:	19, 2, 3, 9 or 8, 4, 5, 4, 20
RADIONUCLIDES	17, 3, 8, 4

Cleaning Procedures:

1. Remove all labels using sponge or acetone.
2. Wash with hot tap water and a brush to scrub inside of glassware, stopcocks, and other small pieces, if possible, using a suitable laboratory-grade detergent.
   - Organics- Liquinox, Alconox or equivalents
   - Inorganic anions- Liquinox or equivalent
   - Inorganic cations- Liquinox, Acationox, Micro or equivalents
   - Microbiology- must pass inhibitory residue test
3. Rinse thoroughly with hot tap water.
4. Rinse thoroughly with deionized water.
5. Rinse thoroughly with pesticide grade Acetone.
6. Rinse thoroughly with pesticide grade Methanol.
7. Rinse thoroughly with pesticide grade Hexane.
8. Rinse or soak with 1:1 HCl (Hydrochloric Acid).
9. Rinse or soak with >10% HNO_3 (Nitric Acid).
10. Bake at 105 C for 1 hour.
11. Bake at 180 C (prior to use as per method).
12. Drain, then heat in muffle furnace for 30-60 minutes at 400 C.
13. Clean, dry glassware should be sealed and stored in dust-free environment.
14. Soak in oxidizing agent (Chromic acid or equivalent); preferably hot (40-50 C).
15. Last step (prior to use) should be a rinse with the solvent used in analysis.
16. Drain, then heat in muffle furnace for 1 hour at 550 C.
17. Heat 1 hour in EDTA solution at 90-100 C.
18. New glassware must be soaked overnight in 10% HNO_3 or HCl.
19. New glassware must be soaked overnight in seawater.
20. Rinse thoroughly with dilution water.

CLASS A VOLUMETRIC GLASSWARE SHOULD NOT BE BAKED

6.2 LABORATORY REAGENT STORAGE

1. Laboratory reagents and chemicals must be stored according to method guidance and the manufacturer's instructions. All solvents used for VOC analyses shall be stored separately.

2. Reagents should be segregated according to compatibility groups (e.g. Solvents {flammable/non-flammable}, bases, acids, reactive chemicals, etc.). Storage should follow all OSHA requirements.

3. A permanent record of reagent storage and preparation shall be maintained for all chemicals. At a minimum, these records shall document:
   a. storage conditions and location for reagents (implemented internal laboratory SOPs and/or safety plans that outline storage conditions and location may be used in lieu of specific reagent container records)
   b. vendor name
   c. date received/date opened
   d. expiration dates
   e. lot numbers
   f. preparation dates
   g. amounts and concentration of all source reagents and compounds used
   h. signature or initials of preparer.
   I. pH of microbiological culturing medias before and after sterilization

4. Documentation shall be maintained on all sources of analyte-free water. This documentation shall include records on all maintenance, cartridge-changing and miscellaneous tasks performed to upkeep or repair the system and all routine QC analysis protocols specifically scheduled and performed to monitor the system. Records must be maintained which identify the source and the specific use of analyte-free water that is obtained from commercial vendors.

6.3 LABORATORY WASTE DISPOSAL

Handling, storage and disposal of laboratory-related hazardous wastes are subject to the regulations contained in the Resource Conservation and Recovery Act.

It is the responsibility of the laboratory to store, package, label, ship and dispose of hazardous wastes in a manner which ensures compliance with all Federal, State and local laws, regulations and ordinances.

A waste is considered hazardous if:

1. The waste material is listed as hazardous in 40 CFR Part 261.30-261.33.
2. The material exhibits any of the characteristics of hazardous waste: (ignitability, corrosivity, reactivity or TC toxicity).
3. The waste is listed in 1 or 2 above and is not excluded by any provisions under the Resource Conservation and Recovery Act.

A waste is considered an acute hazardous waste if it is identified in 40 CFR Part 261.31, 261.32 or 261.33 (e) as an acute hazardous waste.

Laboratories that generate hazardous waste are put into 3 categories based on the amount of hazardous waste generated monthly. These categories are: 1) conditionally exempt small quantity generator; 2) small quantity generator and; 3) full generator:

1. Conditionally Exempt Small Quantity Generator
A generator who generates no more than 100 kilograms of hazardous waste or 1 kilogram of acute hazardous waste in a calendar month and accumulates no greater than 1000 kilograms of hazardous wastes (40 CFR Part 261.5).

2. Small Quantity Generator
A generator who generates 100-1000 kilograms of hazardous waste per calendar month and accumulates no greater than 6000 kilograms of hazardous waste or more than 1 kilogram per month of acute hazardous waste (40 CFR Part 262.34).

3. Full Generator
A generator who generates hazardous wastes in excess of 1000 kilograms per calendar month or more than 1 kilogram per month of acute hazardous waste (40 CFR Part 262.34).

It is the responsibility of the laboratory to know which category their organization falls under. Since most laboratories will fall into the conditionally exempt small quantity generator category these disposal requirements are listed below.

Facilities falling into the small quantity generator and full generator categories must adhere to all regulations pertaining to waste, transport, storage and disposal in the Resource Conservation and Recovery Act.

Conditionally exempt small quantity generators must dispose of hazardous waste in an on-site facility or ensure delivery to a treatment, storage or disposal facility, which is:

1. Permitted under 40 CFR Part 270;
2. In interim status under 40 CFR Parts 270 & 265;
3. Authorized to manage hazardous waste by a state with a hazardous waste management program approved under Part 271; or
4. Permitted, licensed, or registered by a state to manage municipal or industrial solid waste*.

*(subject to local regulations).

6.3.1 General Disposal/Treatment Considerations

1. Hazardous waste solvents, as identified in the 40 CFR Part 261 may not be evaporated off in a fume hood. Solvents evaporated off during the extraction/testing process are exempt.
2. Acidic & Basic wastes may be neutralized and disposed of via the sanitary sewer if they are not hazardous due to the presence of other constituents*. (*subject to local regulations).
3. Heavy metals may be precipitated out and the liquid portion disposed of via the sanitary sewer*. (*subject to local regulations).

6.3.2 Storage and Accumulation

Hazardous waste storage is limited to quantity and/or accumulation time and must comply with RCRA regulations as specified in the 40 CFR. These wastes should be packaged and separated according to compatible groups (e.g. solvents, acids, etc.)

6.3.3 Sample Disposal

Samples submitted to a laboratory for analysis are excluded from regulation as hazardous waste under 40 CFR Part 261.4(d) provided the samples are being transported to or from the laboratory, are being analyzed, are being held for analysis or are being maintained in custody for legal reasons. However, once a decision is made to dispose of laboratory samples, the exclusion provisions of 40 CFR Part 261.4(d) no longer apply. Samples that have been identified as hazardous may either be: 1)

returned to the generator; or 2) disposed of according to applicable RCRA regulations summarized in this document. Samples which are determined to be non-hazardous may be subject to local environmental regulations. It will be the responsibility of the laboratory to be familiar with any such local regulations.

A sample collector shipping samples to a laboratory and a laboratory returning samples to a sample collector must comply with U.S. Department of Transportation (DOT), U.S. Postal Service (USPS), or any other applicable shipping requirements.

7.0 CALIBRATION PROCEDURES AND FREQUENCY

7.1 INTRODUCTION

This SOP stipulates minimum calibration requirements necessary to ensure that the measuring system is capable of producing acceptable data. Acceptable calibration protocol must involve a demonstration that the instrument or measuring system is capable of acceptable performance at the beginning of the analysis sequence and that initial calibration is still valid after continued system operation.

7.2 GENERAL CONSIDERATIONS

7.2.1 Calibrations must be performed according to all analytical method directives OR as indicated in this Guidance Document if specifics are not addressed in the cited method.

7.2.2 Analytical method calibration acceptance criteria must be followed or if acceptance criteria are not specified in the method, general criteria presented in this SOP shall be used to verify an acceptable calibration.

7.2.3 The number of calibration standards used to achieve an acceptable calibration must adhere to the cited method. If this information is not in the method, then a minimum of a blank and 4 standards must be employed to develop calibration curves. See Section 7.5.3 for guidance on other types of analyses.

7.2.4 The lowest calibration standard shall be at a concentration at or below the practical quantitation limit for the method. By using a calibration standard at that level, the laboratory can verify the PQL with each initial calibration.

7.3 STANDARD RECEIPT AND TRACEABILITY

7.3.1 Records to be retained for primary stock standards must include source, type of standard, date of receipt, lot number (if applicable), expiration date and purity statement.

7.3.2 Records to be maintained for preparation of intermediate standards must include identification of primary standards used, preparation date, methods of preparation (including specific dilution information), preparer identification, concentration prepared and expiration date.

7.3.3 Preparation records for working standards must include identification of primary and intermediate standards used in working standard preparation, date of preparation, method of preparation (including dilutions), concentrations prepared and preparer identification.

7.4 FREQUENCY OF STANDARD PREPARATION AND STANDARD STORAGE

7.4.1 STANDARD STORAGE

1. Standards must be stored according to analytical method guidance or supplier recommendations.

2. If no method or supplier guidance is available standards must be replaced upon decreased instrument response.

7.4.2 FREQUENCY OF STANDARD PREPARATION

1. If no method or supplier guidance is available standards must be renewed upon decreased instrument response.

2. It is recommended that all primary standards be held for no longer than one year.

3. Working standards are to be prepared on a daily basis unless specific method guidance stipulates differently.

7.4.3 Tables specifying standard storage protocol and standard preparation frequencies must be available for inspection at the laboratory.

7.5 LABORATORY INSTRUMENTS

7.5.1 INITIAL CALIBRATION

1. Instruments must be initially calibrated each time the instrument is set up or upon failure of any quality control calibration checks.

2. The number of standards to be used for initial calibration must conform to method protocol or general requirements in Section 7.5.3.

3. Correlation coefficients for photometric analyses must be calculated and documented and should be greater than or equal to 0.995.

4. A minimum of one quality control check standard at a mid-range concentration shall be analyzed prior to sample analyses to verify initial calibration. This quality control check standard shall be prepared independently of the calibration standards. Recoveries for this check standard should be between 90 and 110%, or as specified by the method.

7.5.2 CONTINUING CALIBRATION

1. One mid-range continuing calibration standard must be analyzed for each group of 20 samples analyzed. The check standard used for initial calibration verification will verify acceptable calibration for the first set of 20 samples.
Subsequent sample sets of 20 or portions thereof (if a complete set of 20 is not available), must have a continuing calibration check standard analyzed at the beginning of each sample set.

2. Recovery for the continuing calibration check standard shall be between 80 and 120%, the range specified by the analytical method or the documented acceptance range that is determined by internal historical data (see 9.2.3.4).

7.5.3 GENERAL CALIBRATION RECOMMENDATIONS BY SPECIFIC ANALYSIS OR ANALYSIS TYPE**

1. Titrimetric Analyses - Standardize all titrants just prior to use.

2. Residue or Solids Analyses
   a. Analyze Quality Control Check Samples on a quarterly basis.***
   b. See calibration requirements for analytical balances and ovens (Section 7.7.1 and 7.7.3).

3. Conductivity
   a. A minimum of 2 KCL standards must be analyzed bracketing the expected concentration of the samples to be analyzed.
   b. The readings for the calibration standards must be within 1% of the expected value.
   c. Continuing calibration checks must be within 1% of the true value.

4. Turbidity
   a. Calibration must be checked for each instrument testing range applicable to the levels of turbidity to be measured.
   b. If formazin standards are not used for the daily calibrations, then formazin standards must be prepared on a quarterly basis and compared with daily standards.
   c. Calibration must be checked every 20 samples with 1 standard in each applicable testing range.
   d. Acceptance criteria for all calibration and standard checks must be established per instrument accuracy specifications.

5. Dissolved Oxygen
   a. Probe - Calibrate against Winkler Titration on an annual basis. Results should agree within 0.2 mg/l.
   b. Winkler Titration - see titration section (7.6.3.1).

6. Color and Chlorine
   Final determination made by comparison against Nessler Tubes or sealed color standards.
   a. Confirm results against an approved alternate test procedure on a quarterly basis.
   b. Results should be within 10% of the original value.

7. Temperature
   a. Laboratory thermometers must be checked against an NIST certified thermometer on an annual basis. Results must be within the manufacturer's specifications.
   b. Other devices used to record temperature must be checked on a monthly basis against a thermometer that has been calibrated against an NIST certified thermometer.

8. BOD
   a. Analyze a glucose/glutamic acid check sample each day BODs are analyzed.
   b. Check standard recovery must satisfy method criteria.
   c. See Dissolved Oxygen calibration protocols (7.5.4).

9. Oil and Grease
   a. See calibration criteria for the analytical balance (7.7.3).
   b. Analyze a QC check sample on a quarterly basis (all applicable matrices).

10. Flash Point
    a. Analyze a solution of known flash point each day of operation.
    b. The flash point temperature should be within 5% of the literature flash point value.

11. Salinity
    a. Electrical Conductivity Method - follow protocols for conductivity calibration and standardize instrument for seawater analyses according to method protocol on a semiannual basis.
    b. Argentometric Method - standardize titrant daily and check method against a known seawater sample or alternate method quarterly.
    c. Hydrometric Method - check method against the argentometric method or with a QC check sample quarterly.
    d. Alternate method comparisons should agree within 10%.

12. Chlorophyll - analyze a QC check sample quarterly (if available).

13. Sulfate
    a. Gravimetric - analyze a QC check sample quarterly and follow calibration requirements for the analytical balance (Section 7.6.3).
    b. Turbidimetric - see requirements for calibration of turbidity (Section 7.5.3.4).
    c. If sulfuric acid is used for standard preparation, then it must be standardized with each preparation.

7.6 SUPPORT EQUIPMENT CALIBRATION

7.6.1 TEMPERATURE MONITORING

1. Ovens - temperature recorded daily. Temperatures must be within acceptable method range.
2. Incubators and water baths – monitor and record temperature twice daily, at least 4 hours apart, for microbiological work and once for other applications. Temperatures must be within acceptable method ranges.

7.6.2 AUTOCLAVES

Must document that sterilization temperature and pressure has been achieved by the use of sterilization indicators with every autoclave run.

7.6.3 ANALYTICAL BALANCES

Monthly monitoring with Class S Weights. Results must fall within the suppliers acceptance criteria.

7.7 CALIBRATION DOCUMENTATION

Records must be maintained to document and verify acceptable instrument or measuring system calibration for each analysis.

7.7.1 Records must be maintained for all standard preparations and working standards must be easily traced to intermediate and primary standards used for preparation.

7.7.2 Acceptable calibration verification (% recoveries, correlation coefficients) must be recorded and easily identified with applicable daily calibrations.

7.7.3 If calibration acceptance criteria are based on manufacturer's instrument specifications or acceptable recoveries specified by QC check sample suppliers, then records of such activities must be maintained. Such records must be easily accessible and must establish verification of acceptance criteria.

7.7.4 Laboratories must have available for inspection a table specifying calibration acceptance criteria for all parameters.

7.8 DEFINITIONS

7.8.1 Mid-Range Standard - a standard in the middle of the linear range of the established calibration curve or a standard concentration in the middle of the expected sample concentration range depending on the type of determination to be performed.

7.8.2 Intermediate Standard - a standard prepared from the primary stock standard which is diluted to prepare the working calibration standards.

7.8.3 Working Standards - the standards that are actually analyzed to perform the instrument or measuring system calibration.

* Acceptance criteria presented in this guidance document are general advisory limits. Variances to the listed criteria must be supported with documentation. If the method stipulates different criteria, then the method criteria must be used to verify acceptable calibration.

** If analysis or analysis type is not mentioned in this SOP then method calibration protocol and general requirements as presented in this guidance document must be followed.

*** Recoveries for QC Check Samples should be between 90 and 110% or within acceptable ranges specified by the supplier.

8.0 PREVENTIVE MAINTENANCE

Preventive maintenance is the key ingredient to possessing analytical equipment that will produce reliable data over the life of the instrument. Proper maintaining of the equipment will greatly reduce non-conformances in the laboratory.

Responsibility for preventive maintenance lies with the analyst and supervisory personnel in charge of monitoring the equipment. The analytical staff must be dedicated to the implementation of the preventive maintenance program and always watchful for signs that there is a need for maintenance activities. A maintenance schedule is often necessary to ensure equipment is maintained properly. The analyst and supervisory personnel must be supported by vendor specialists or in-house experts that handle activities beyond simple repairs or maintenance.

The Preventive Maintenance (PM) Program must consist of:

1. A written PM schedule;
2. Documentation of all maintenance and repairs (records must be kept in an easily accessible manner);
3. Vendor operation and maintenance manuals available for all instrumentation; and
4. A written contingency plan specifying that backup equipment will be maintained for all instrumentation or stating that sampling events will be postponed and current sample load be invalidated until repairs are accomplished. If samples are sent to another laboratory the subject laboratory must have an approved CompQAP for the parameters of concern and the Project Manager must be notified if the analytical work is being performed under a Quality Assurance Project Plan.

Table 8.1 identifies general preventive maintenance activities by instrument type with recommended frequencies. Please note that it may be necessary to perform activities more frequently depending on heavy workloads, sample types analyzed and/or instrument performance. If the instrument manufacturer recommends more frequent or additional maintenance activities these shall also be incorporated into the facility maintenance program. More detailed procedures can be found in the back of specific method SOPs and in the manufacturer operation manuals.

Table 8.1
PREVENTIVE MAINTENANCE ACTIVITIES

INSTRUMENT/ACTIVITY	FREQUENCY
SEAL	
Run autowash, extra wash, water baseline and syringe prime	D
Inspect function of probe wash ring and rinse well fill	D
Switch pump-tubing end for end or replace as needed	M
Clean well wash with cotton swab	M
Clean lamp filter and lubricate rollers on both pumps	Q
Replace lamp and optimize water baselines	A
Replace aspiration, sampling and waste water tubing	A
Run mechanical adjustment function	A
Replace syringe barrel, plunger and O ring	A
AUTOANALYZERS	
Check lamp function	D(1)
Replace pump tubing	M
Flush all tubing with bleach solution	M
Clean and lubricate pump and autosampler moving parts	M
AA SPECTROPHOTOMETER (FURNACE)	
Check graphite tubes	D(1)
Flush autosampler tubing	D
Replace graphite electrodes and Shrouds	SA
Clean furnace housing and injector tip	D
Check electronics	A(3,4)
Check noise levels for lamps	3,4
ICP	
Clean and realign torch	M
Clean nebulizer and spray chamber; Check peristaltic pump tubing	W(1)
Check entire optical system (mirrors, windows, etc.)	A(3,4)
Check water lines, torch compartment and gases	D
Check electronics (voltages, waveforms, etc.)	SA
Check wavelength calibration and adjust as needed	SA
Run interference (interelement) standard	D
GAS CHROMATOGRAPHS	
GENERAL	
Check septa, cylinder gas pressure, oxygen/moisture traps	D
Bake out injector body	2
Check electronics (voltages, waveforms, etc.)	Q(3,4)
Check GC temperature calibrations (injector, oven, detector)	Q
COLUMNS	
Change glass sleeve inserts, shorten ends of columns, change glass wool plugs, check for leaks or replace	3
ELECTRON CAPTURE DETECTOR	
Wipe Tests	SA
Bake detector at elevated temperature	3
Returned to factory for cleaning and refoil	3,4

Table 8.1, cont.
PREVENTIVE MAINTENANCE ACTIVITIES

INSTRUMENT/ACTIVITY	FREQUENCY
GAS CHROMATOGRAPHS, Cont.	
FLAME IONIZATION DETECTOR	
Clean	Q
Replace Flame Tip	A
HALL ELECTROLYTIC CONDUCTIVITY DETECTOR	
Replace resin, change solvent and clean conductivity cell	3,4
Change Ni tube	Q
NITROGEN PHOSPHORUS DETECTOR	
Clean	Q
MASS SPECTROMETER	
Replace vacuum pump oil and change desiccant	A
Check ion source and analyzer (dismantle and clean, replace parts as needed)	Q
Check mechanicals (vacuum pumps, relays, gas pressures and flows)	Q
Check mass calibration w/ BFB	D
PURGE AND TRAP	
Clean sparger	W
Change Trap	A
Bake Trap	2
Check purge flow	M
Check for leaks	M
Flush sample lines with methanol	3
HIGH PRESSURE LIQUID CHROMATOGRAPHY	
Gas lines checked for leaks	D
Clean mobile phase flow system with nitric acid	SA
Clean detector flow cells with nitric acid	SA (3)
Clean injection valve	A
Check solvent filters	W
Check pumps seals and check valve assemblies (clean and replace as pressures & flows of mobile phase indicate)	D
Lubricate oil felts, if present	M
Lubricate post column reagent pumps and check valve assembly oil felts	M
INFRARED SPECTROPHOTOMETER	
Clean instrument housing	M
Change desiccant and clean cells	Q
Clean windows	M
UV-VISABLE SPECTROPHOTOMETER	
Check lamp function	D(1)
Check linearity & wavelength accuracy with potassium dichromate	A
Check stray light	A
Check wavelength of Didymium filter absorbance minimum	A
FLUORIMETER	
Check lamp function	D(1)

Table 8.1, cont.
PREVENTIVE MAINTENANCE ACTIVITIES

INSTRUMENT/ACTIVITY	FREQUENCY
ORBECO COLOR COMPARATOR	
Wipe outside with damp cloth and check light	W
ION CHROMATOGRAPH	
Check for leaks	D
Check all lines for wear and discoloration	W(1)
TOC ANALYZER	
Check reagent levels, waste drains and gas pressure	D
Clean injection port and clean/change catalyst	M
Replace combustion tube	Q
Replace scrubbers, membrane filter, O rings and syringe	A
Clean and lubricate worm drive	A
REFRIGERATORS, INCUBATORS, OVENS	
Check and record temperature	D
Clean interior	M
Check thermometer temperature against certified thermometer or equivalent	A
ANALYTICAL BALANCES	
Clean pan and compartment	D
Check with class S weights	D
Manufacturer cleaning and calibration	A
AUTOCLAVES	
Gaskets checked	W(1)
Timing mechanism checked	Q
Clean interior	M
Sterilization indicator tape	D
MICROSCOPES	
Clean optics	M
pH AND ION SELECTIVE ELECTRODES	
PROBE	
Check probe for cracks and proper levels of filling solution; check reference junction; clean electrode	D(1)
Check response time	D
Check temperature calibration against NIST thermometer	A
METER	
Check batteries and electronics for loose connections and cracked leads	D(1)
Check internal temperature calibration	A
TURBIDIMETER	
Clean instrument housing	M

Table 8.1, cont.
PREVENTIVE MAINTENANCE ACTIVITIES

INSTRUMENT/ACTIVITY	FREQUENCY
QUANTI-TRAY SEALER	
Wipe down outside of sealer & check outside of trays for leaks	D
CONDUCTIVITY METER	
Check batteries and probe cables	D
Check temperature calibration against NIST thermometer	A
DISSOLVED OXYGEN METERS	
PROBE	
Check membrane for deterioration; check filling solution	D(1)
Clean electrode with ammonium hydroxide	A
METER	
Battery level and electronics checked	D(1)
Check temperature calibration against NIST thermometer	A
THERMOMETERS	
Check for cracks and gaps in the mercury	D(1)
Check temperature calibration against NIST thermometer	A
TEMPERATURE PROBES	
Check connections, cables	D
Check temperature calibration against NIST thermometer	A
AUTOSAMPLERS	
Check needles and tubing	D(1)
Clean	Q
AUTOMATIC SAMPLE COLLECTION SYSTEMS (ex. ISCO, Sigma, etc.)	
Check sampler operation (forward, reverse, automatic through three cycles of the purge-pump-purge cycle)	D(6)
Check purge-pump-purge cycle when sampler is installed	D(7)
Check the flow pacer that activates the sampler to assure proper operation	
Check desiccant	D(1,6)
Check batteries	D(1,6)
Check pumping rate against manufacturer's specifications	D(1,6)
DATA SYSTEMS	
Clean computers, check battery backup and check ventilation fans	Q

KEY:

1	Replace as necessary	D	Daily*
2	High background	W	Weekly
3	Loss of sensitivity or failing resolution	M	Monthly
4	Erratic response	Q	Quarterly
5	QC failure	SA	Semi-Annually
6	Prior to sampling event	A	Annually
7	In situ (under field conditions)		

*Daily is defined as prior to use or a 12-hour period if equipment is run continuously.

9.0 MINIMUM QUALITY CONTROL REQUIREMENTS AND ROUTINES TO CALCULATE AND ASSESS PRECISION, ACCURACY AND METHOD DETECTION LIMITS

9.1 QC CHECKS

9.1.1 LABORATORY QC CHECKS

The laboratory shall follow the minimum quality control requirements specified by each method. If no quality control requirements are listed in the method, or if the method quality control requirements are less stringent than those listed below, the laboratory shall follow the guidelines listed below:

9.1.1.1 Chemistry QC Checks

a. Method reagent blanks - shall be prepared and analyzed at a rate of one per sample set (see definitions in Appendix A).
b. Matrix Spikes - At least one sample in a sample set (or 5%, whichever is greater) with similar matrices shall be prepared and analyzed by the specified method. If a set contains samples of different matrices, matrix spikes should be prepared and analyzed for each matrix type. Matrix spikes must be included as routine protocol.
c. Reagent water or reagent matrix spikes - Reagent water or reagent matrix spikes may be used as additional QC checks to monitor the effectiveness of the method. If used, these must be analyzed at a frequency of 5%.
d. Quality control check samples - shall be analyzed in duplicate semiannually. Such samples shall be analyzed as blind samples (i.e., the component concentrations in these samples shall not be provided to the analyst until after analysis). If the data are not acceptable, the analytical results must be reported in a QA report (see Section 13).
e. Quality control check standards - shall be analyzed at a continuing frequency equivalent to 5% of the samples in the analytical set (i.e. one every 20 samples) or shall be analyzed at the beginning of each run to verify the standard curve.
f. Duplicate samples or matrix spike duplicates - at least one or 5% of all samples in a sample set with a similar matrix shall be selected and analyzed in duplicate. If a sample set contains samples from different matrices (e.g., effluent and drinking water), then duplicates or matrix spike duplicates should be analyzed for each matrix.
g. Continuing calibration standards shall be analyzed at a frequency equivalent to 5% of the samples in an analytical set. Alternatively, quality control check standards may be used (see e. above). At least one of these checks shall be a standard at a concentration of 1 - 2 times the laboratory stated PQL.
h. Additional quality control checks may be included and shall be used if specified by the approved method:

    1. Reagent purity checks
    2. Internal standards
    3. Surrogate spikes

9.1.1.2 Microbiology QC Checks

a. Blanks
    1. Membrane Filter Analysis: For each set of samples, a control blank shall be run at the beginning (dilution water blank), every tenth plate, and at the end of the set.
    2. IDEXX Analyses: For Presence / Absence testing, a blank (sterile DI) shall be run each day. For Quantitray, a blank (sterile DI) shall be run with each set of samples.
    3. MPN Analysis: No blank is analyzed.

b. Duplicates
    1. Membrane Filter Analysis: A lab replicate shall be performed in each run and for every 10 plates within a run when sufficient volume is available.
    2. IDEXX Analysis: For Presence / Absence testing no duplicate is analyzed. For Quantitray, a lab replicate is analyzed every 10 samples.
    3. MPN Analysis: A lab replicate including all dilutions shall be performed with each run.
c. Spikes
    1. Membrane Filter Analysis: (EPA 1600) A spike shall be performed each day a run is performed and for every 10 samples within a run.
    2. IDEXX Analysis: No spike is performed.
    3. MPN Analysis: No spike is performed.
d. Positive/Negative Controls: Microorganisms obtained from the American Type Culture Collection (ATCC) or equivalent sources shall be used to confirm the morphological and biochemical responses to test media. Positive and negative controls shall be run with each new lot of media prior to use.
e. Water Quality Indicators:
    1. Water source shall be tested monthly for chlorine residual, conductivity, TOC, and standard plate count.
    2. The use-test shall be conducted quarterly.
    3. The concentration of metals in the water source shall be determined annually.
f. Verification
    1. Membrane Filter Analysis: 10 colonies per method per month shall be verified with the appropriate confirmation media.
    2. IDEXX Analysis: Instantaneous against comparator and UV fluorescence.
    3. MPN Analysis: Instantaneous with growth and gas production.

9.1.1.3 Laboratory QC Checks (Bioassays)

a. At least one set of controls (dilution water and hardness or salinity, if appropriate) shall be run with each test.
b. Analytical equipment shall follow the chemistry laboratory quality control checks listed above.

9.1.1.4 Laboratory QC Checks (Species Identification)

a. Should maintain or have access to a type specimen collection.
b. Must, at a specified frequency use outside experts to corroborate species identification.

9.2 ROUTINE METHODS USED TO ASSESS PRECISION AND ACCURACY

9.2.1 Precision and accuracy targets listed in the tables of Methods, Matrices and QA Targets must be generated from matrix spikes and matrix spike duplicates or duplicates of environmental samples. The laboratory must maintain a list of QC checks, as presented in Section 9.1, which identifies applicable analytical methods and the concentrations to be used to make the determination in terms of low, mid or high levels:

a. Low level is defined as concentrations from the minimum detection limit to a level 5 times the MDL.
b. Mid level is defined as the mean level between the minimum detection level and the upper end of the linear range.
c. High level is defined as concentrations at the upper and of the linear range.

9.2.2. The laboratories shall use the following formulas for calculating the precision and accuracy of test measurements and the associated acceptance ranges:

9.2.2.1 The precision of replicate pairs shall be calculated using one of the following formulas:

a. Percent Relative Standard Deviation (% RSD)

1. Precision multiple values

$$\% \text{ RSD} = \frac{S}{\bar{X}} \text{ x } 100$$

Where: ẍ = Mean (average) of the data points
s = Standard deviation calculated as:

$$s = \sqrt{\frac{\sum_{i=1}^{n}(x_i - \bar{x})^2}{n-1}}$$

Where: n = total number of values
x_i = each individual value
ẍ = mean of n values

2. Precision duplicate values:

$$\% \text{ RSD} = \frac{|\text{A-B}|}{\text{A+B}} \text{ x}\sqrt{2} \text{ x } 100$$

Where: A = concentration in aliquot A of sample
B = concentration in aliquot B of sample

b. Relative Percent Difference (RPD)

$$\% \text{ RPD} = \frac{|\text{A-B}|}{(\text{A+B}) / 2} \text{ x } 100$$

Where: A = concentration in aliquot A of sample
B = concentration in aliquot B of sample

9.2.2.2 The accuracy of a measurement shall be determined by the recovery of a known amount of analyte in a real sample as:

$$\% R = \frac{C_s - C_u}{S} \times 100$$

Where: Cs = concentration of spiked sample
Cu = concentration in unspiked sample
S = expected concentration of spike in sample
%R = percent recovery

9.2.2.3 Upper and Lower Warning and Control Limits to be used as acceptance criteria shall be calculated as follows:

$$s = \sqrt{\frac{\sum_{i=1}^{n}(x_i - \bar{x})^2}{n-1}}$$

Where: s = Standard Deviation
n = Number of points or data pairs to be included
x_i = Sample Percent Recovery or precision of replicates
ẍ = Mean (average) of the data points

$CL = P_{av} \forall 3 S$

Where: CL = Control limit (upper and/or lower)
P_{av} = Mean of P (average percent recovery or average % RSD)

$WL = P^{av} \forall 2 S$

Where: WL = Warning limit (upper and/or lower)

9.2.3. Microbiological quality control acceptance criteria shall be calculated per formulae specified in Standard Methods for the Examination of Water and Wastewater, 22nd Edition, Method Number 9020, Section 9 (pp. 9-17 and 9-18).

9.2.4 Quality Control charts must be prepared or other easily followed system instituted to track results of QC checks.

9.2.5 Quality control charts or tabulation systems must be updated every 20 data points or annually at a minimum.

9.3 METHOD DETECTION LIMITS AND PRACTICAL QUANTITATION LIMITS

9.3.1 METHOD DETECTION LIMITS (MDLS)

a. The MDL is defined as the minimum measured concentration of a substance that can be reported with 99% confidence that the measured concentration is distinguishable from method blank results.

b. MDLs shall be determined in accordance with 40 CFR Part 136, Appendix B Rev. 2.

NOTE: IN ALL CASES, THE METHOD DETECTION LIMIT IS DEFINED TO BE THREE TIMES THE STANDARD DEVIATION DERIVED FROM THE STUDY.

9.3.2 PRACTICAL QUANTITATION LIMIT (PQLS)

a. The PQL is defined as the smallest concentration of an analyte of interest that can be reported with a specific degree of confidence.
b. The PQL is defined as 12 times the standard deviation that is derived from the procedures used to determine MDL.

9.3.3 VERIFICATION

a. MDLs shall be verified at a minimal frequency of annually.
b. PQLs shall be verified at a minimal frequency of quarterly.

9.4 DOCUMENTATION

9.4.1 FIELD QC CHECKS

See the Custody Section for Field QC checks.

9.4.2 LABORATORY CHECKS

a. Records which document sample/standard preparation, source and concentration (this includes protocols for preparation and certification, if applicable) must be maintained. All required records specified in the Calibration SOP must be maintained.
b. Identification of analyses set that the applicable QC sample is associated with.
c. Calculations performed to determine QC results.
d. Control limits used to evaluate analysis results and how these were determined.

9.4.3 MDL STUDIES

a. Documentation for the MDL studies must be conducted according to all other SOPs regarding sample and standard handling procedures, calibrations, QC checks and analyses.
b. Documentation must include:
    1. Date of study
    2. Analytical Method
    3. Identification of analyst responsible for analysis
    4. Compound(s) covered by study
    5. Unique ID of standards used for the study with respect to traceability

10.0 DATA REDUCTION, VALIDATION AND REPORTING

10.1 DATA REDUCTION

Data reduction includes all activities that convert instrument/computer responses into reportable results. These activities may involve mathematical calculations, compound identification and summary statistics. The final results may be obtained in two ways:

1. Direct readings from the instrument; or
2. Calculations based on instrument output, readings or responses.

The initial data reduction is the responsibility of the analyst or field technician who operates the analytical instrument. In addition to the general duties specified below, additional responsibilities for manual and computer related data reduction have been specified.

1. Calculate spike recoveries and precision for duplicates;
2. Identify quality control data (blank, spikes, duplicates, etc.) for review by quality assurance officer;
3. Assure accurate transcription of sample identification numbers on all records;

10.1.1 MANUAL DATA REDUCTION

1. If applicable, assure that all readings or output are precisely measured and noted on strip charts;
2. Select appropriate formulae for calculating final results;
3. Enter the formulae and at least one complete sample calculation on the strip chart or in the notebook;
4. Assure that all data are accurately transcribed into notebooks, forms or spreadsheets;
5. Enter all manual calculations into notebook or data records;
6. Check raw data entries with final computer output to assure accurate initial data entry;
7. Record appropriate and accurate information concerning sample identification, operating conditions, etc.

If raw data is entered into a computer program or spreadsheet for data reduction, the organization must be aware of and have on file a record of the mathematical formulae that are being used by the computer. If such information is not available, the organization shall verify the formula by manual calculations and maintain a record of the verification process.

All raw data output (strip charts, tabular printouts, etc.) must be retained as a part of the records. These records at a minimum must be identified with the following information: Date of run; sample ID numbers; analyst or operator; type of analysis (nitrate, metals, etc.). In addition, the following information must be maintained: instrument operating conditions (if applicable); detector and column types; instrument configuration; etc. The latter information may be kept in cross referenced records or may be entered on the various output records.

10.1.2 COMPUTER/INTEGRATOR REDUCTION

1. Assure that all data to be used in final calculations are entered accurately: sample weights or volumes; final extract volumes; dry weight factors; dilution factors; surrogate standard concentrations, etc.;
2. Properly interpret the computer output in terms of properly identified components, positive or negative identifications, and appropriate confirmatory measures;
3. Record appropriate and accurate information concerning sample identification, operating conditions, etc.;
4. Calculate surrogate recoveries and internal standard responses (if applicable);

5. GC and GC/MS analyses should be checked to verify that target components are within acceptable retention time windows and that additional confirmation (if needed) is initiated.

Many analytical instruments are interfaced with computers or integrators that automatically evaluate, identify and calculate final values. The results are printed in combinations of graphic (ex. chromatograms) and tabular forms. As with manual data reduction, the organization must be aware and should have a record on file of the mathematical formulae or algorithms that are being used by the computer. If the information is not available, the organization shall maintain records which demonstrate that the software is providing the expected results (e.g. check sample or check standard data is acceptable).

Typically, computer data files are identified by a queue number or a data file number. In such cases, the organization must maintain a cross reference index or log to identify the computer data files with sample ID numbers. Additional information that should be entered into the data file records are: date of run, analysis type, and analyst initials. Cross referenced auxiliary records are required to identify instrument operating conditions (if applicable); detector and column types; instrument configuration; etc.

10.1.3 FORMULAE AND CALCULATIONS

The final results of each test shall be calculated by the formula specified in the analytical method that is being used.

The final result should be rounded off to an appropriate number of significant figures (typically 3 significant figures). If the digit 6,7,8 or 9 is dropped, increase the preceding digit by one unit; if the digit 0,1,2,3, or 4 is dropped, do not alter the preceding digit. If the digit to be dropped is 5, round off the preceding digit to the nearest even number: 2.225 becomes 2.22 and 2.335 becomes 2.34.

As a general rule the results should be converted to the reporting units presented on Table 10.1. Other reporting conventions (i.e. wet weight instead of dry weight) should be clearly identified on the final reports with appropriate justification.

Note: If components of interest are detected in any quality control blank (e.g. method blanks, digestion blanks, etc.), the blank concentration must be reported. The blank concentration shall not be subtracted from any associated sample data.

10.2 DATA VALIDATION

10.2.1 DATA INTEGRITY

The purpose for implementing a data integrity plan is to promote shared accountability among staff that are responsible for analysis, reporting, and record keeping. This plan is designed to recognize that there is no single accountable person, but multiple persons and departments that must share the responsibility of maintaining integrity in laboratory testing. Benchmark's data integrity procedures are defined in detail in SOP GM-19(BEA) or GMS-3 (BEAS), found among the Management SOP's.

A mandatory data integrity training session will be given for all new hires. At this session the laboratory manager or QA officer will define data integrity and review the data integrity plan:

- Employees will be given examples of unethical behavior as related to data manipulation.
- Employees will be informed that all reports and data are subject to in-depth review and that any infractions found will be investigated.
- Any violations witnessed by an employee should be reported to a senior staff member or the QA Supervisor. This information will be kept confidential.
- A written ethical agreement will be signed stating employees will not engage in any unethical practices concerning data integrity.

The QA officer may randomly select reports for an in-depth review, or submit blind samples to the laboratory as a means of verifying that data integrity requirements are being met. If any violations are found, an immediate investigation will be conducted. Any disciplinary actions taken as a result of the investigation will be documented in locked file cabinets and protected by passwords electronically, to ensure confidentiality. Data integrity procedures will be reviewed by management with all employees on an annual basis.

Table 10.1
DATA REPORTING UNITS

TEST NAME OR COMPONENTS	REPORTING UNITS			
	WATER	SED	FISH	WASTE
Metals except:	ug/L	mg/kg	mg/kg	mg/kg
Reports for potable(drinking water),				
Calcium, magnesium, sodium, potassium	mg/L	mg/kg	mg/kg	mg/kg
Microbiological parameters except:	cfu/100mL	#/gram		
Heterotrophic Plate Count (HPC)	cfu/mL			
Purgeable organic components (VOCs and VOAs)	ug/L	ug/kg	mg/kg	mg/kg
Extractable organic components Including pesticides and herbicides except:	ug/L	ug/kg	mg/kg	mg/kg
Dioxin/Furan Scan and Dibenzo dioxins and dibenzofurans	ng/L	ng/kg	ng/kg	ng/kg
Odor (60ºC)	TON			
Odor (Room Temp)	TON			
pH (Laboratory)	units			
Carbon Dioxide	mg/L	mg/kg	mg/kg	mg/kg
Color (True-PTCO)	CU			
Color (Apparent-PTCO)	CU			
Conductivity	uMHOS/cm			
Corrosivity	SI units			
Flash Point				DEG F
Hardness (as CaCO3)	mg/L			
Settleable Solids	ml/L/h			
Total Solids	mg/L	mg/kg		mg/kg
Volatile Total Solids	mg/L	mg/kg		mg/kg
Total Suspended Solids	mg/L	mg/kg	mg/kg	
Volatile Total Suspended Solids	mg/L	mg/kg		mg/kg
Total Dissolved Solids (180 Degree C)	mg/L			
Volatile Total Dissolved Solids	mg/L	mg/kg	mg/kg	
Toxicity (EP and TCLP)	mg/L			
Turbidity	NTU			
Radium-226, Total	pCi/L	pCi/g		
Radium-228, Total	pCi/L	pCi/g		
Radium-226, Diss	pCi/L	pCi/g		
Radium-228, Diss	pCi/L	pCi/g		
Gross Alpha, Total	pCi/L	pCi/g		
Gross Beta, Total	pCi/L	pCi/g		
Acidity	mg/L	mg/kg	mg/kg	mg/kg
Alkalinity, Bicarbonate (as $CaCO_3$)	mg/L			
Alkalinity, Carbonate (as $CaCO_3$)	mg/L			
Alkalinity, Total (as $CaC0_3$)	mg/L	mg/kg	mg/kg	mg/kg
Bicarbonate (as HCO3 ION)	mg/L	mg/kg		
Carbonate (as CO_3 ION)	mg/L	mg/kg		
Ammonia (an N)	mg/L	mg/kg	mg/kg	mg/kg

Table 10.1
DATA REPORTING UNITS, cont.

TEST NAME OR COMPONENTS	REPORTING UNITS			
	WATER	SED	FISH	WASTE
Ammonia, Dissolved (as N)	mg/L			
Ammonia, Unionized (as NH_3)	mg/L			
Bromide	mg/L	mg/kg		mg/kg
Chlorate	mg/L	mg/kg		mg/kg
Chloride	mg/L	mg/kg		mg/kg
Chlorite	mg/L	mg/kg		mg/kg
Chlorine Residual	mg/L	mg/kg	mg/kg	mg/kg
Cyanide	mg/L	mg/kg	mg/kg	mg/kg
Cyanide Amenable to Chlorination	mg/L	mg/kg	mg/kg	mg/kg
Cyanide, Free	mg/L	ug/kg	mg/kg	mg/kg
Dissolved Oxygen (Winkler)	mg/L			
Dissolved Oxygen (Electrode)	mg/L			
Fluoride	mg/L	mg/kg	mg/kg	mg/kg
Nitrate-Nitrogen	mg/L	mg/kg	mg/kg	mg/kg
Nitrite-Nitrogen	mg/L	mg/kg		
Nitrate+Nitrite Nitrogen	mg/L	mg/kg	mg/kg	mg/kg
Nitrate+Nitrite Nitrogen, Dissolved	mg/L			
Ortho-Phosphate Phosphorus	mg/L	mg/kg	mg/kg	mg/kg
Silicon (Si)	mg/L	mg/kg	mg/kg	mg/kg
Silica (SiO_2)	mg/L	mg/kg	mg/kg	mg/kg
Sulfate	mg/L	mg/kg		mg/kg
Reactive Sulfides (as H_2S)	mg/L	mg/kg		mg/kg
Sulfides	mg/L	mg/kg		mg/kg
Sulfite	mg/L	mg/kg		mg/kg
Temperature	Deg C			
Total Dissolved Phosphorus	mg/L	mg/kg		mg/kg
Total Kjeldahl Nitrogen	mg/L	mg/kg	mg/kg	mg/kg
Total Kjeldahl Nitrogen, Dissolved	mg/L			
Total Petroleum Hydrocarbons (TPH)	mg/L	mg/kg	mg/kg	mg/kg
Total Phosphorus	mg/L	mg/kg	mg/kg	mg/kg
Bio-Chemical Oxygen Demand, 5 Day	mg/L	mg/kg	mg/kg	
Bio-Chemical Oxygen Demand, 5 Day, Dissolved	mg/L	mg/kg	mg/kg	
Bio-Chemical Oxygen Demand, 20 Day	mg/L	mg/kg	mg/kg	
Bio-Chemical Oxygen Demand, 60 Day	mg/L	mg/kg	mg/kg	
BOD, Carbonaceous, 5 Day	mg/L			
Chemical Oxygen Demand	mg/L	mg/kg	mg/kg	mg/kg
Chemical Oxygen Demand, Dissolved	mg/L			
Linear Alkyl Sulfonate (MBAS)	mg/L	mg/kg	mg/kg	mg/kg
Oil and Grease	mg/L	mg/kg	mg/kg	mg/kg
Phenols (4AAP)	ug/L	mg/kg	mg/kg	mg/kg
Total Organic Carbon	mg/L	mg/kg	mg/kg	mg/kg
Total Organic Carbon, Dissolved	mg/L			
Purgeable Organic Carbon	mg/L			
Total Organic Halogen	ug/L	ug/kg	mg/kg	

10.2.2 Data Validation

Data validation is accomplished through a series of checks and reviews that are intended to assure that the reported results are of a verifiable and acceptable quality. Data validation takes place at multiple levels within the organization.

The first step in the process takes place in the Receiving department as samples are received. Section 5.0 of this Quality Manual describes, in detail, Benchmark's sample receiving protocol and policies. Deviations or exceptions that may occur from these protocols and policies are to be noted on the chain of custody and brought to the attention of management or quality control personnel. From there, the appropriate actions are to be taken at the discretion of management.

The second step in data validation occurs at the bench level with the analyst. The analyst is responsible for reading, understanding and following information found in the laboratory SOPs and applicable reference methods. The analyst must also maintain equipment according to Section 8.0 of this Quality Manual, lab SOPs, and manufacturer's instructions. When non-conformances occur, they are to be documented in the raw data and brought to the attention of management as instructed in SOPs GM-7 (BEA) or GMS-16 (BEAS) and GM-23 (BEA) and GMS-22 (BEAS).

The third step in data validation is the responsibility of the QC officer. The bulk of data validation ultimately lies in this step. The quality control elements listed in the individual method SOPs and in Section 9.0 of this Quality Manual are evaluated prior to result reporting to the client. Acceptance criteria can be found in the method SOPs, Table 11.1 of this Quality Manual, and in current calculated laboratory control limits. Data is reviewed by a QC officer after manual data entry by the analyst or upon uploading into the laboratory LIMS system. The data is then initialed and dated by the QC officer.

1. Verify that all quality control blanks meet criteria;
2. Review all other applicable quality control data (spikes, duplicates, quality control check standards, quality control check samples, etc.) for acceptability;
3. Review all surrogate and standard additions spike recoveries and internal standard responses for acceptability;
4. Identify any sample set or data that are unacceptable and initiate appropriate corrective action measures;
5. Assign data qualifiers (if needed) to reported values;
6. Verify mass spectral interpretation (if applicable) and/or component identification;
7. Assign data qualifiers to all applicable data (see Table 10.2).
   Note: The reported value always precedes the data qualifier code.

The fourth step in data validation is the reporting of the results described in Section 10.3 below.

10.3 DATA REPORTING AND OVERALL PROJECT VALIDATION

10.3.1 LABORATORY DATA REPORTS

The final reports from the laboratory may be generated in several different ways:
1. Hand written report forms;
2. Manually typed reports and narrative;
3. Computer generated reports;
4. Any combination of the above methods.

All parties who are involved with the data review and validation process are responsible for providing data entry operators or clerical personnel with accurate records for transcription. If data are automatically reported through a LIMS system, the final reviewer must assure that the appropriate commands have been input to release the data for final reports. More detailed reporting validation can be found in SOP GM-5 (BEA) and GMS-10 (BEAS).

10.3.2 ENGINEERING PROJECT REPORTS

The final reports from an engineering firm or the organization responsible for a project involves assimilating and presenting data from both the laboratory and field. These reports may also include narratives on site history, an analysis of current findings; and conclusions and/or recommendations on further project work.

10.3.3 PROJECT VALIDATION

Project validation is the process by which all project data is reviewed prior to reporting the data to the client. Data is examined to ensure that results are consistent with project expectations. If any suspect data is observed, management or a QC officer is to be notified for confirmation of the results. When applicable, the results are compared with sample history as another form of validation. When historical discrepancies arise, the data is again reviewed and confirmed. This task is normally assigned to the project manager but may be performed by an individual who is responsible for overall management operations, such as the laboratory director or QC officer. More detailed reporting validation can be found in SOP GM-5 (BEA) and GMS-10 (BEAS).

Table 10.2
DATA QUALIFIER CODES

SYMBOL	MEANING
	(Per 62-160.700 Table 1)
A	Value reported is the arithmetic mean (average) of two or more determinations. This code shall be used if the reported value is the average of results for two or more discrete and separate samples. These samples shall have been processed and analyzed independently. Do not use this code if the data are the result of replicate analysis on the same sample aliquot, extract, or digestate.
B	Results based upon colony counts outside the acceptable range. This code applies to microbiological tests and specifically to membrane filter colony counts. The code is to be used if the colony count is generated from a plate in which the total number of coliform colonies is outside the method indicated ideal range. This code is not to be used if a 100 mL sample has been filtered and the colony count is less than the lower value of the ideal range.
F	When reporting species: F indicates the female sex.
H	Value based on field kit determination; results may not be accurate. Value based on field kit determination; results may not be accurate. This code shall be used if a field screening test (i.e., field gas chromatograph data, immunoassay, vendor-supplied field kit, etc.) was used to generate the value and the field kit or method has not been recognized by the Department as equivalent to laboratory methods.
I	The reported value is between the laboratory method detection limit and the laboratory practical quantitation limit.
J	Estimated value. A “J” value shall be accompanied by a narrative justification for its use. Where possible, the organization shall report whether the actual value is less than or greater than the reported value. A “J” value shall not be used as a substitute for K, L, M, T, V, or Y, however, if additional reasons exist for identifying the value as estimate (e.g., matrix spike failed to meet acceptance criteria), the “J” code may be added to a K, L, M, T, V, or Y. The following instances shall be noted along with the “J” qualifier for justification: 1. Surrogate recovery limits have been exceeded. 2. No known quality control criteria exists for the component. 3. The reported value failed to meet the established quality control criteria for either precision or accuracy. 4. The sample matrix interfered with the ability to make any accurate determination. 5. The data are questionable because of improper laboratory or field protocols (e.g. composite sample was collected instead of a grab sample).
K	Off scale low. Actual value is known to be less than the value given. This code shall be used if: 1. The value is less than the lowest calibration standard and the calibration curve is known to be non-linear 2. The value is known to be less than the reported value based on sample size, dilution or some other variable NOTE: This code shall not be used to report values that are less than the laboratory practical quantitation limit or laboratory method detection limit.

Table 10.2
DATA QUALIFIER CODES, cont.

SYMBOL	MEANING

(Per 62-160.700 Table 1)

L — Off scale high. Actual value is known to be greater than the value given. To be used when the concentration of the analyte is above the acceptable level for quantitation (exceeds the linear range or highest calibration standard) and the calibration curve is known to exhibit a negative deflection.

M — When reporting chemical analyses: presence of material is verified but not quantified; the actual value is less than the value given. The reported value shall be the laboratory practical quantitation limit. This code shall be used if the level is too low to permit accurate quantification, but the estimated concentration is greater than the method detection limit. If the value is less than the detection limit use "T" below.

N — Presumptive evidence of presence of material. This qualifier shall be used if:
1. The component has been tentatively identified based on mass spectral library search; or
2. There is an indication that the analyte is present, but quality control requirements for confirmation were not met (i.e. presence of analyte was not confirmed by alternative procedures).

O — Sampled, but analysis lost or not performed.

Q — Sample held beyond accepted holding time. This code shall be used if the value is derived from a sample that was prepared or analyzed after the approved holding time restrictions for sample preparation or analysis.

T — Value reported is less than the laboratory method detection limit. The value is reported for informational purposes only and shall not be used in statistical analysis.

U — Indicates that the compound was analyzed for but not detected. This symbol shall be used to indicate that the specified component was not detected. The value associated with the qualifier shall be the laboratory method detection limit. Unless requested by the client, less than the method detection limit values shall not be reported.

V — Indicates that the analyte was detected in both the sample and the associated method blank. Note: The value in the blank shall not be subtracted from associated samples.

Y — The laboratory analysis was from an improperly preserved sample. The data may not be accurate.

Z — Too many colonies were present (TNTC); the numeric value represents the filtration volume.

? — Data are rejected and should not be used. Some or all the quality control data for the analyte were outside criteria, and the presence or absence of the analyte cannot be determined from the data.

* — Not reported due to interference.

Table 10.2
DATA QUALIFIER CODES, cont.

SYMBOL	MEANING

(Per 62-160.700 Table 1)

The following codes deal with certain aspects of field activities. The codes shall be used if the laboratory has knowledge of the specific sampling event. The codes shall be added by the organization collecting samples if they apply:

D Measurement was made in the field (i.e. in situ). This applies to any value (except pH, specific conductance, dissolved oxygen, temperature, total residual chlorine, transparency, or salinity) that was obtained under field conditions using approved analytical methods. If the parameter code specifies a field measurement (e.g. "Field pH"), this code is not required.

E Indicates that extra samples were taken at composite stations.

R Significant rain in the past 48 hours. (Significant rain typically involves rain in excess of ½ inch within the past 48 hours.) This code shall be used when the rainfall might contribute to a lower than normal value.

! Data deviate from historically established concentration ranges.

NOTE: 1) The following codes found in Table 10.2 may or may not be acceptable for use with results submitted for compliance with 62-550 and 92-555, depending on the parameter(s) and/or the circumstances. Results with these codes will be evaluated on a case by case basis:

J, Q, R, and Y

2) The following codes found in Table 10.2 are not acceptable for results submitted in compliance with 62-550 and 62-555 (i.e. Drinking Water):

A, F, H, N, O, T, Z, ? and *

10.3.3.1 Laboratory
- a. Review all identified quality control checks. Assure that any deviations or questionable data have been reported with qualifiers or with appropriate explanations;
- b. Check for overall project consistency and any obvious anomalous values;
- c. Check for clerical errors, transposed numbers and accurate data transfer.

10.3.3.2 Field/Engineering
- a. Review all quality control data (field and laboratory) for project acceptability. Attach appropriate justification or explanation for any questionable data;
- b. Check for overall project consistency, including comparison with historical or expected results;
- c. Check for clerical errors, transposed numbers and accurate data reporting.

All final reports should be verified and signed by the project manager(s), laboratory director or other individual who is responsible for the overall operations of the organization.

10.4 DATA STORAGE

All records of the laboratory that are pertinent to TNI standards or a specified project must be retained for a period of at least 5 years after the completion of the project. These records include:

1. All field notebooks, data sheets and documentation on the sampling event;
2. All field and laboratory analytical records including supporting calibration, raw data, data reduction calculations, quality control information and all data output records (chromatograms, strip charts and other instrument response readout records);
3. All field and laboratory custody records including shipping receipts, sample transmittal forms, internal routing and assignment records and sample disposal;
4. All notebooks, data forms, and logs pertaining to laboratory operations including sample receipt and log in;
5. All records concerning receipt, preparation and use of calibration standards;
6. All statistical calculations used in data reduction and in determination of quality control limits;
7. Preventative maintenance records for all analytical and support equipment and instrumentation;
8. Copies of final reports;
9. Standard operating procedures.

Records such as SOPs, manuals and reference documents must clearly indicate the time period during which the procedure or document was in force.

Records that are stored by computers or PCs must have hard copy or write-protected backup copies.

The records must be protected from environmental degradation; stored under secure conditions to discourage tampering or vandalism; and must be cross indexed by project number, laboratory ID number or some other common identifier for easy retrieval.

Access to archived information shall be documented with an access log or an electronic audit trail for applicable electronic data.

10.5 DOCUMENT CONTROL SYSTEM

Management will follow the procedure below to create or revise SOPs or guidance documents used in the laboratory. This procedure describes the requirements for drafting, revising, implementing, and tracking SOPs and guidance documents as instructed in SOP GM-31 (BEA) or GMS-18 (BEAS).

1. Staff member prepares a draft after review of current or proposed lab procedure based upon reference method or guidance documents. A procedure is created based on template or modification of existing SOP or document for that methodology. A copy of this new procedure is printed and marked as DRAFT and submitted for review.

2. Draft is reviewed by staff members performing the analysis. It is checked for grammatical or procedural errors or clarification of required steps or requirements. Any changes are marked on the draft.

3. Draft is given back to the draftee to review and update any needed changes.

4. Final draft is submitted for review/acceptance by quality personnel and/or lab director. The tracking log will include: revision number, reference method, details of changes made, existing procedure, and any needed signatures.

5. Document is then implemented and tracked. Signed tracking log sheet, old and new documents are filed in the Document Control Log. Signed copy of new procedure is placed in area of operation. Tracking Log Summary Sheet is updated to reflect new revision number, revision date (also date that new document is in force) and cited reference method.

11.0 CORRECTIVE ACTIONS

Quality controls are used to monitor and assess the effectiveness and validity of a sampling or analysis activity. If a specified quality control measure is determined to be out of a predetermined acceptance range, and the source or reason for the deviation is not identified and corrected, the sample data associated with the quality control measure may not be useful or valid information.

Some quality control criteria (ex. calibration) have a direct effect on the test results. Others (ex. blanks and duplicates) are indicators of improper protocols or contamination.

11.1 QUALITY CONTROL MEASURES AND ACCEPTANCE CRITERIA

Table 11.1 identifies each of the quality control checks that are required by test methods acceptance criteria. The acceptance range criteria or the source of the acceptance range has been identified.

11.2 IDENTIFYING AND ASSESSING QC MEASURES

Generally, quality control information is reviewed by several individuals. The responsibility for the initial assessment of a quality control measure lies with the individual who (1) identifies the sample or procedure as a QC measure; and (2) has access to the test results:

11.2.1. The individual responsible for operating the analytical instrument or equipment must be responsible for assessing the following applicable QC Measures:

1. Method, reagent and calibration blanks
2. Calibration integrity: initial and continuing calibration, interference standards, and QC check standards
3. System performance checks
4. Tuning criteria
5. Surrogate and internal samples
6. Titrating solutions

11.2.2. The following checks are normally assessed by a secondary reviewer (supervisor or QA Officer), but may be evaluated by the primary analyst:

1. Standard Reference Material
2. QC Check Samples
3. Spiked samples (matrix and blank)
4. Duplicates

11.2.3. The following must be assessed by the organization or individual(s) responsible for sample collection, but may be reviewed by laboratory personnel if the sample has been identified as:

1. Precleaned and field cleaned equipment blanks
2. Trip blanks
3. Field collected duplicates
4. Split samples

11.3 DETERMINING THE SOURCE OF QC PROBLEMS

Once a problem has been identified, the process (whether analytical or review) should be halted until the reason for the problem has been identified. Finding the source of a QC problem involves identifying probable sources of error, and checking each source to determine if the protocols were properly followed. Common sources of error and expected follow-up protocols are outlined on Table 11-2. Usually, the individual who is responsible for identifying the problem is responsible for determining the cause. However, other personnel and organizations may need to cooperate.

11.4 INITIATING CORRECTIVE ACTION

When the source of a QC error has been identified, appropriate steps must be taken to eliminate or minimize recurrences.

11.4.1. If a QC measure listed in 11.2.1 above is not acceptable, testing cannot continue until the QC check meets specifications. Corrective actions may be initiated:

1. By the individual who is operating the instrument; or
2. By an individual in oversight authority (i.e. supervisor or QA Officer) if a solution is not immediately apparent.

11.4.2. Corrective actions for QC measures in 11.2.2 and 11.2.3 must be initiated by the individual who identifies the problem.

11.5 SPECIFIC CORRECTIVE ACTIONS

A list of expected corrective actions for each QC measure is included on Table 11-2. Since many QC problems have unique solutions, the corrective action protocols are not limited to those listed. Further assessment based on an individual's experience and knowledge may be warranted.

11.6 DOCUMENTATION AND NOTIFICATION OF AFFECTED PARTIES

If a quality control measures fails to meet acceptance criteria, the QC measure, and the procedures were used to correct the problem must be documented.

Documentation does not imply a formal memo or corrective action form:

1. Corrective actions that are initiated during an on-going analytical run may be documented on the chromatogram, integrator or strip chart recorder records as well as in the instrument, analytical and/or field logs.
2. Corrective actions that require input or intervention of more than one individual must at a minimum be documented in the related logs and records. Corrective action forms for larger organizations are recommended.
3. If more than one organization is involved with identifying a QC problem and the associated corrective actions, formal memos are recommended, although dated and signed phone logs are acceptable. In all cases, a copy of all documentation should be maintained in the project files.

If an identified quality control problem affects more than one set of data or multiple projects, the documentation associated with identifying and resolving the problem must be cross referenced to all associated projects.

11.7 CORRECTIVE ACTIONS FROM EXTERNAL SOURCES

The need to initiate corrective action may be the result of activities or audits from external sources. Sources include systems audits; performance audits; split samples; blind QC samples; and findings from project or data validation review.

IN ALL CASES, CORRECTIVE ACTIONS MUST BE INITIATED.

Table 11.1
ACCEPTANCE CRITERIA AND CORRECTIVE ACTIONS FOR QUALITY CONTROL CHECKS

QC CHECK		ACCEPTANCE CRITERIA
BLANKS		
Method blank Reagent blank Calibration blank Precleaned Equipment Blanks Field Cleaned Equipment Blanks Trip Blanks		<MDL or less than 1/10 of concentration of any batch sample
CALIBRATION		
Calibration Standard (CALSTD)		a. Reference any method specific acceptance criteria, if none exists, use following criteria. b. A minimum correlation coefficient of 0.995 must be achieved.
Quality Control Sample (QCS)	**Nutrients:**	a. Reference any method specific acceptance criteria, if none exists, use following criteria. b. A standard deviation of +/- 10% of the standard's true value must be achieved.
Laboratory Check Standard (LCS)	**Nutrients:**	a. Reference any method specific acceptance criteria, if none exists, use following criteria. b. Must be within laboratory generated control limits. If outside control limits see following criteria. c. Data acceptable with a standard deviation of +/- 15% however, it must be footnoted on final report.
Interference standard		Method acceptance criteria
Tuning criteria		Method acceptance criteria
SYSTEM PERFORMANCE CHECKS		
Pesticide		Method acceptance criteria
Standard Reference Materials		Within certified limits
QC Check Samples		Within specified limits
SPIKES		
Matrix Spike (MS)	**Nutrients:**	a. Must be within laboratory generated control limits. If outside control limits see following criteria. b. Data acceptable with a standard deviation of +/- 20% however, it must be footnoted on final report.
Laboratory Fortified Blank (LFB)		Within method specified criteria

Table 11.1, cont.
ACCEPTANCE CRITERIA AND CORRECTIVE ACTIONS FOR QUALITY CONTROL CHECKS

QC CHECK	ACCEPTANCE CRITERIA
DUPLICATES	
Laboratory Duplicates	Nutrients: Within range specified in laboratory generated control limits
Matrix Spike Duplicates	Within range specified in laboratory generated control limits
Field Duplicates	Within range specified in laboratory generated control limits
OTHERS	
Surrogate Standards	Method acceptance criteria
Internal Standards	Method acceptance criteria
Split Samples	Meets precision criteria in laboratory generated control limits
Titrating Solutions	a. +/- 10% of expected (lab determined) value b. Replicate sample aliquot results are within method specified limits
MICROBIOLOGY	
Monthly parameters Chlorine Residual Conductivity Heterotrophic Count	Per Page 305 of EPA-600/8-78-017
Annual metals concentration	Per Page 305 of EPA-600/8-78-017
Distilled water suitability test	Per Table IV-A-3 of EPA-600/8-78-017
Incubators	35 +/-0.5 C, 44.5 +/-0.2 C, or 41 +/-0.5 C
Duplicates	Within calculated precision criteria (See Standard Methods 22nd Ed., pp. 9-17 and 9-18)
Morphological and Biochemical Confirmation	Per Table IV-A-5 of EPA-600/8-78-017
Positive and negative media controls	Per Table IV-A-4 of EPA-600/8-78-017
MF Blanks	<1 CFU
MPN dilution blanks	<1
Inhibitory Residue Test	The RPD between Groups A, B and C should be less than 15% if there are no toxic or inhibitory substances.
Inhibitory Residue Blank	<1 CFU

Table 11.1, cont.
ACCEPTANCE CRITERIA AND CORRECTIVE ACTIONS FOR QUALITY CONTROL CHECKS

QC CHECK	ACCEPTANCE CRITERIA
MICROBIOLOGY, cont.	
Membrane Filter Analysis	Verified colonies must be coliforms
MPN Analysis	Verified colonies must be coliforms

Table 11.2
PROBABLE SOURCES AND EXPECTED CORRECTIVE ACTIONS

1. **BLANKS**
   a. Sources and expected review procedures:
      1. Contaminated reagents - verify reagent sources
      2. Environmental Contamination (all sample collection, sample and analysis conditions) - review sampling handling protocols
      3. Improper or incomplete laboratory and/or field decontamination/cleaning procedures - review cleaning protocols
      4. Contaminated sample containers - verify source and storage conditions
      5. Contaminated source water - verify water source
   b. Expected Corrective Actions:
      1. Review data with respect to reported contamination levels. If sample concentrations are near the reported blanks levels, reprocess (re-extract or digest) associated samples or resample. If sample concentrations or the reporting levels are significantly higher than blanks, or contaminants are not detected in the samples, report the sample data and concentrations in blank.
      2. Take measures to eliminate future problems: discard reagents, revise protocols, perform preventative maintenance on system, adjust use of interfering chemicals (solvents, fuels, etc.).

2. **CALIBRATION**
   a. Sources and expected review procedures:
      1. Improperly prepared or outdated standards - review preparation logs for calculation/dilution errors and use of expired sources.
      2. Improperly prepared or outdated check standard - verify check standard
      3. Poor instrument response - determine if preventative maintenance is required
      4. Incorrect calculations - review and verify all calculations
      5. Contamination problems (see blanks above)
   b. Expected Corrective actions:
      1. Recalculate calibration curve
      2. Prepare fresh standards
      3. Recalibrate instrument
      4. Perform preventative maintenance
      5. Perform mass calibration and retune
      6. Reanalyze all samples bracketing those from previous ACCEPTABLE QC check through next acceptable QC check.
      7. Take measures to eliminate sources of contamination

3. SYSTEM PERFORMANCE CHECKS
   a. Sources and expected review procedures:
      1. Pesticides:
         Poor column performance - replace/repack column
      2. Standard Reference Materials and QC Check Samples:
         a. Improper sample preparation or analysis - review all protocols associated with sample preparation and analysis
         b. Incorrect dilutions or calculations - recheck all calculations
         c. Contamination (see blanks above)
   b. Expected Corrective Actions:
      1. Reanalyze all samples bracketing those from previous ACCEPTABLE QC check through next acceptable QC check
      2. Reprocess all samples associated with QC check sample or standard reference material (unless the problem is unique to processing of the check sample)
      3. Take measures to eliminate sources of contamination

Table 11.2, cont.

PROBABLE SOURCES AND EXPECTED CORRECTIVE ACTIONS

4. SPIKES

a. Sources and expected review procedures:
   1. Error in calculation - review/recheck all calculations
   2. Error in preparing or using spike solutions - review all preparation and/or analytical logs (including sample preparation) for proper dilutions, solvents, buffers, etc.
   3. Outdated standards - review expiration dates and standard preparation logs
   4. Contamination problems (see blanks above)
   5. Poor instrument response - determine if preventative maintenance is required

b. Expected Corrective Actions:
   1. Take measures to eliminate contamination problems, reprocess if necessary
   2. Perform required maintenance and revise pm schedules
   3. Review preparation, calculation and record keeping to determine if additional training or more stringent protocols are needed
   4. If the laboratory has no historical data to show that the sample matrix produces consistently unacceptable (out of control) recoveries, and none of the sources discussed above are responsible for the problem, the sample must be reprocessed and reanalyzed. If reanalysis produces the same result, associated samples should be reported with qualified results. If results are different, all associated samples must be reprocessed for analysis.

5. DUPLICATES

a. Sources and expected review procedures:
   1. Non representative sample - review sample collection and/or sample processing protocols
   2. Error in calculations - recheck calculations
   3. Contamination problems (see blanks above)
   4. See matrix spikes above

b. Expected Corrective Actions:
   1. Report data with qualifiers and explanation
   2. Revise sample collection/sample processing protocols to assure a representative sample
   3. Takes measures to eliminate contamination problems.
   4. Reprocess and reanalyze sample set (if laboratory generated replicate).

6. SURROGATE SPIKES

a. Sources and expected review procedures:
   1. See 4.a above

b. Expected Corrective Actions:
   1. See 4.b above

7. INTERNAL STANDARDS

a. Sources and expected review procedures:
   1. See 4.a above

b. Expected Corrective Actions:
   1. See 4.b above
   2. Reanalyze samples from last acceptable QC check to next acceptable QC check

9. SPLIT SAMPLES

a. Sources and expected review procedures:
   1. See 5.a above

b. Expected Corrective Actions:
   1. See 5.b above

Table 11.2, cont.
PROBABLE SOURCES AND EXPECTED CORRECTIVE ACTIONS

10. TITRATING SOLUTIONS

a. Sources and expected review procedures:
   1. Error in calculation - review/recheck all calculations
   2. Error in preparing or using titrant and standard solutions - review all preparation and/or analytical logs (including sample preparation) for proper dilutions, solvents, buffers, etc.
   3. Outdated standards and/or - review expiration dates and standard preparation logs
   4. Contamination problems (see blanks above)
   5. Non representative sample - review sample collection and/or sample processing protocols
   6. Indistinct or inconsistent endpoint readings

b. Expected Corrective Actions:
   1. Take measures to eliminate contamination problems, reprocess if necessary
   2. Review preparation, calculation and record keeping to determine if additional training or more stringent protocols are needed
   3. If replicate analyses are not acceptable, titrate additional aliquots
   4. Reanalyze samples from last acceptable QC check to next acceptable QC check
   5. Train analysts to titrate to consistent endpoint

11. MICROBIOLOGY - MONTHLY PARAMETERS, METALS, WATER SUITABILITY

a. Sources and expected review procedures:
   1. Deionizer/Water not functioning properly

b. Expected Corrective Actions:
   1. Clean, replace cartridges and/or perform other preventative maintenance tasks
   2. Reanalyze water
   3. Reprocess samples (if still within holding times) or resample

12. MICROBIOLOGY - AUTOCLAVE

a. Sources and expected review procedures:
   1. Autoclave not functioning properly

b. Expected Corrective Actions:
   1. Perform preventative maintenance and re-sterilize

13. MICROBIOLOGY - INCUBATORS

a. Sources and expected review procedures:
   1. Incubator not functioning properly
   2. Thermometers or recording devices not functioning properly

b. Expected Corrective Actions:
   1. Perform preventative maintenance on devices, recalibrate if necessary
   2. Reprocess samples (if still within holding times) or resample

14. MICROBIOLOGY - DUPLICATES

a. Sources and expected review procedures:
   1. Counting errors or difficulties in identifying coliform organisms (membrane filter).
   2. Nonrepresentative sample.
   3. Contamination problems.

b. Expected Corrective Actions:
   1. Recount or re-examination colonies to determine counting error or misidentifications.
   2. Examine blanks and samples analyzed to determine possible sources of contamination.

Table 11.2, cont.
PROBABLE SOURCES AND EXPECTED CORRECTIVE ACTIONS

MICROBIOLOGY – DUPLICATES, Expected Corrective Actions, cont.

3. If 14.a.2 above is found to be the problem, or the problem has not been identified, data must be invalidated and resampling and retesting must occur.

15. MICROBIOLOGY - ATCC AND BIOCHEMICAL CONFIRMATION

a. Sources and expected review procedures:
   1. Media prepared improperly (incorrect pH, sterilized too long, etc.).
   2. Incorrect incubator temperatures.
   3. Media shelf life has expired and no longer functions properly.

b. Expected Corrective Actions:
   1. Isolate problem with media preparation.
   2. Confirm proper incubator temperatures.
   3. Prepare new batch of media from the same lot to determine media acceptability or discard media if the shelf life has expired.
   4. Prepare new media from a different lot number.
   5. Invalidate all affected data linked to the media that was not functioning acceptability.

16. MICROBIOLOGY - POSITIVE AND NEGATIVE MEDIA CONTROLS

a. Sources and expected review procedures:
   1. See 15.a.1-3 under ATCC or biochemical confirmation.
   2. Samples used were not positive or negative.
   3. Improper analytical protocol.
   4. Contamination problems (negative control).
   5. Colony misidentification.
   6. Stressed organisms that did not respond in a typical fashion.

b. Expected Corrective Actions:
   1. See 15.b.1-4 under corrective actions for ATCC or biochemical confirmation.
   2. Re-examine response for misidentifications.
   3. Use alternate positive and negative control samples to confirm media response and check on original samples.
   4. Invalidate data and retest if problem was with the media or testing system.

17. MICROBIOLOGY - MF BLANKS

a. Sources and expected review procedures:
   1. Equipment or rinse water/dilution water improperly sterilized.
   2. Rinsing technique not adequate.
   3. Contamination problems.

b. Expected Corrective Actions:
   1. Review sterility checks on the autoclave for rinse/dilution water and other associated equipment.
   2. Evaluate rinsing protocols between samples.
   3. Review testing procedures and test location for other sources of contamination.
   4. Reject data and resample

18. MICROBIOLOGY - MPN DILUTION BLANKS

a. Sources and expected review procedures:
   1. Equipment or dilution water not properly sterilized.
   2. Contamination problems during test procedure.

b. Expected Corrective Actions:
   1. Review sterility checks on the autoclave for dilution water and other sterilized equipment.
   2. Review testing procedures and location for possible sources of contamination.

Table 11.2, cont.
PROBABLE SOURCES AND EXPECTED CORRECTIVE ACTIONS

19. MICROBIOLOGY - INHIBITORY RESIDUE TESTS

a. Sources and expected review procedures:
   1. Detergent residues inhibit bacterial growth.
   2. Alternate rinsing practice alleviates the problem.

b. Expected Corrective Actions:
   1. Implement rinsing protocols that produce an acceptable inhibitory residue test.
   2. Change detergents to one that produces an acceptable test result under normal rinsing operations.

20. MICROBIOLOGY - MEMBRANE FILTER VERIFICATION

a. Sources and expected review procedures:
   1. Compare original counts against verified colony counts.

b. Expected Corrective Actions:
   1. Adjust initial colony count based upon positive verification percentage and report as verified coliform count.

21. MICROBIOLOGY - MPN COMPLETED TESTS

a. Sources and expected review procedures:
   1. Compare original results against completed test results.

b. Expected Corrective Actions:
   1. Adjust original MPN result calculated from the completed test results.

22. BIOASSAY - DILUTION WATER CONTROLS

a. Sources and expected review procedures:
   1. See 1.a.1-5 above

b. Expected Corrective Actions:
   1. Invalidate data and retest

11.8 NON-CONFORMING WORK

The need to initiate corrective action may be the result of non-conforming work. The responsibilities and authorities for the management of non-conforming work are designated and actions (including halting of work and withholding of test reports, as necessary) are taken when non-conforming work is identified. These designated individuals include: Laboratory Director, Laboratory Manager, and/or Quality Assurance officers unless otherwise specified by the Laboratory Director. These same individuals are responsible for ensuring all non-conformances are documented, affected parties are contacted when appropriate, and work is qualified, if needed.

Once non-conforming work has been addressed, it is the responsibility of the above mentioned individuals to authorize the resumption of work. In some cases this will be followed by in-depth further review to address the situation and ensure that correct procedures were followed and the cause for non-conformance has been corrected, along with preventative action taken.

12.0 PERFORMANCE AND SYSTEMS AUDITS

12.1 REQUIREMENTS FOR AUDITS OF LABORATORY OPERATIONS

12.1.2 INTERNAL AUDITS

12.1.2.1 Internal Systems Audit

Internal systems audits should be conducted as the complement to implementation and use of internal SOPs and Quality Plans, in order to assure good Quality Assurance management practices.

In general, procedures for conducting internal audits should be developed according to the following guidelines:

a. Schedule systems audits to occur with routine frequency. Annual auditing of all lab operations is a minimum recommendation. Audits of selected systems may be staggered throughout the year to accomplish this goal.

b. Develop a standardized protocol and list of minimum requirements which will constitute the style and scope of the audit and which will provide the criteria list by which operational deficiencies can be detected. These protocols and criteria should reflect the intent of all internal SOPs and Quality Plans, and should at a minimum conform to all regulatory requirements for procedures and documentation. The use of standardized audit forms and checklists is recommended.

c. Designate appropriate personnel as Quality Assurance staff and charge these officials with auditing responsibility and authority, preferably independently of and lateral to the chain of authority responsible for laboratory operations.

d. Encourage all staff members to adopt good Quality Assurance practices, at all levels of the organization and to perceive audits as an educational opportunity.

The scope of internal systems audits of lab operations should include, but is not limited to the proper execution of:

a. Electronic and paper documentation and filing associated with sample and data handling and all ancillary or support procedures, to include procedures employed to track all records pertinent to any sample results.
b. All sample log-in, trafficking, log-out and disposal.
c. Sample preparations.
d. Calibrations.
e. Sample analyses.
f. Data reduction, validation and reporting.
g. Standard and reagent preparation and storage.
h. Waste disposal and segregation.
I. Non-contaminating practices and the design/maintenance of non-contaminating laboratory environments.
j. Container and labware decontamination and storage.
k. Preventative maintenance and repair procedures.
l. QC management practices and assessment of analytical precision, accuracy and sensitivity.
m. proper promulgation and execution of established written procedures.

12.1.2.2 Requirements For Internal Performance Audits

Conduct blind, internal performance audits on all analytical systems. These audits shall be conducted at least annually.

General requirements for internal performance audits are:

a. QC samples of certified assay from external sources or vendors, or internally prepared QC check samples can be used. Routine samples may also be utilized for the audit.
b. Samples may be composed in artificial matrices such as analyte-free laboratory water or in other matrices whose characteristics are well delineated and can be consistently controlled from sample to sample.
c. Analysts whose systems are to be audited shall not be made aware of the intent to audit the parameter(s) in order to audit the routine practices in the laboratory. They may be informed of the nature of the samples, or the audit samples may be inserted into the routine laboratory sample analysis without the knowledge of the applicable analysts.
d. Replicated analysis of the audit samples is discretionary. However, all routine QC procedures and sample handling procedures must be followed when analyzing performance samples. This is required in order that the performance audit may best represent the actual routine operations for the system.
e. Any corrective action taken must be completed within ninety days of an internal audit.

12.1.2.3 Documenting and Reporting Internal Audits

Document all aspects of the audit. Retain all standard forms used in the audit, as well as all notes and final reports. Distribute audit reports or deficiency lists and corrective action orders to appropriate management staff affected, and verify execution of satisfactory corrective actions with follow-up documentation (see Section 11). Provide copies of all of the above to all staff at all levels involved in the audit or whose system area was affected. The following may also be included in all documentation and reports:

a. Audit dates.
b. Auditor names.
c. Systems audited.
d. Parameters analyzed in performance audits.
e. Analysts involved in performance audits.
f. Personnel interviewed for systems audits.
g. All supporting documentation solicited or submitted in support of any systems, performance or data-package audit.
h. Narrative description or report of findings, including summary charts and tables.
I. Report condensations for executive summaries.
j. Statistical evaluation report for performance audit analytical results.
k. Recommended or required corrective actions.
l. List of personnel for report distribution and follow-up responsibilities associated with corrective actions.

13.0 GENERAL MANAGEMENT RESPONSIBILITIES

13.1 Client Complaints

The laboratory shall operate from a standard operation procedure for responding to client complaints. The procedures include provisions for conducting an internal audit of laboratory operations that are called into question by the client. If audit findings cast doubt on the

correctness or validity of the laboratory's calibrations or test results, the laboratory shall take immediate corrective action and shall immediately notify in writing, any client whose work may have been affected. The laboratory will maintain a record of complaints and subsequent actions to resolve the complaint. Laboratory management shall review feedback from clients and corrective actions in response to client complaints.

The laboratory shall address client complaints through the following steps:

1) Obtain precise definitions of the complaint.

2) Complaints regarding issues other than reported data will be reviewed on a case-by-case basis by management.

3) Complaints regarding reported results or procedures will initiate internal audit:
   (a) Review all quality control checks.
   (b) Check for consistency and any obvious anomalous values.
   (c) Check for clerical errors, transposed numbers and accurate data transfer.
   (d) Verify that the sample ID numbers are correct and consistent with the chain of custody.

4) If the internal audit is not satisfactory or, if the client requests, then a reanalysis will be conducted:
   (a) Reanalyze the same sample if within hold time requirements.
   (b) Collect a new sample and reanalyze.

5) Client complaints will be documented as case narratives.

13.2 Confidentiality and Proprietary Rights

The laboratory does not currently conduct work requiring high security (i.e. National security). The laboratory will maintain this standard operating procedure to ensure that client's confidential information and proprietary rights are not compromised. Client confidentiality will be retained through the following procedures:

a) Employees will be cautioned to avoid discussing laboratory business in social circles.

b) Employees will be cautioned to avoid discussing laboratory business in front of other visiting clients in the laboratory.

c) Reporting operations will carefully check mailings to ensure results are mailed to the correct clients.

d) Discarded reports will be submitted to a paper shredder.

e) Client results will not be discussed with other clients or compliance agencies without written permission of the client.

f) Data will not be transferred electronically without request from the client.

g) Electronically transmitted data that is sent via facsimile or other electronic means must include a blanket statement that is used to protect the confidentiality of client information sent in error.

h) Client ID's will be removed from copies of worksheets when a client requests a copy of raw data.

13.3 Personnel Training Processes/Procedures

13.3.1 Undue Pressure on Employees

All personnel are required to notify the laboratory of any outside burdens or conflicts that may adversely affect the quality of their work (i.e. secondary employment, self-employment, internship, etc.) by completing a Secondary Employment Form.

13.3.2 Technical staff members shall have the education and experience to demonstrate specific knowledge of their duties, laboratory operations, test methods, QA/QC procedures and records management.

The training process will operate from a documented standard operating procedure with the following components:

a) Technical degree.

b) College level technical courses completed.

c) Initial demonstration of capability.

d) Verification of familiarity with latest version of laboratory's quality manual relating to his/her responsibilities.

e) Verification that the most recent version of the test method or SOP has been read.

f) Demonstration of continued proficiency.

g) Verification of advisement of ethical and legal responsibilities.

h) Attendance of training courses or workshops on specific equipment, analytical techniques or laboratory procedures.

13.3.3 Demonstration of Capability

As a part of data validation, lab analysts are required to demonstrate that they can properly follow test method protocol. Therefore, an Initial Demonstration of Capability (IDC) must be completed by each analyst prior to first use of a given test method and at any time there is a change in test method or instrumentation related to the test method. In addition to the IDC, a Continuing Demonstration of Capability (CDC) must also be completed by the analyst on an annual basis following the IDC.

Method requirements for demonstrations of capability, if given, will be followed unless an analyte cannot be spiked (i.e. coliforms, pH, etc). If an analyte cannot be spiked, then correct analysis of four duplicate quality control samples within the laboratory's acceptance criteria will be acceptable. A passed proficiency test may also be used as a continued demonstration of capability.

13.4 Mechanisms for Reviewing New Work Relative to Facilities and Resources

The laboratory has the following procedure for reviewing all new work to ensure that it has the appropriate facilities and resources before commencing such work.

Evaluate whether:

a) The laboratory has the correct method certifications to meet compliance requirements of the client's permit.

b) Evaluate the time-line expectations of the client relative to the ability of the laboratory to meet the client's expectations.

c) Evaluate the laboratory's current operating effectiveness,
- Data integrity
- Corrective actions
- Customer complaints
- Proficiency testing results

d) Evaluate whether the space and type of space is appropriate for the new work.

e) Evaluate whether sufficiently trained personnel are currently available for assignment to new work.

f) Evaluate whether currently available equipment has the capacity and correct performance for new work.

13.5 Legal and Ethical Responsibilities of Employees

The Code of Conduct shall apply to all directors, officers and personnel in the laboratory and its purpose is to articulate Company standards of conduct and to provide guidance to employees in discharging their obligations under this Code.

a) The Company will not tolerate unlawful, improper or unethical conduct, or the appearance of impropriety by an employee. Employees are expected to use good judgement in a legal and ethical manner consistent with the standards established by the Code, in all their dealings on behalf of the Company. Each employee must use common sense and his/her own judgement in applying these standards to specific situations that may arise.

b) Company employees have their first business responsibility to the Company and are expected to avoid any activity that may affect their ability to impartially perform contract work.

c) Employees should not become involved in any activity that results in or may result in obtaining or acquiescing in the unauthorized receipt of competitor's confidential bid/proposal information.

d) Employees are strictly prohibited from engaging in any fraudulent conduct (including deceit, deception, concealment, breach of trust and any other act of dishonesty). All employees are expected to obey the law in this area and to deal fairly and openly in all business relations.

e) Company employees should not promise future employment or business opportunities to a procurement official or give anything of value to a procurement official. Both state and federal criminal statues strictly prohibit bribery, dispensing of gratuities and sub contractor kickbacks at the workplace.

f) The Company reserves the right not to employ close relatives of officers, or other high level employees of customers including competitors, or others with whom the company deals with, to avoid the appearance of conflict of interest, or to protect confidential information.

g) Any employee who knows of or suspects an unethical or prohibited practice has a duty to immediately report the incident to his/her supervisor. The Company will not tolerate violation of the Code of Conduct by any director, officer or employee and disciplinary action, up to and including dismissal, may result from any violation of this Code.

13.6 Departures from Documental Policies and Procedures

The laboratory performs work, (under special request from clients) that is not for compliance reporting. In some cases, work will be performed under procedures supplied by the client or under modified procedures that do not meet compliance requirements. This work will be conducted in the following way:

1) Samples will be provided unique log-in ID's in the same manner as compliance samples.

2) Those parameters using non-compliance procedures, will be marked as "non-compliance" on the chain of custody.

3) Containers will be marked as "non-compliance".

4) Routine, repeat out-of-compliance work will be collected in separate notebooks or files.

5) If the procedure for a non-compliance sample departs from documented procedures and is recorded in a compliance workbook, then that data will be noted in the margin as "non-compliance".

6) The final report will not contain reference to Benchmark's certification numbers.

14.0 Data Integrity Plan

14.1 Training

The laboratory manager will present all new hires with a training session about Benchmark's Data Integrity Plan. This training will include the following:

a. Emphasis on the need for honesty and full disclosure in all analytical, reporting and record keeping.
b. After the new hire has read the laboratory SOP's, the manager will review these SOP's with respect to proper procedure and adequacy of record keeping. Examples of unethical behavior as related to data manipulation will also be discussed. Such examples may include, but are not limited to the following:
    1. Not running samples, but fabricating the results based on previous tests from the client.
    2. Not running Dilution Water through for the blanks in membrane filtration analysis, but just placing the filter directly in the petri dish.
    3. Manipulating any computer generated curved to force the spike or standard to be correct.
    4. Running a sample out of hold time, but writing a time in the logbook to make it appear that the sample was run within hold time.
c. New hires will be informed that all reports and data are subject to in-depth review.
d. It will be disclosed that any infractions found will be investigated. Any violations found may result in disciplinary action, immediate termination, and/or prosecution.

e. It will be explained that any violations they witness should be immediately reported to a senior staff member or the Quality Assurance Supervisor. These reports will be kept confidential. Violations can also be anonymously reported by placing a written explanation of the violation in the locked suggestion box in the laboratory. Only the individual responsible for the laboratory checks this box.

14.2 Signed Data Integrity Documentation

The new hire will sign a training roster, indicating that they have received the training and that they will not engage in any unethical practices concerning data integrity. Also, that they will not tolerate such practices from others.

14.3 Monitoring of Data Integrity

1. The Quality Assurance Officer may randomly audit data reports.
2. The QA Officer may also submit blind samples to the laboratory as a means to verify that the data integrity requirements are being met.
3. If any violations or ethical concerns are found, laboratory management will be informed and a detailed investigation will be conducted.

14.4 Data Integrity Procedure Documentation

1. If any data integrity incidents occur, they must be documented along with the investigative findings and any disciplinary actions. Also any disclosure to clients and the eventual outcome will be recorded.
2. To ensure confidentiality, locked file cabinets may be used and key electronic files, such as SOP's, will be password protected.
3. Any and all records will be maintained for seven years.
4. The data integrity procedure will be reviewed annually by senior management and updated as needed. The senior management will sign off on the Training Roster.

15.0 Laboratory Document Filing and Storage

15.1 Sample Submission Chains of Custody

Chains of custody are to be stored in a file box labeled: BEAN or BEAS, COC's and shall include the month and year for each set of Chains placed in the box. A month of Chains shall be added to the box at the end of the month, until the box is full.

15.2 Raw Data

Raw data may include workbooks and bench sheets. They are to be stored in a box labeled with (for example): Raw Data Notebooks-BEAS- the test methods- and the dates of use. Multiple test methods may be kept in the same box. Retired workbooks going into the box will have the start and end dates of use on the front page of the workbook.

15.3 Reported Data

a. The reports for the current year from January 1st to December 31st will be kept in folders in the file cabinets in the office. The folders will be labeled with the client's name and time period of reports in that folder. The time period may be weekly, monthly, yearly, or any other appropriate time frame for that client. The folders will be stored alphabetically A-Z by the client's name. Individuals will be filed by last name. If the name starts with "the", use the next word. Also if the client is "City of", file them by their city name.

b. The reports from the previous year will be moved to file boxes and kept in alphabetical order. These boxes will be labeled (for example): BEAS- the year- and the client's name. Note that smaller clients can be grouped in a box labeled A-Z (or whatever letters are appropriate). Only the previous year's report file boxes will be kept in the lab area. Other years will be moved to the Benchmark storage facility. Accessing the archived reports must be logged into the Archive Access Log. If the laboratory closes or is sold, clients must be informed and given the choice as to what they want done with their reports.

15.4 Equipment Monitoring Records

The current and previous year's logs are kept in the Equipment Monitoring Logs. Old logs are filed in a box labeled (for example): BEAS – Equipment Logs – and the year. Maintenance and service logs are kept with that piece of equipment either in the binder or in the file box.

15.5 Disposal Records

A log will be kept of samples that are disposed. This log will include the sample number, date of disposal, place disposed of, and initials. There is a clipboard for the individual sheets and then they will be transferred to a binder, when necessary, or filed electronically.

15.6 Quality Control Records

Correspondence logs and exception logs will each be filed by year in the "Misc." file. The Fax confirmation sheets will be stored each month in a file box labeled with "Fax Confirmations", BEAS, and the month and year of each set of confirmations in the box. They may also be filed electronically. Precision criteria records are stored in the computer in the "D" drive in the Precision Criteria file in the BEAS folder. For BEA, these files are kept electronically via SentryFile.

15.7 Personnel Records

Records for current and former employees are kept confidential and stored with the laboratory owner's records.

15.8 Receiving Records

Commercial reagents and standards and consumables received by the lab are recorded on the appropriate clipboard. Standards are also recorded in the "Commercial Standards Receipt Log". Laboratory prepared reagents and standards are recorded on their preparation log sheet in the "Laboratory Reagent Preparation Log".

---------- END OF MANUAL ----------

APPENDIX A-1

DEFINITIONS

The following definitions are used by Benchmark EA, Inc. and Benchmark South. Employees are encouraged to use these terms as defined.

μmho – Unit of measurement used when analyzing samples for specific conductivity. One μmho is equal to one μS.

Acceptance Criteria – The numerical limits prescribed for accepting or rejecting generated data.

Accuracy – The degree of agreement of a measurement with an accepted reference or true value

Aliquot – Portion of a sample or standard prepared in accordance with prescribed criteria.

Ambient Temperature – For the purposes of this laboratory, the surrounding room temperature of the laboratory (~20-25°C).

Analytical Bias - The consistent appreciable noise observed in a method which is greater than zero.

Analytical Set - The basic unit for analytical quality control. Also known as sample set or analytical batch. The analytical set is defined as samples which are analyzed (or sampled together) with the same method sequence, the same lots of reagents and with the same treatment common to all samples. The samples must have been analyzed (or collected) within the same specified time period or in continuous sequential time periods. Samples in each set should be of similar composition.

Apparent Color - The color of water resulting from the presence of dissolved substances, which absorb light. Only applies to samples that have not been filters.

Aqueous – Laboratory testing matrix defined as an aliquot of sample consisting mostly of water. Any fresh water laboratory samples, <20% solid, are aqueous, i.e. ground, drinking and some surface water (<5ppt salinity) samples.

Audits - A systematic check to determine the quality of the operation of some function or activity.

Performance Audits - Quantitative data are independently obtained for comparison with routinely obtained data in a measurement system. Examples of these audits are EPA performance evaluation programs, commercial performance evaluation programs, split sampling program involving at least two laboratories, blind spike samples.

Systems Audits - These are qualitative in nature and consist of an on-site review and evaluation of a laboratory or field operations quality assurance system and physical facilities for sampling, calibration and measurements.

Project Audits - These consist of an independent review of all sampling and analytical activity records that are associated with a specific project or event to determine if the resulting data are valid and acceptable. Enough documentation must be available so that a reviewer is able to reconstruct the history of the samples from time of sample collection (or sample container acquisition) through final results and sample disposal.

Brilliant Green Lactose Bile Broth (BGB) – The culture medium used during the total coliform confirmed phase of the MPN and MF techniques.

Calibration - Process by which the correlation between instrument response and actual value of a measured parameter is determined. Calibration Curve: A curve which plots the concentration of known analyte standards against the instrument response to the analyte. Also known as a Standard Curve.

Calibration Standard (**CALSTD**) - A solution prepared from the primary dilution standard solution or stock standard solutions and the internal standards and surrogate analytes. The **CALSTD** solutions are used to calibrate the instrument response with respect to analyte concentration.

Quality Control Sample (**QCS**) – A solution of method analytes of known concentrations that is used to fortify an aliquot of **CALBLK** or when appropriate the **METHBLK**. The **QCS** is obtained from a source external to the laboratory and different from the source of calibration standards. It is used to check laboratory performance with externally prepared test materials, ie. "Second Source" and is typically half the concentration of the highest standard in the curve.

Laboratory Check Standard (**LCS**)- A solution of analytes prepared in the laboratory by adding appropriate volumes of the Stock Standard Solutions to reagent grade water. Typically there are three **LCS** per analytical run: low, medium, and high in concentration that span the range of the calibration curve.

Calibration Blank (**CALBLK**) – A volume of reagent grade water fortified with the same matrix as the calibration standards, but without the analytes, internal standards, or surrogates.

Chemical Waste - Includes sludge and residual from domestic or industrial wastewater processing, and liquid or solid chemicals that are no longer used for its intended purpose.

Chlorophyll a (***chl a***) – A photosynthetic pigment present in all green plants, including planktonic algae. It is known to 1 to 2% of the dry weight of the algae. It can be quantitatively measured to estimate the biomass of phytoplankton.

Chromogenic Substrate – Used in microbiological testing to detect the presence of an enzyme, ß-D-galactosidase. When ß-D-galactosidase is present the enzyme substrate reaction causes chromogen to be released resulting in a color change. The color change indicates the presence of total coliform bacteria.

Colilert® – One brand of reagent used for the Enzyme Substrate Test. See MMO-MUG.

Colloidal Matter – Finely divided organic or inorganic matter; examples include clay, silt, plankton, microscopic organisms, etc.

Colorimetric – A laboratory method used to analyze certain chemical properties by measuring color spectrophotometrically.

Community Water System – A public water system that serves at least 15 connections used by year round residents or regularly serves at least 25 year round residents.

Confidence Level - The statistical probability associated with an interval of precision (or accuracy) values in a QC chart. The values of confidence intervals are generally expressed as percent probability. It is a commonly accepted convention that the result being tested is significant if the calculated probability is greater than 90 percent, and is highly significant if the probability is greater than 99 percent.

Confluent Growth (CFG) – A continuous bacterial growth covering the entire filtration area of a membrane filter or a portion thereof, in which bacterial colonies are not discrete.

Contaminant – Any physical, chemical, biological or radiological substance, or matter in water.

Correction Factor – A substitution factor used to compensate measurements of instruments not in agreement with traceable standards.

Correlation coefficient (**r^2**) – value obtained through linear regression of calibration standards.

Data Quality - The totality of features and characteristics of data that bears on its ability to satisfy a given purpose. The characteristics of major importance are accuracy, precision, completeness, representativeness, and comparability. These characteristics are defined as follows:

Representativeness - Expresses the degree to which data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, a process condition, or an environmental condition.

Comparability - Expresses the confidence with which one data set can be compared to another.

Data Quality Objectives - A set of specifications that the environmental data must meet in order to be acceptable for its intended use in a program area. DQOs are commonly established for limits of detection and quality of data (precision, accuracy, representativeness and comparability).

Deionized Water (**DI**) – Water used by the laboratory that has ions and particulates (turbidity and microorganisms) removed by means of a purification system.

Detection Limits - The smallest concentration/amount of an analyte of interest that can be measured with a stated probability of significance. Detection limits must be further defined as:

Instrument Detection Limit - The smallest amount of an analyte of interest that generates an instrument response (signal) under prescribed conditions such that the magnitude of the signal is larger than the absolute uncertainty (error) associated with it.

Drinking Water (**DW**) - Water intended for human consumption, dermal contact, culinary purposes or dishwashing as approved by the Florida Department of Health.

EC Broth (**ECB**) – The culture medium used during the fecal coliform confirmed phase of the MPN and MF techniques.

EDTA – Aka ethylenediamine tetraacetate.

Environmental Sample - Means any sample from a natural source or source that may reasonably be expected to contribute pollution to or receive pollution from ground waters or surface waters of the state. This includes, but is not limited to: receiving waters; waters used to define natural background conditions; soils; sediments; industrial, domestic or municipal discharge effluents; chemical storage or handling facilities; waste disposal facilities or areas; industrial or agricultural chemical handling or application areas; surface water run-off; and facilities for handling or applying of chemicals for weed or insect control [definition per Rule 10D-41.101(7), F.A.C.].

Parent Sample - Refers to a sample from which aliquots are taken for testing purposes.

Subsample - Refers to any derivative obtained from a sample. These include, but are not limited to: aliquots; filtrates; digestates; eluates; fractions; extracts; reaction products; supernatants; etc.

Enzyme Substate Coliform Test – See chromogenic and fluorogenic substrate definitions for an example.

Equilibrium - A state of balance between opposing forces or actions that is either static (as in a body acted on by forces whose resultant is zero) or dynamic (as in a reversible chemical reaction when the rates of reaction in both directions are equal).

Field Duplicates – Two separate samples collected at the same time and placed under identical circumstances and treated exactly the same throughout field and laboratory procedures. Analyses of field duplicate indicate the precision associated with sample collection, preservation, and storage, as well as with laboratory procedures.

First draw sample – A one-liter sample of tap water that has been standing in plumbing pipes uninterrupted, for at least 6 hours and is collected without flushing the tap.

Fluorogenic Substrate – Used in microbiological testing to detect the presence of an enzyme, ß-glucuronidase. When ß-glucuronidase is present the enzyme substrate reaction produces a substance to be released resulting in fluorescence at 366nm of UV light. The fluorescence indicates the presence of *Eschericia coli (E. coli)* bacteria.

Gravimetric – A laboratory method used to analyze certain chemical properties by measuring mass.

Ground water under the direct influence of surface water (GWUDI) – Any water beneath the surface of the ground with significant occurrence of insects, macroorganisms, algae, large diameter pathogens (i.e.*Giardia lamblia* or *Cryptosporidium),* significant and rapid shifts in water characteristics (i.e.turbidity, temperature, conductivity or pH) which closely correlate to climatological conditions.

Ground Water (**GW**) - Any water that comes from beneath the surface of the ground. Includes all waters found below ground in confined or unconfined aquifers.

Haloacetic acids (five) (HAA5) – The sum of the concentrations in milligrams per liter of the haloacetic acid compounds, there are five: monochloroacetic acid, dichloroacetic acid, trichloroacetic acid, monobromoacetic acid and dibromoaceticacid, rounded to two significant figures after addition.

Halogen – One of the chemical elements: chlorine, bromine or iodine.

Heterotrophic Plate Count (HPC) – Formerly known as the standard plate count (SPC). A microbiological procedure for estimating the number of heterotrophic bacteria in water and measuring changes during water treatment and distribution. Unless stated otherwise, HPC refers to method (9215 A&B), the pour plate method, as set forth in Standard Methods for Examination of Water and Wastewater, American Public Health Association, 22nd Edition, 2012, pp. 9-49 to 9-54.

Humic Material – Derived from humus, which is a dark material resulting from partially decomposed plant or animal matter.

Interferents – Substances present in a sample that may interfere with the final outcome of a laboratory procedure.

Ion-selective electrode (ISE) - an electrode that is used to measure the concentration of a specific ion in a solution by use of an ion-selective membrane.

Kjeldahl Nitrogen, Total – Sum of organic nitrogen; ammonia (NH3) and ammonium (NH4+) in the chemical analysis of soil, water, or wastewater. To calculate Total Nitrogen (TN), the concentrations of nitrate-N and nitrite-N are determined and added to TKN. TKN is determined in the same manner as organic nitrogen, except that the ammonia is not driven off before the digestion step.

Laboratory Fortified Blank (**LFB**) – An aliquot of reagent grade water or other blank matrices to which known quantities of the method analytes are added in the laboratory. The **LFB** is analyzed exactly like a sample, and is to determine whether the methodology is in control, and whether the laboratory is capable of making accurate and precise measurements.

Lauryl Tryptose Broth (**LTB**) – The culture medium used during the presumptive phase of the MPN and MF techniques.

Limited Use System – All water systems that have less than 15 service connections or which regularly serve less than 25 individuals daily at least 60 days out of the year or at least 25 individuals daily less than 60 days out of the year.

Limited Use Community Public Water System – Serves 2 or more rental residences or 5 or more non-rental homes. I.e. a triplex with 2 rental units, two rental mobile homes, at least 5 homes connected to the same system or a small group care facility.

Limited Use Commercial Public Water System – Serves any non-residential building. I.e. Stores that have the employees at the site or stores that have public access.

Linear Dynamic Range (**LDR**) - The concentration range over which the analytical curve remains linear.

Materials Safety Data Sheet (**MSDS**) – Written information provided by vendors concerning a chemical's toxicology, health hazards, physical properties, fire, and reactivity data including storage, spill, and handling precautions.

Matrix – specified sample type such as Aqueous, Saline, or Solid and Chemical Materials. The characteristic of an environmental or laboratory sample, associated with its physical and chemical properties, which defines how such a sample is handled when subjected to the intended analytical process.

Matrix Duplicate (**MD**) – Two aliquots of the same sample that are treated exactly the same throughout laboratory procedures

Matrix Spike (**MS**) – An aliquot of an environmental sample to which known quantities of method analytes are added in the laboratory. The **MS** is analyzed exactly like a sample, and its purpose is to determine whether the sample matrix contributes bias to the analytical results. The background concentrations of the analytes in the sample matrix must be determined in a separate aliquot and the measured values in the **MS** corrected for background concentrations.

Matrix Spike Duplicate (**MSD**) - A second aliquot of a solid matrix sample to which known quantities of method analytes are added in the laboratory. The **MSD** is analyzed exactly like the matrix spike, and its purpose is to determine the precision between the two spikes.

Maximum Contamination Level (MCL) – The maximum permissible level of a contaminant in water, which is delivered to any user of a public-water system.

Membrane filter technique (**MF**) – A microbiological procedure for estimating the number of bacteria present in a sample. This laboratory conducts the MF procedure for the following bacteria: total coliform, fecal coliform, Fecal streptococcus and Enterococcus. Unless otherwise stated MF refers to method (9222 A, B&D and 9230C), as set forth in Standard Methods for the Examination of Water and Waste Water, American Public Health Association, 22nd edition, 2012.

Method Detection Limit (MDL) - The smallest amount of an analyte of interest that can be measured and reported with 99% confidence that the concentration is greater than zero.

m-Endo – The growth medium used to cultivate total coliform bacteria for the membrane filtration method. Available in agar or broth.

Method Blank (**METHBLK**) – An aliquot of reagent grade water or other blank matrices that are treated exactly as a sample including exposure to all glassware, equipment, solvents, reagents, internal standards, and surrogates that are used with other samples. The **METHBLK** is used to determine if method analytes or other interferences are present in the laboratory environment, the reagents, or the apparatus.

m-FC – The growth medium used to cultivate fecal coliform bacteria for the membrane filtration method. Available in agar or broth.

MMO-MUG - Also known as the Enzyme Substrate Test. A microbiological procedure used for the simultaneous detection of total coliform and E. coli. Unless stated otherwise, MMO-MUG refers to method (9223 A&B), as set forth in Standard Methods for Examination of Water and Wastewater, American Public Health Association, 22nd Edition, 2012.

Most Probable Number (**MPN**) – The reporting unit per 100mL that is the estimation of bacterial density used for the Multiple Tube Fermentation technique. For the purposes of this laboratory the terms MPN and Multiple Tube Fermentation are analogous.

Multiple Tube Fermentation – A microbiological procedure for estimating the number of Enterobacteria present in a sample. This laboratory conducts the Multiple Tube procedure for the following bacteria: total coliform and fecal coliform. Unless otherwise stated Multiple Tube Fermentation refers to method (9221A, C&E), as set forth in Standard Methods for the Examination of Water and Waste Water, American Public Health Association, 22nd edition, 2012.

Nesslerization – The addition of Nessler's reagent to a sample aliquot that yields a gold color when nitrogen is present.

Non-Community Water System – A public water system that is not a community water system i.e. a church. A non-community water system is either a "transient non-community water system " or a "non-transient non-community water system".

Non-Transient Non-Community Water System (NTNCWS) – A public water system that is not a community water system and that regularly serves at least 25 of the same persons over 6 months per year.

Organizational Terms:
Internal - Refers to operations, personnel, documents and protocols within the specified organization.
External - Refers to operations, personnel, documents and protocols from a party that is separate from or outside the specified organization.

Package Plant - In order to use less space, treat difficult waste, deal with intermittent flow or achieve higher environmental standards, a number of designs of hybrid treatment plants have been produced. Such plants often combine all or at least two stages of the three main treatment stages into one combined stage.

Parameter Group - Is defined as a group of samples that have been preserved in the same manner, prepared by similar protocols and analyzed using instruments of similar technology (also known as analyte group). Examples of parameter groups are:
Volatiles - (EPA methods 601, 602, and 624)
Pesticides - (EPA methods 608, 614, 622)
Trace Metals - (All metals except mercury)
Nutrients - (Total Kjeldahl Nitrogen, Nitrate + Nitrite, Total Phosphorous)

Performance Evaluation Samples - A sample submitted for analysis whose composition and concentration are known to the submitter but unknown to the analyst. Also known as a Blind Sample.

Pheophytin a (***phe a***) – A magnesium-free degradation product or derivative of *chlorophyll a.*

Point-of-entry treatment device (POE) – Treatment device applied to the drinking water entering a house or building for the purpose of reducing contaminants in the drinking water distributed throughout the house or building.

Point-of-use treatment device (POU) – Treatment device applied to a single tap used for the purpose of reducing contaminants in drinking water at that one tap.

Potentiometric - The apparent equivalence point of a titration at which a relatively large potential change is observed.

Potentiometric Surface - An imaginary surface formed by measuring the level to which water will rise in wells of a particular aquifer. For an unconfined aquifer the potentiometric surface is the water table; for a confined aquifer it is the static level of water in the wells. (Also known as the piezometric surface.)

Practical Quantitation Level (**PQL**) - The smallest concentration of an analyte of interest that can be reported with a specific degree of confidence. Per Benchmark EA's Quality Manual, this value is twelve times the standard deviation of the replicate analyses.

Precision - A measure of mutual agreement among individual measurements of the same property.

Primary Dilution Standard Solution (PDS) – A solution of several analytes prepared in the laboratory from stock standard solutions and diluted as needed to prepare calibration solutions and other needed analyte solutions.

Public Water System – A system that provides water to the public for human consumption through pipes or other conveyances, if such a system has at least 15 service connections or regularly serves an average of 25 individuals daily at least 60 days out of the year. A public water system is either a "community water system" or a "non-community water system".

Qualifiers - These codes shall be used by laboratories when reporting data values that either meet the specified description outlined below or do not meet the quality control criteria of the laboratory. Reference Table 10.2 of this Quality Manual for complete list.

Quality Assurance - A system of activities whose purpose is to provide the producer or user of environmental data the assurance that it meets defined standards of quality with a stated level of confidence.

Quality Plans (QP) - An orderly assembly of detailed and specific procedures which delineates how data of a known and accepted quality is produced.

Quality Control - The overall system of activities whose purpose is to document and control the quality of environmental data so that it meets the needs of the users.

Quality Control Measures:
1) Blanks - An artificial sample of an analytical matrix designed to monitor the introduction of artifacts into the system.
    a) Field Quality Control Blanks

1) Field Blanks - Blanks of analyte free water that are prepared on-site by filling appropriate sample containers with the water, adding appropriate preservatives, sealing the containers, and completing the appropriate documentation. These blanks should be prepared during the middle to end of a sampling event by filling sample containers with water from the equipment decontamination water transport containers. They are to be treated, stored, transported, and analyzed in the same manner as the sample group for which it was intended. These blanks may be submitted for all water parameter groups.

2) Equipment Blank - Blanks of analyte-free water that are prepared on-site by pouring the equipment decontamination water through decontaminated field equipment. Appropriate sample containers, for each analyte group must be used, preservatives added, if required, and appropriate documentation must be completed. These blanks are to be stored, transported and analyzed with the intended parameter groups. At least one equipment blank is required for each water and solid matrix analytical group, and must be collected **at the beginning** of the sampling episode. If field decontamination is performed on-site, additional equipment blanks must be submitted for all water and solid matrix analytical groups.
3) Trip Blank - These blanks are required for only VOC samples. Blanks of volatile organic free water that are prepared by the organization that is providing the sample containers. These are transported to the site with the empty VOC sample containers, and shipped to the analyzing laboratory in the same containers as the VOC samples. They remain unopened for the entire trip. Proper labeling and documentation must be completed. A trip blank must be submitted for each cooler that transports VOC samples.

b) Laboratory:

1) Replicate Sample - Samples that have been collected at the same time from the same source (field replicates) or aliquots of the same sample that are prepared and analyzed at the same time (laboratory replicates). Duplicate samples are one type of replicate sample. The analytical results from replicates are used to determine the precision of a system. If the concentration of analytes in the sample are below detectable limits, Duplicate Spike Samples may be used to determine precision. Blind Replicates (Duplicates) are replicates that have been collected (field replicate) or prepared (laboratory replicate) and are submitted and analyzed as separate samples (analyst does not know they are replicates).

2) Quality Control Checks - Standards or samples from an independent source that are analyzed at a specified frequency.

3) Split Samples - Replicates of the same sample that are given to two independent laboratories for analysis.

4) Acceptance Criteria - The numerical limits, prescribed by the approved analytical method or internal data, by which an analytical system is verified. These numerical limits may be generated from internal, historical data using the formula specified in Section 9.2.3.4. Acceptance criteria shall be generated and used for all Quality Control Measures described above. Also known as Control Limits.

ReadyCult® - One brand of reagent used for the Enzyme Substrate Test. See MMO-MUG.

Reagent Water – A sample of water which conforms to ASTM grades II, III or IV. For the purposes of this laboratory, deionized water used in a chemical reaction, especially one used to detect, measure, or prepare reagents

Recreational Water (**RW**) – Samples from a body of water where people swim recreationally i.e. public pool, public beach, public springs, etc.

Relative Percent Difference (RPD) - The difference between two sample results divided by their mean and expressed as a percentage.

Registered Water System – A commercial entity that does not use it's piped water for consumption, are required to provide bottled water as an alternative. Main uses include hand washing and toilet flushing.

Saline (**SA**) - Laboratory testing matrix defined as an aqueous aliquot of sample containing high levels of salts. Any laboratory samples >5ppt salinity are considered saline; examples of this are marina, estuary and seawater samples.

Sample Custody - All records and documentation required to trace a sample from point of origin through disposal after analysis. These records must include, but are not limited to:

1) Field notebooks;
2) Field sample ID tags;

3) Laboratory transmittal forms (if applicable);
4) Laboratory sample receipt logs;
5) Sample extraction/preparation logs or worksheets;
6) Analytical (instrument) logs or worksheets;
7) Calibration and quality control data associated with a sample set;
8) Instrument maintenance logs;
9) Sample disposition logs; and
10) Final reports.

Legal Chain of Custody is a special type of sample custody in which all events (i.e. possession, transport, storage, and disposal) and time intervals that are associated with a specific sample must be documented in writing. In addition to the records described above, chain of custody records must include the following:

1) Sample transmittal forms or tags that have adequate spaces for the dated, original signatures of all individuals who handle the sample (or cleaned sample containers if obtained from a contracted laboratory) from time of collection (or container receipt) through laboratory delivery.
2) Laboratory sample storage logs that identify date, time, and individuals who remove samples from storage.
3) Secure, limited access storage areas.

Sampling Kit - A set of sampling accessories that has been assembled for a specified use or project. A Sampling Kit may include, but is not limited to: sample containers; sampling equipment (e.g., bailers); sample preservatives, trip blanks; reagent transfer tool (e.g., disposable pipets); calibration standards; indicator papers (e.g., pH paper); or reagents. Sampling Kits shall be subject to the documentation outlined in Section 5.0.

Sediment (**SDMNT**) – Surface or subsurface soils and sediments of fresh or salt water origin (i.e. lake, stream, marina, etc.).

Sensitivity - The slope of the analytical curve.

Sludge (**SLDG**) - A muddy or slushy mass, deposit, or sediment as precipitated solid matter produced by water and sewage treatment processes

Solid - Laboratory testing matrix defined as an aliquot of sample consisting mostly of solid, but may have some liquid present. Any laboratory samples >20% solid material are considered solid; examples of this are sludge, digester and soil samples.

Source Water – Water as it enters a system.

Standard Bacteria Sample or "Bacti" - The standard aliquot, not less than one hundred milliliters (100 ml), of raw or finished drinking water that is examined for the presence of coliform bacteria.

Standard Methods Agar (SMA) - The growth medium used to cultivate heterotrophic bacteria for the Heterotrophic Plate Count.

Stock Standard Solution (**SSS**) – A concentrated solution containing a certified standard that is a method analyte. Stock Standards are used to prepare secondary or working standards.

Stoichiometric - Calculation of the quantities of chemical elements or compounds involved in a chemical reaction.

Subpart H System – A public water system using surface water or ground water under the direct influence of surface water as a source that are subject to the requirements of 40 CFR, Part 141 (National Primary Drinking Water Standards), Subpart H.

Supplier of Water – Any individual; corporation; company; association; partnership; municipality; State agency, Federal agency or tribal agency that owns or operates a public water system.

Surface Water (**SW**) – All water which is open to the atmosphere and subject to surface runoff.

Threshold Odor – Method used for measuring the intensity of odor.

Titrimetric - A common laboratory method of quantitative/chemical analysis that can be used to determine the unknown concentration of a known reactant.

Too Numerous To Count (TNTC) - When the total number of bacterial colonies exceed 200 on a 47-millimeter diameter membrane filter. Reported as >200cfu/100mL.

Total Trihalomethanes (TTHM) - The sum of the concentration in milligrams per liter of the trihalomethane compounds: trichloromethane (chloroform), dibromochloromethane, bromodichloromethane, tribromomethane (bromoform), rounded to two significant figures.

Transient Non-Community Water System (TWS) – A non-community water system that does not regularly serve at least 25 of the same persons over six months per year i.e. campground.

True Color – The color of water once turbidity has been removed.

Volumetric – A laboratory method used to analyze certain chemical properties by measuring volume.

Wastewater - Includes any influent or effluent associated with domestic or industrial waste treatment facilities.

Water System – The mechanical and electrical assembly of one or more pumps, pipes, storage structures, treatment equipment and distribution network meant to provide water to the plumbing of a building or premise.

Well - Any excavation that is constructed when the intended use of such excavation is to conduct ground water from a source bed to the surface (by pumping or natural flow) when ground water from such excavation is used for a public water supply system.

Appendix A-2

Key Words Associated with Regulatory Language

- **Must**
  Denotes a requirement that must be met.
  This action, activity or procedural step is required.
- **Requirement**
  Denotes a mandatory specification.
  Often designated by the term “shall” or “must”.
- **Shall**
  Denotes a mandatory specification.
  Denotes a requirement that is mandatory whenever the criterion for conformance with the specification requires that there be no deviation. This does not prohibit the use of alternative approaches or methods for implementing the specification so long as the requirement is fulfilled.
- **Should**
  Denotes a non-mandatory specification.
  Denotes a guideline or recommendation whenever noncompliance with the specification is permissible.
  This action, activity or procedural step is suggested but not required.
- **May**
  Denotes permitted action, but not required action.
  This action, activity or procedural step is neither required nor prohibited.
- **And**
  together with, along with, in addition to, as well as
- **Or**
  Used as a function word to indicate an alternative.
  Used to connect different possibilities.
  Used to link alternatives.

APPENDIX B

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