Quality Assurance Project Plan for Impingement Mortality and Entrainment Characterization Study at Gulf Power

Submitted in Compliance with
Section 316 (b) Phase II Rules

Gulf Power Company
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MACTEC PROJECT Number 6063050043

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QAPP APPROVAL

Project Name:	Gulf Power
Project Number:	6063050043
Site:	Gulf Power
Site Location:	Plant Crist Plant Scholz Plant Smith

We have reviewed the QAPP, for the above referenced project. We recognize that when this form is completed, the attached QAPP is approved for the activities on the above-referenced project. Changes to this QAPP shall be documented in writing and approved.

Gulf Power Project Manager	_____	Date:	_____
MACTEC Project Manager	_____	Date:	_____
MACTEC QA Manager	_____	Date:	_____

1.0 INTRODUCTION

This Quality Assurance Project Plan (QAPP) addresses quality assurance and quality control (QA/QC) requirements for environmental measurements and information to be collected during the implementation of the Gulf Power Impingement Mortality and Entrainment Characterization Study for the Gulf Power generating stations listed below.

PLANT NAME	IMPINGEMENT STUDY	ENTRAINMENT STUDY
Crist	Yes	No
Scholz	Yes	No
Smith	Yes	Yes

An essential part of the proposed monitoring programs will be a quality assurance plan instituted to ensure that the data generated by the programs meet an acceptable standard of quality. Quality assurance (QA) is defined as an integrated system involving quality planning, quality control, quality assessment, quality reporting, and quality improvement to ensure that a product or service meets defined standards of quality with a stated level of confidence. The United States Environmental Protection Agency (USEPA) has published guidance documents (e.g., USEPA, 1995, USEPA 2000; USEPA 2002a, USEPA 2002b) for preparing and implementing project-specific quality assurance plans for their staff and for contractors funded by their organizations to follow, known as Quality Assurance Project Plans (QAPPs). A QAPP has four basic element groups: project management, data generation and acquisition, assessment and oversight, and data validation and usability. This plan provides the details of the QAPP for the Gulf Power Impingement Mortality Characterization Study.

Project Objectives

In response to the new Section 316(b) rules in 40 Code of Federal Regulations (CFR) Part 125.95(b)(1), Gulf Power has prepared a Sampling Plan to collect additional data as part of the Impingement Mortality (IM) and Entrainment Characterization Study. Specific objectives of this sampling plan include the following:

- √ Identify fish and shellfish in the vicinity of the Cooling Water Intake Structure (CWIS) of the Generating Stations that are subject to impingement,
- √ Document and evaluate the temporal variability in impingement at the Generating Stations with respect to diel, monthly, seasonal and total annual IM rates,
- √ Quantify current rates of IM&E for the purpose of establishing a calculation baseline for each plant.

2.0 PROJECT MANAGEMENT

2.1 Organization and Responsibilities

The Impingement Sampling Plan provides many of the elements necessary for the program management functions of a QAPP, such as problem definition and resolution, and project and task descriptions. Other program management functions of a QAPP that are provided in the Plan include presentation of the project objectives and the interrelationships among the project tasks that direct the course of studies and identify information endpoints. An important element is the project organization, which identifies the roles and responsibilities of project personnel.

2.1.1 Gulf Power QC Program Manager

Mr. Joseph Neese has been identified as the Project Manager for this project. Mr. Neese will have managerial authority on behalf of Gulf Power for the project. In this role, he will be the primary point of contact for Gulf Power.

2.1.2 MACTEC Program Manager

Dr. Ann Shortelle has been identified as the Program Manager for this project. Dr. Shortelle will have managerial authority on behalf of MACTEC for the project. In this role, she will be the primary point of contact for MACTEC. She has overall responsibility for completing the project on time and within the budget. Dr. Shortelle has over 19 years of experience in aquatic ecological assessments in riverine, lake, and estuarine environments; ecotoxicology; and ecological modeling.

2.1.3 MACTEC QA Manager

Bill Elzinga will be the MACTEC QA Manager. Mr. Elzinga reports directly to the MACTEC PM and also has a line of communication to Gulf Power. He will be responsible for ensuring that all the stated procedures for this project are being followed. Additional specific functions and duties include:

- Reviewing and approving QA plans and procedures;
- Providing QA technical assistance to project staff;
- Reporting on the adequacy, status, and effectiveness of the QA program on a regular basis to the MACTEC PM; and
- Reviewing field procedures as well as field and analytical data generated by the field team to ensure it meets the project requirements.

Additional personnel who will be assigned to support the QA Manager shall include:

- Jaclyn Debicella
- Judith Dudley
- Stacy Rizzo

2.1.4 MACTEC Project Team

Ms. Jaclyn Debicella is a field biologist with 5 years of experience and will act as the field team leader on the project. Ms. Debicella has worked previously on rivers such as the Suwannee and St. John's, various lakes and reservoirs, and offshore reefs. As Field Team leader, Ms. Debicella will provide leadership in the execution of entrainment and impingement sampling.

2.2 Quality Objectives and Definitions

In terms of impingement mortality quantification, the USEPA has not set standards for precision of estimates, so the sampling design proposed in this Plan conforms to sampling effort and precision levels that currently are standard practice. If the USEPA publishes guidance on sampling methods in the future, including QA standards and desired or required levels of precision, the program design and methodology will address these standards. For this Program, the established standards for precision are presented in Table 1.

Table 1. Measurement Performance Criteria

Measurement Parameter	Precision	Accuracy	Completeness
Water Quality			
-- temperature	+/- 0.5 °C	ASTM thermometer check	> 90%
-- dissolved oxygen	+/- 0.1 mg/l	saturated air	> 90%
Impingement			
-- fish count	+/- 10%	repeat count	> 95%
--taxonomic identification	+/- 10%	voucher specimen or taxonomist	
-- total length (mm)	+/- 3%	repeat measurement	
-- weight (g)	+/- 3%	repeat measurement	
Entrainment			
-- egg & larval counts	+/- 10%	repeat count	> 95%
-- pump volume	+/- 5%	flowmeter calibration	
-- taxonomic identification	+/- 10%	voucher specimen or taxonomist	
-- total length (mm)	+/- 3%	repeat measurement	
Data Processing			
-- correct fields	+/- 1%	Double keying and verification software	> 99%

2.2.1 Precision

Precision is a measure of the degree to which two or more measurements are in agreement. Field precision is assessed through the use of field and laboratory audits to verify proper taxonomic identification of collected specimens, accurate measurement of total length, accurate measurement of weight, and accurate counts of total number of each taxa collected.

2.2.2 Accuracy

Accuracy is the degree of agreement between an observed value and an accepted reference value. Accuracy in the field is assessed through the adherence to all protocols and requirements for sample collection, handling, preservation, and labeling and storage.

2.2.3 Completeness

Field and laboratory completeness is the number of valid measurements obtained from those measurements planned to be collected in the field or laboratory, respectively. Field completeness is a measure of the amount of valid measurements obtained from measurements planned to be collected in the field. Field completeness associated with the

removal of fish from the collection basket (on occasions of heavy detritus loading) will be at least 90 percent (%.) Laboratory completeness is a measure of the amount of valid measurements obtained from measurements planned to be taken in the laboratory. Laboratory completeness will be at least 80 %.

2.2.4 Representativeness

Representativeness expresses the degree to which data accurately and precisely represent a characteristic of a population, parameter, and variations at a sampling point, a process condition, or an environmental condition. Representativeness is dependent upon the proper design of the sampling program and will be satisfied by ensuring that the sampling procedures presented in the Sampling/Work Plan are followed and that proper sampling techniques are used.

2.2.5 Comparability

Comparability is an expression of the confidence with which one data set can be compared with another. Comparability is dependent upon the proper design of the sampling program and will be satisfied by ensuring that the procedures in the Sampling/Work Plan are followed and that proper sampling techniques are used. Comparability is also dependent on similar QA objectives.

3.0 DATA GENERATION AND ACQUISITION

This component of the QA program is the heart of the field and laboratory tasks undertaken to generate data on current impingement rates at Gulf Power. Elements include sampling design and methods, sample handling and custody, analytical methods, quality control, instrument maintenance and calibration, and data management.

3.1 Sampling Methodology

Sampling methods will be standardized so that they are repeatable and produce data that are comparable through time. This will be accomplished by preparing detailed Standard Operating Procedures (SOPs) for all activities, including sampling location and frequency, sampling gear and deployment, sample processing, data coding and recording, database entry, and to some degree, data analysis. The SOPs can be reviewed by all parties to reach consensus on their applicability, and will be adhered to by all project personnel. SOPs will provide a description of procedures to follow if obstacles to sampling or completion of all sampling activities are met, so that the acquisition of quality data can be maximized. The SOPs will describe procedures for sample handling and custody, including required signatures and blank forms for associated labels and logs. Also included will be project-specific data sheets, variable definitions and coding instructions. Equipment and instrument specifications will be described, including levels of precision and calibration methods for ensuring accuracy.

3.1.1 Field Impingement Sampling Procedures

Impingement sampling at each station will be conducted on a bi-weekly or monthly basis for a one-year period (12 or 26 sampling events). Impingement sampling will be conducted by utilizing collection basket fitted with 3/8" mesh net liners placed under the screen wash discharge at the CWIS. Sampling procedures will be conducted using the protocol provided below:

1) Sampling will be conducted by qualified field personnel through the conclusion of the sampling program. Impingement samples will be collected continuously for a 24-hour period.

2) Sampling date, start time, and stop time shall be recorded for all samples. *(NOTE: start time/stop time shall be particularly important in recording actual sampling intervals in the event of breaks in continuous sampling.)*

3) Plant flow data for the sample period(s) will be recorded in order to calculate the volume of water withdrawn for cooling during a given sampling period. It is proposed that impingement sampling be conducted for a one-year period in order to encompass the spawning and/or migratory patterns of fish located in the vicinity of the CWIS.

4) Prior to the initiation of an impingement sampling event the traveling screens shall be operated and backwashed to remove any trash or debris that may have accumulated on the screens or in the screen wash trough.

5) Screens shall be operated normally during the course of the sampling event.

6) Impingement samples will be collected using collection baskets fitted with 3/8-inch mesh. The baskets will be placed under the screen wash discharge at the on-set of each 24-hour sampling event.

7) As required by sampling conditions and "loading" of the collection basket, the contents of the baskets will be emptied into holding containers and will be cleaned of all organisms.

8) Upon retrieval of the collection basket, all of its contents shall be emptied and placed within holding containers for processing.

9) All fish contained within the holding containers shall be sorted from any accompanying debris or leaf material in preparation for taxonomic identification and processing.

10) Any live fish shall be placed in an aerated live well and processed in advance of other specimens which may be dead or moribund. If partial fish (head only, tail only) are present in the sample, measurements will be accompanied by a description of the fish body part. Fish will be recorded as live if the fish is able to maintain equilibrium in the aerated live well for a minimum of 10 minutes. Fish will be recorded as moribund or stunned if they are unable to maintain equilibrium, cannot swim down, are lying on the bottom of the live well or have extruded the swim bladder. Moribund or stunned fish will still move their fins and operculum (gills flaps) occasionally. Signs that a fish is dead include unmoving gill flaps, no body movement and clouded eyes. Fish will be recorded as previously dead if they show any signs of decomposition or extensive fungus growth. Fish parts that have become detached from the body (head only, tail only) will be described, identified (if possible), measured, and weighed.

11) Any live fish will be returned to the source body of water in a suitable area where they are not subject to re-impingement, subsequent to processing.

12) Competent fisheries biologists will process the impingement sample by identifying the collected fish to species, enumerating any impinged fish by species, and recording the total length and total weight and relevant or notable physical condition of each impinged fish. Individual fish that cannot be identified to species in the field will be preserved for identification by taxonomic specialists.

13) Processing of specimens will entail their measurement to the nearest mm in total length (TL) and recording their condition as live, dead or moribund. Weights for each specimen shall also be recorded. During periods of high impingement observations will be made to document causes for impingement other than plant withdrawal such as winter die-off of gizzard shad. Photographs of unusual impingement events and/or site conditions shall be taken to document such events.

14) If the number of specimens in the sample for a particular species and size category is large, then the species/size category count will be estimated by sub-sampling. A sub-sample of 30 individuals will be weighed and the total sample will be weighed. The

number of individuals in the whole sample will be estimated from the ratio of the total sample weight to the sub-sample weight total and the count within the sub-sample.

15) Shellfish found in the impingement sample, such as native freshwater mussels, Asiatic clams, zebra or quagga mussels, and crayfish, will be identified to a practicable taxonomic level and will be counted (in the case of few specimens such as native freshwater mussels or crayfish) or weighed in bulk (in the case of numerous Asiatic clams or zebra and quagga mussels).

16) Threatened or endangered species that are collected during impingement sampling will be identified, measured, weighed and promptly returned to the source water body. These species will be processed prior to all other samples. Threatened or endangered species that are dead upon collection of impingement samples from the basket will be identified, measured, weighed and reported to the appropriate agency (i.e. Florida Fish and Wildlife Conservation Commission).

Occasionally impingement studies cannot be conducted due to facility operations or other factors that may delay or cancel sampling. In such cases, Gulf Power's PM shall be notified and the sampling event shall be rescheduled as soon as possible.

3.1.2 Field Entrainment Sampling Procedures

Entrainment sampling will be conducted only at Plant Smith. The entrainment study work scope for Plant Smith shall be performed as detailed in the Standard Operating Procedures.

The purpose of entrainment sampling is to determine the abundance, seasonality, and species composition of selected fish larvae, and post-larvae entrained through the CWIS at each CWIS at Plant Smith. Collection of samples will be according to the following general methods:

1) Prior to the initiation of sampling, continuous chlorination treatment of all units shall be discontinued.
2) Samples shall be obtained by diverting water from a 4" tap previously installed on the water boxes of each unit.
3) Incoming flow from the tap shall be adjusted such that the flow rate is approximately 110-150 gpm.
4) Samples will be collected using ichthyoplankton nets with 500-µm mesh and removable cups or cod ends. Nets shall be suspended in water to reduce velocities and extrusion of sampled organisms.
5) Sample volume will be determined with an in-line flow meter and shall not be less than 100 m^3.

6) Entrainment samples will be collected from each CWIS during the evening/night (after 6pm).

7) Entrainment sampling will be conducted biweekly for one year.

8) At the completion of sample collection, the flow meter readings will be recorded.

9) When a sufficient sample volume has been achieved (i.e., >26,400 gals) as indicated on the accumulating flow meter, sample collection shall cease by closing the flow control valve on the incoming line.

10) The net shall be removed from the sampling tank and positioned for external wash-down. Washing of the net shall be accomplished using a low-pressure wash consisting of previously filtered raw water. All organisms and detritus shall be washed into the collection bucket at the cod end of the net.

11) After the net has been thoroughly washed down, the collection bucket shall be carefully removed. A large white sorting tray shall be position under the collection bucket when it is removed and as the contents of the bucket are transferred to labeled sample containers. Collection buckets shall be carefully rinsed to ensure that all organisms have been properly transferred to the sample container. Any organisms collected in the sorting tray shall also be transferred to the sample jar.

12) After transfer of the sample to the appropriate, labeled sample container, the sample shall be and preserved in 10% buffered formalin solution with Rose Bengal stain. Each sample will be properly labeled.

13) Entrainment samples will be processed through MACTEC's EAT Laboratory according to the EAT Laboratory SOPs for Sample Processing.

14) If samples contain a large number of specimens or large amounts of detritus, samples may be split using a Folsom plankton splitter or other appropriate device. Sub samples will be processed until a minimum of 200 identifiable specimens are found, but counts for individual sub samples will be maintained.

15) Technicians trained in taxonomy will identify the specimens to the life stage and the lowest practicable taxon. Counts will be made by species (taxon) and life stage. Up to 30 specimens per RS and life stage will be measured to the nearest 0.1 mm.

Occasionally entrainment studies cannot be conducted due to facility operations or other factors that may delay or cancel sampling. In such cases, Gulf Power's PM shall be notified and the sampling event shall be rescheduled as soon as possible.

3.1.2.1 Frequency/Schedule

Impingement sampling at each generating station will be conducted on a bi-weekly or monthly basis for a one-year period (12 or 26 sampling events are assumed). Such a frequency and duration will be adequate to characterize seasonal variation in impingement mortality. Annual

changes in the populations should be documentable from existing literature and reported information. Entrainment sampling at Plant Smith will be conducted on a biweekly basis.

3.2 Sample Handling and Custody

Field data collection activities will be recorded using field computers or project specific field data sheets (Figure 3 -1). Electronic data entry using field computers shall be accomplished using MACTEC's Biological Database Management System (BDMS). For each sample data entry, the BDMS system allows for the following input screens:

- √ General Sample Identification
  - Date
  - Start time, Stop time
  - Weather, field team members
  - Plant name
  - Sample collection method
  - Sample location
  - Sample identification
  - Sample collectors
- √ Operational Data
  - Number of pumps operating
  - Screen type
  - Screen operational characteristics
- √ Water Quality
  - Source water body
  - Temperature
  - Dissolved oxygen
  - pH
  - Conductivity
  - Salinity
- √ Biological Data
  - Species common name
  - Length
  - Weight
  - Status/condition (live, dead, moribund)
  - DELT (disease, erosion, lesions, tumors)
  - Voucher specimen
  - Batched fish (length category, count, and weight)

Field data entry will be conducted using data sheets or field computers. Data entered on data sheets will be subsequently entered into the project database. Entries will be made in ink, signed or initialed, and dated. No erasures will be made. If an incorrect entry is made, the information will be crossed out with a single strike mark that is signed or initialed and dated by the sampler. The photographs, if any are taken, will be numbered and a brief description regarding the photograph will be noted.

Sample identification labels or numbers/locations will be assigned prior to sample collection.

For samples that are collected for laboratory processing, the following sample and or specimen packaging and shipment procedures will ensure that the samples/specimens will arrive at the laboratory in good condition with the chain-of-custody intact.

a. The field team leaders will be personally responsible for the care and custody of the samples/specimens until they are transferred or properly dispatched.

b. Sample containers will be identified by use of sample labels with sample numbers, sampling locations, the date/time of collection, collectors, and if appropriate specimen identification.

c. Sample labels will be completed using waterproof ink unless prohibited by weather conditions.

d. Samples that will be transferred from person to person will be accompanied by a properly completed chain-of-custody form that contains the associated sample numbers and locations. When transferring the possession of samples, the individuals relinquishing and receiving will sign, date, and note the time on the form. This chain-of-custody form documents the custody transfer of samples from the field technician to another person, to the permanent laboratory, or to/from a storage area.

e. Sample/specimen containers will be placed in a box or cooler to ensure that the containers do not get broken. Additional insulation material such as Styrofoam peanuts or additional bubble pack may be used to ensure the sampling/specimen containers are secure or fill any remaining void space in the box or cooler.

3.3 Analytical Methods

Analysis of impingement and entrainment data will be conducted by tabulation and analysis of field impingement and entrainment data with plant flow information. Analysis will include data tabulations and transformations to produce the following for use in reporting:

- √ A complete tabulation of taxa impinged at the plant site;
- √ Overall impingement rates and trends (annual-total, seasonal, diel);
- √ Fish impingement rates (by species) per million gallons of intake water,
- √ Fish entrainment rates (by species) per 1000 cubic meters of intake water;
- √ A description of fish species relative importance (forage/prey, commercial, sport, threatened and endangered, etc.)
- √ A characterization of impinged fish in terms of size and age distribution by species; and
- √ Fish condition (live, dead, moribund, etc).

Additional evaluation of the impingement data will be performed by conducting length frequency analyses of representative species.

3.4 Quality Control

Quality control is defined as activities whose purpose is to measure and control the quality of a procedure so that it meets the needs of its user. Quality control (QC) activities monitor the outgoing quality of the data and can lead to response actions to bring the data within control limits through various actions, such as retraining of personnel, repair or recalibration of equipment, or other similar actions.

Systematic QC procedures will be instituted to verify recorded data. The primary area where these QC procedures will be used is sample processing, e.g., impingement fish counts, species identification, and length and weight measurements. The sampling plans implemented under these procedures have a specified average outgoing quality limit (AOQL), which represents the maximum fraction of all items (e.g., measurements, taxonomic identifications or counts) or lots (e.g., whole samples) that could be defective as a worst case. A defective item could be a measurement or count that falls outside of a specified tolerance limit (e.g., plus or minus 1 to 10 percent). In practice, the average outgoing quality (AOQ) is typically much better than the AOQL.

3.4.1 Taxonomic Identification of Fish and Shellfish

In accordance with 40 CFR Section 125.95(b)(3)(i) a taxonomic identification of all life stages of fish in the vicinity of the CWIS of each generating station must be presented as part of the IM&E Characterization Study. Proper taxonomic identification all fish collected as part of the impingement and entrainment study will be assured by using properly trained personnel who are familiar with fish (native and non-native) occurring in Florida. Reviews of the accuracy of field taxonomy of collected specimens shall be undertaken as part of the field auditing program. Similarly, a review of the accuracy of laboratory taxonomy of entrainment samples and impingement samples shall be undertaken. Additionally, a voucher collection shall be established for each Gulf Power plant in which several specimens of each identified taxon shall be preserved and retained in labeled containers. Voucher collections shall be established for each plant site and shall be reviewed for accuracy by a second qualified fisheries biologist. Any deviations in taxonomic accuracy shall be reported as described in Section 4.0. Taxa that are obscure or that require additional verification shall be sent to an outside recognized taxonomic expert for confirmation. Taxonomic keys and guides used for the identification of fish will include the following:

Juveniles and Adults

- √ Eddy, Samuel. 1975. The Freshwater Fishes, 2nd Edition. WM. C. Brown Company Publishers.
- √ Kaplan, Eugene H. 1988. A Field Guide to Southeastern and Caribbean Seashores. A Peterson Field Guide. Houghton Mifflin Company.
- √ Hoese, H. Dickson and Richard H. Moore. 1998. Fishes of the Gulf of Mexico, 2nd Edition. Texas A&M University Press.

Ichthyoplankton

- √ Auer, Nancy A. December 1982. Identification of Larval Fishes of the Great Lakes Basin with Emphasis on the Lake Michigan Drainage. Great Lakes Research Division Special Publication 82-3.
- √ Ditty, J.G. and R.F. Shaw. 1994. Preliminary Guide to the identification of the early life stages of sciaenid fishes from the western central Atlantic. NOAA Tech. Memorandum NMFS-SEFSC-349.
- √ Jones, Philip. 1978. Development of Fishes of the Mid-Atlantic Bight- an atlas of egg, larval, and juvenile stages. V. I-VI. Biological Sciences Program. Fish and Wildlife Service. US Dept of the Interior.

Representative taxonomic experts who may be consulted to confirm species identifications may include:

- Heidi Ferrel, M.S., Natural Resources, Mactec-Kennesaw, GA

3.4.2 Fish Measurement and Enumeration

Proper measurement and enumeration of all fish and shellfish collected as part of the impingement and entrainment study will be assured by using properly trained personnel who are familiar with fish and shellfish collection and processing techniques. Additionally, assessments of the accuracy of field measurement and enumeration of collected specimens shall be undertaken as part of the field auditing program. Similarly, collections returned to the laboratory for processing shall be subject to laboratory auditing procedures in which fish and shellfish measurement and enumeration accuracy is evaluated. Laboratory audits and QA verification of fish measurement and enumeration shall be based on a frequency of 10 percent of all sample collections returned to the laboratory for processing.

3.4.3 Corrective Actions

Corrective or preventive action is required when potential or existing conditions are identified that may adversely impact data quantity or quality. Corrective action (CA) could be immediate or long term. In general, any member of the project staff who identifies a condition adversely affecting quality can initiate corrective action by notifying their supervisor or the Project QA Officer in writing (see CA Request/Routing Form Figure 3-2). The written communication will identify the conditions and explain how it may affect the data quality or quantity.

3.4.3.1 Immediate Corrective Action

Immediate CA is usually applied to spontaneous, nonrecurring problems (e.g., instrument malfunction). The individual who detects or suspects nonconformance to previously

established criteria or protocol in equipment, instruments, data, or methods, will immediately notify their supervisor. The supervisor and the appropriate Task Leader will investigate the extent of the problem and take the necessary corrective steps.

If a large quantity of data is affected, the Task Leader must prepare a memorandum to the Project Manager and Project QA Officer. These individuals will collectively decide how to proceed to correct the problem(s). Corrective measures will be coordinated with Gulf Power and any significant corrective actions taken will be reported in a project QC summary submittal. If the problem is limited in scope, the Task Leader will decide on the corrective action measure and document the solution in the memorandum in addition to the corrective action request/routing form.

3.4.3.2 Long-Term Corrective Action

Long-term corrective action procedures are devised and implemented to prevent the recurrence of the potentially serious problem. The Project QA Officer will be notified of the problem and will conduct an investigation to determine the severity and extent of the problem. They will then file a corrective action request with the Task Leader and Project Manager. If the corrective action will impact project budget or schedule, the action requires involvement of Gulf Power.

Corrective actions may also be initiated as a result of other activities including:

- System audits
- Laboratory/field comparisons, and
- QA project audits.

Examples of long-term corrective actions include:

Staff training in technical skills or in implementation of QA Program,
Rescheduling of work routines to ensure project schedule is maintained and is on budget, and
Revision of QA Program or replacement of project personnel.

For either immediate or long-term corrective actions, steps comprising a closed loop corrective action system are as follows:

1. Define the problem,
2. Assign responsibility for investigating the problem,
3. Investigate and determine the cause of the problem,
4. Determine a corrective action to eliminate the problem,
5. Assign and accept responsibility for implementing the corrective action,
6. Establish effectiveness of the corrective action and implement the corrective action, and
7. Verify that the corrective action has eliminated the problem.

Depending on the nature of the problem, corrective action employed may be formal or informal. In either case the occurrence of the problem, corrective action employed, verification that the problem has been eliminated must be documented. Final resolution of the problem will be documented by the signature of the Project QA Officer who shall sign the corrective action form to indicate that the project problems have been resolved.

3.5 Preventative Maintenance

3.5.1 Field Instruments

Preventative maintenance of field equipment, which is performed by field personnel routinely and preceding each field sampling event; more extensive maintenance is performed by manufacturers on the basis of hours of equipment in use. Sampling technicians report performance of the equipment after each sampling event. Critical spare parts are kept in stock. At times, it is necessary to perform routine maintenance in the field; therefore, each field instrument is provided with an operating manual and any appropriate maintenance tools. The list of field instruments and their maintenance frequency are provided in Table 3-1.

Table 3-1 Field Equipment and Associated Preventative Maintenance

Instrument Probe	Activity	Frequency
Dissolved Oxygen (DO) Meter	Check battery Check to ensure that mechanical zero is set properly Check DO probe membrane Replace membrane	Daily and replace as needed Prior to each use As needed As needed
pH Meter	Battery replacement Probe replacement	As needed As needed
Conductivity Meter	Battery replacement Check loose connections Replatinization	As needed Daily As needed
Temperature Probe	Check connections Check against calibrated Thermometer	Daily Prior to field use
Flow Meter	Check battery Check loose connections	Prior to use As needed

3.6 Instrument Calibration and Frequency

Field instruments will be calibrated prior to use in the field. The calibration procedures will follow standard manufacturers' instructions to ensure equipment is functioning with in tolerances established by the manufacturers. A copy of the instrument user manuals will be placed with the instrument and brought to the field. A record of the instrument calibration will be maintained, kept with the instrument and brought to the field.

The following is a listing of field equipment:

- Digital top-loading scale
- Spring scale
- Fish measuring board (metric scale)
- 500 micron mesh conical plankton net
- Paddle wheel flow meter with totalizer
- Hydrolab
- Drum
- Bucket
- Dip net
- Fish Aerator
- Sample Containers/Bags
- Cooler/Ice

3.7 Data Management and Documentation

Subsequent to recording of field data on data sheets, data will be directly recorded into field computers consisting of specific project forms (Figure 3-1) immediately after measurements are taken. The field data will be entered into a project developed Access database and will be reviewed for accuracy and completeness. Reports will be generated from the database and/or from database information exported into Excel for reporting or calculation/statistical purposes. All electronic files (data, database, reports, etc.) will be stored on the office local area network under the project number in an appropriately named subdirectory. Original field logbooks and any additional raw data will be maintained in the project files located in the office central files under the project number. In addition hard copies of reports generated will be filed in the project file.

4.0 ASSESSMENT AND OVERSIGHT

Assessment and oversight is the process of determining whether the QA plan is being implemented as designed. For the proposed programs, this will be accomplished primarily by conducting technical audits or surveillance of field, laboratory and data management activities. Experienced senior staff, designated by the organization chart, will accompany field personnel during a set number of sampling events to observe sampling activities and to verify that SOPs are being followed properly. These auditors also will observe laboratory and data management personnel during their activities on specified occasions. Variances from approved procedures will be documented and corrected, either by modifying SOPs to address any systematic problems or by testing and/or retraining staff, as necessary. Prior to the first scheduled sampling, a readiness review will be conducted to ensure that trained personnel, required equipment, and procedural controls (e.g., SOPs) are in place. A technical audit will be scheduled for the first month of sampling (or very soon thereafter) so that any necessary corrections can be made before significant data losses occur. Follow-up audits will be scheduled (e.g., quarterly) to monitor progress and address changing conditions, such as recruitment of new life stages or species, entrainment or impingement abundances, river stage or flow, new personnel, or plant operations.

Another QC aspect for oversight is the maintenance of a voucher specimen collection and a library of taxonomic keys and references to assist personnel with taxonomic identification. The voucher specimen collection will consist of preserved specimens that have been positively identified by a qualified taxonomist. Oversight also will be provided by procedures requiring that specimens that are not positively identifiable by field or lab personnel will be preserved and given to a qualified taxonomist for identification.

4.1 Field Assessment

The following quality control measures and checks will be employed for the project field effort as follows. Field identification of species will be verified by use of a voucher collection. A voucher specimen will be collected for each species that is identified during the field sampling event. The voucher specimen samples will be properly labeled, preserved, and brought back to the EAT Laboratory per sample custody procedures. The voucher specimens will be processed into the EAT Laboratory and reviewed by a third party or a qualified fisheries biologist other than the initial collector. The review will verify that identification of species has correctly occurred. This will be verification of the voucher specimen collection will be documented. Any incorrect or nonconformance situations will be fully discussed, documented, and corrected.

Field Audits

A minimum of two random field audits will be conducted by the Project Manager or other designated representative to ensure that field sampling protocols are properly followed. Audit procedures will assess and document the performance of project staff and equipment. All aspects of field sampling shall be observed and evaluated as to conformance with established project protocols. Results of field audits shall be recorded on a separate field audit evaluation form (Figure 4-1). Project audits form a basis for corrective action requirements and constitute a record of the conformance of measurement systems to QA requirements. Any deficiencies observed shall be accompanied by corrective measures request that shall be implemented immediately.

Field audits conducted by a designated representative will immediately communicate the results verbally to the Project Manager. The designated representative will then provide the Project Manager with a written summary of the field audit results containing all pertinent information within an appropriate time frame agreed upon by the Project Manager. The audit report should contain the audit's name, date of audit, project audited, type of audit performed, system audited, listing of findings/deviations from protocol, corrective actions and information on implementation and follow up to corrective actions at the time of report submittal (Figure 4-2).

4.2 Reports to Management

QC Reports

Project reports to management can be from the following sources: audits, QC issues, and data validation process. The reports will be submitted to the Project Manager in a timely manner and will contain all pertinent information as it relates to the integrity of the project data and overall project completion. The Project Manager will ensure that all report items are addressed and if applicable appropriate follow up actions taken. The Project Manager will review the reports and will at his discretion notify and discuss any significant issues with the Gulf Power Project Manger.

5.0 DATA VERIFICATION, VALIDATION AND USABILITY

Data verification and validation will be conducted by qualified biologists (e.g., QA manager or field/lab supervisors) during the course of the project to ensure that the resulting data will be suitable for use as intended. Project records, including field sampling logs, raw data sheets, sample chain-of-custody forms and instrument calibration logs, will be reviewed to verify that data were collected according to the QAPP. Data will be validated first by a review of datasheets and data files to find whether data are incomplete or appear to be inappropriate or out of a reasonable range of values. Data entry into the database also will undergo a 100 percent visual QC comparison to the data on the corresponding data sheets. Finally, data files will be subjected to error checking programs to detect outlying values either to investigate further or to eliminate if shown to be spurious. This investigation will require tracing the data to raw data sheets and consulting with field or lab personnel who recorded the data. All raw data sheets, log books and data files will be maintained for future reference. All computer files will be backed up on a daily basis while any data entry or editing procedures are ongoing.

Data generated through field activities or by the laboratory operation will be reduced and validated prior to reporting. No datum will be disseminated until it has been subjected to the procedures that are summarized in subsections below.

Field Data Validation

Field data reduction procedures will be minimal in scope compared to those implemented in the laboratory setting. Only direct-read instrumentation will be employed in the field. The field instruments will generate measurements directly read from the meters following calibration per manufacturer's recommendations. Such data will be written into field log books immediately after measurements are taken. If errors are made, results will be legibly crossed out, signed or initialed and dated by the field member, and corrected in a space adjacent to the original (erroneous) entry. Later, when the results tables and figures required for this study are being completed, MACTEC will proof 100% of the tables and figures to determine whether any transcription errors have been made by the technical field staff. MACTEC tables and figures are generated with a legend notation as to the following information: created by, date, reviewed by, and approved by. The MACTEC project personnel place their initials by the appropriate task that they have performed. Once created the tables and figures proceed to a peer reviewer who will then validate that the information on the tables and figures are correct. Once tables and figures are reviewed they are finalized for the reports by the approval of the Project Manager.

Data entry of the field data sheets into the project database will be reviewed in a similar nature in that all data entered into the data base will be reviewed for accuracy and completeness.

The data reports generated from the data base will be checked at a 20% frequency to ensure that the programs are performing correctly. Similarly statistical analysis performed on the data from the database will be check by verification of calculations to ensure validity of the analysis findings.

FIGURES

Figure 3-1. Data Sheets

Plant XXX
316(b) Field Form

Project Information

Project Title/Number:_____ **Date:**_____ **Sampling Method:**_____

Client:_____ **Time:**_____ **Field Team:**_____

Location:_____

Water Quality Data

Water Temp (°C):_____ **Conductivity (uS/cm):**_____

pH (standard units):_____ **D.O. (ppm):**_____

Salinity:_____ **Air Temp. (°F)**_____

Operational Data

Sample Start Time:_____ **Sample Stop Time:**_____

Screen Type (Fixed or Traveling)_____ **Cleaned/Rotated Prior to Start Time (Y/N):**_____

Screens Operated During Sampling (Y/N):_____ **No. of Pumps Operating:**_____

Total Intake Flow (gpm):_____

Comments (weather, other observations, etc)_____

_____

_____

_____

_____

Signature:_____ Date:_____ Page ___ of ____. **MACTEC**

Field Fisheries Data

Species	Length (mm)	Weight (Circle kg or g)	Status (Live, Dead, Moribund)	Batch (Total Catch Weight/ Subsample Count/Subsample Weight)
		kg g		
		kg g		
		kg g		
		kg g		
		kg g		
		kg g		
		kg g		
		kg g		
		kg g		
		kg g		
		kg g		
		kg g		
		kg g		
		kg g		
		kg g		
		kg g		

Signature:_____ Date:_____ Page ___ of ____. **MACTEC**

Quality Assurance Corrective Action Request and Routing Form

Project Name/Number: _____

Project Corrective Action #: _____

1) Identification of a Problem:
Originator: _____ Date: _____

Nature of the Problem: _____
_____
_____
_____
_____

2) Determination of Required Action:
Responsibility Assigned to: _____ Due Date: _____
_____
Recommended Action: _____
_____
_____
_____
_____

3) Implementation of Required Action:
Responsibility Assigned to: _____ Due Date: _____
_____

4) Assuring Effectiveness of Action:
Responsibility Assigned to: _____ Due Date: _____
_____
Procedure to Assure Effectiveness: _____
_____
_____
_____

Figure 3-2 Corrective Action Request and Routing Form

316(b) Field Audit Evaluation Form

Site Information

Project: _____ Project #: _____
Client: _____ Location: _____
Service being provided: _____
_____
MACTEC Employees:_____ _____
_____ _____
SHSO: _____ Project Manager: _____
Auditor: _____ Date: _____
Average hours worked in a day: _____

ATTACH COPY OF PROTOCOLS TO AUDIT EVALUATION FORM

Paperwork Review – Comments – Note ALL Deviations from Protocols:

Field Data Sheets: _____
_____
_____
_____
_____
_____
_____

Place additional notes on the back of this sheet.

Item	Yes	No	Comments?
HASP on site?			
Site Safety Meetings?			
Corrections to entries performed correctly?			
Data sheets legible, complete and signed?			
Voucher Specimen Collection? (labels, etc)			
Equipment calibration documented?			
Preventative maintenance performed/documented?			
Correct Action Verification? – (if applicable)			

Auditor signature:_____ Date:_____
_____

Figure 4-1 Field Audit Form

List of Findings and Corrective Actions for the (Project Name):

_____

Type of Audit: _____ Field _____ Laboratory

Project Name/Number:_____

Auditor: _____

Audit Date	Type of Audit	System Audited	Significant Findings	C

Additional Notes:

Figure 4-2 Field Audit Report