STAFF REPORT

Date: November 6, 2013

To: Mayor and City Council

Thru: Andrew Clinger, City Manager

Subject: **Staff Report (For Possible Action): Approval of Amended Consultant Agreement between CDMSmith and the Cities of Reno and Sparks for Engineering Services in support of Phase II improvements to the Truckee Meadows Water Reclamation Facility's (TMWRF) Electrical Distribution System in the amount of $274,190 with the City of Reno's portion being $188,176.60 (Sewer Enterprise Fund).**

From: Dave Kershaw, Associate Civil Engineer

Summary: The work for Phase II improvements was under design when TMWRF experienced a near total failure of the components that provides electrical power to the entire facility. The response that ensued included deployment of multiple generators on-site to keep the water reclamation facility operational. Given the timing and costs, it was critical to initiate immediate replacement of components. These components had been in service for 33 years and replacement parts were no longer readily available resulting in a need for modified design. Staff concluded it was most expedient to redirect CDMSmith to assist with this effort. The engineering evaluations of key electrical systems to be replaced indicated facilities needed to be upsized to continue to provide a reliable and redundant power supply. Therefore, this amendment is for the expanded tasks of designing these additional facilities as detailed in the attached amended agreement. Staff recommends Council approval of the Amended Agreement with CDMSmith for design of Phase II improvements in the amount of $274,190 and authorize the Mayor to sign the amended agreement.

Previous Council Action: On August 22, 2012, Council approved a Consulting Agreement between the Cities of Reno and Sparks and CDMSmith for design of the Phase II electrical distribution system upgrades.

Background: An arc-flash study of 1964-vintage electrical system components at TMWRF, determined serious hazards existed due to aging and environmental factors. The schedule of funding dictated that the electrical upgrades to correct all arc flash hazards be divided into two phases, Phase I and II. The first phase of electrical system upgrades was designed by CDMSmith and constructed by Auburn Construction with completion this last summer. Design of the Phase II improvements is ongoing. The detailed engineering evaluations have identified several improvements that are needed to provide reliable power supply to key components of the treatment process that were not included in the original scope.

Discussion: Shortly after the initiation of design of the TMWRF Electrical Upgrades Phase II Project, TMWRF experienced a severe operational emergency with the near failure of the existing Medium Voltage Switch Gear (MVSWGR-1); the failure of which would have left TMWRF unable to treat wastewater for an extended period of time. Staff concluded it was most expedient to redirect CDMSmith to assist with the design to include the immediate preparation of plans and specifications for replacement of the medium voltage switch gear.

Electrical Upgrades Phase II Project includes the design and replacement of the remaining electrical components identified by the arc–flash study. Some of the items included in this additional design effort will include upsizing of four major transformers, upsizing of several electrical switchboard bus bars, installation of additional power conduits and electrical cables from the medium voltage switch gear to several electrical switchboards in the facility, and modification to structures supporting electrical gear due to changes in the size of components. Also included is the installation of standby power quick connect facilities throughout the plant to help provide a quick access to mobile standby power facilities during a localized power failure. This is listed in the approved FY14 CIP for TMWRF. It is advantageous both from timing and costs to incorporate these additional CIPs into the current design work.

The additional tasks as partially summarized in this staff report and detailed amended agreement, have expanded the design and engineering services required of CDMSmith an additional $274,190, thereby increasing the total design and services during construction costs to $729,670.

Financial Implications: The City of Reno will administer the agreement and will be reimbursed for a portion of the costs by the City of Sparks through the current cost sharing agreement for TMWRF operation and maintenance. The City of Reno and the City of Sparks share the cost of this project as follows: 68.63% for Reno and 31.37% for Sparks, as shown in Table 1. Costs for the City of Reno are budgeted in the Sewer Enterprise Fund. This project and amendment tasks are included in the TMWRF Capital Improvement Plan approved by the Joint Coordinating Committee.

Table 1 - Cost Sharing Between Reno and Sparks

Total Amendment Cost	Reno Share	Sparks Share
$ 274,190.00	$188,176.60	$86,013.40
Percentages	68.63%	31.37%

Legal Implications: None at this time.

Recommendation: Staff recommends Council approve the Amended Agreement for Consultant Services with CDMSmith for the design and engineering services described in the attached proposal in an amount not to exceed $274,190 and authorize the Mayor to execute the attached Amendment.

Proposed Motion: I move to approve the staff recommendation.

Attachments:

- Amendment Agreement - CDM Smith, Inc. (PDF)

AMENDMENT TO AGREEMENT BETWEEN
CITY OF RENO, CITYOF SPARKS
AND
CDM SMITH, INC.

This Amendment, made this _____ day of _____, 2013, by and between CDM Smith, Inc., herein referred to as "ENGINEER" and CITY OF RENO and CITY OF SPARKS herein referred to as "CLIENT", hereby amends the Agreement between ENGINEER and CLIENT made and entered into on August 22, 2012, herein referred to as Basic Agreement:

WHEREAS, CLIENT and ENGINEER entered into an Agreement for services on August 22, 2012 for engineering support services for the TMWRF Electrical System Upgrades, referred to as "Project";

WHEREAS, the CLIENT has requested additional engineering support services for design and construction management during the construction of the Project;

Now, therefore CLIENT and ENGINEER for considerations hereinafter ser forth, mutually agree as follows:

ARTICLE II – SCOPE OF SERVICES is amended as follows:

The Scope of Services is set forth in Exhibit A which attached hereto and incorporated herein by this reference. Exhibit A consists of thirty-three (33) pages.

ARTICLE III – COMPENSATION is amended as follows:

A. Compensation to the ENGINEER for the engineering services performed in accordance with Exhibit A and this Amendment is on a time and expense basis for a total sum not to exceed $274,190.00. The City of Reno's share is the sum of $188,176.60 and the City of Spark's share is the sum of $86,013.40.

D. The budget for total charges for services including those authorized by this Amendment to Agreement is $729,670.00 and shall not be exceeded without authorization of the CLIENT. The City of Reno's share is the sum of $500,772.52 and the City of Spark's share is the sum of $228,897.48. The budget may be increased by amendment hereto if necessitated by a change in scope of services which increases the cost of providing the services. ENGINEER is not authorized to provide any additional services beyond the scope of work without having authorized funding pursuant to a written amendment hereto.

ARTICLE IV – SCHEDULE OF WORK – is hereby amended as follows:

ENGINEER will proceed in accordance with the schedule of work as set forth in Exhibit A attached hereto and incorporated herein by this reference.

The terms of the August 22, 2012 Basic Agreement are incorporated herein by this reference, unless inconsistent with the terms set forth herein or unless otherwise stated. If there are any inconsistencies, the terms specified above shall prevail.

If there are any inconsistencies between the terms of this Amended Agreement and Exhibit A, the terms specified above shall prevail.

IN WITNESS WHEREOF, CLIENT has caused these presents to be executed by its officers hereunto duly authorized and the ENGINEER has subscribed same, all on the day and year first above written.

CITY OF RENO, NEVADA

By: _____
Robert A. Cashell, Sr., Mayor

ATTEST:

_____
Reno City Clerk

APPROVED AS TO FORM:

By: _____
Susan Ball Rothe
Deputy City Attorney

CITYOF SPARKS, NEVADA

By: _____
Geno Martini, Mayor

ATTEST:

_____
Sparks City Clerk

APPROVED AS TO FORM:

By: _____
Chet Adams
City Attorney

ENGINEER

By: _____
Paul F. Meyerhofer, P.E.
Senior Vice President

CDM Smith

3860 GS Richards Blvd.
Suite 100
Carson City, NV 89703
tel: 775883-2583
fax: 775 883-7928

EXHIBIT A

October 11, 2013

David Kershaw, PE
Associate Civil Engineer
City of Reno
P.O. Box 1900
Reno, Nevada 89505

Subject: TMWRF Electrical Systems Upgrade 2012 – Phase II Contract Amendment for Additional Engineering Services

Dear David:

In response to your recent request, CDM Smith is submitting this amendment to provide additional work requested by the City of Reno for the Truckee Meadows Water Reclamation Facility (TMWRF) Electrical Systems Upgrade 2012 Phase II City Project #I100062 per the agreement between the City of Reno and CDM Smith dated August 22, 2012.

The following amendment is organized into two sections: Project Understanding and Scope, and Proposed Schedule and Fee. See Part 2 - Estimate of Expenditures for reference.

1. Project Understanding and Scope

CDM Smith is currently providing Engineering services for the City of Reno to improve the reliability and safety of the existing electrical system at the Truckee Meadows Water Reclamation Facility (TMWRF). This effort started in 2010 with the Electrical Systems Improvement 2011 Project which addressed critical upgrades and improvements to the existing plant electrical system.

On September 30, 2013, Plant Management Staff requested CDM Smith to include additional design engineering services and provide a contract amendment to the current TMWRF Electrical Systems Upgrade 2012 Phase II Project agreement. The additional scope of services will follow the previously defined scope deliverables and tasks included in the original contract for the design scope of services. Additional services include the following:

- Electrical design to replace the existing MVSWGR-1 Medium voltage switchgear with new Eaton Electric medium voltage switchgear. This includes the addition of new bus ducts from

the facility's existing 5000 kVA transformer 2.4 kV secondary sides. This task also includes bidding support, and services during construction for the MVSWGR-1.

- Current project scope includes the design engineering services required to upgrade the Nitrification Building's two existing 1500 kVA transformers and the 2000A LVDC-5 switchboard with equal capacity equipment. Following the August 2013CDM Smith load study results, it was recommended to upgrade the switchboard and transformers to 2000 kVA capacity and the switchboard to a 3000 A bus rating. The additional scope includes the upgrade of the new transformers and switchboard electrical modifications from 1500kVA to 2000kVA and the switchboard to 3000 A bus capacity. Structural scope includes switchgear, medium voltage switch and transformer concrete pads and fire wall modifications for the transformers, and new parallel underground duct banks to increase the capacity of the Nitrification building.

- The existing Nitrification Building electrical system has a single radial feeder and no redundant back-up. The new scope includes the design and installation of a new feeder (cable and conduit in underground duct bank) from MVSWGR-1 to provide redundant feed to the Nitrification Building. The new MVSWGR-1 has a spare breaker cell that will be used to provide the parallel redundant feeders to the existing radial system. The design modifications include the addition of two new overhead conduits from MVSWGR-1 to manhole P-8, 3 conduits from P-8 to P-9, 2 conduits from P-9 to P-10, 2 conduits from P-10 to P-11, 3 conduits from P-11 to P-12, and 2 conduits from P-12 to the Nitrification Building Transformer medium voltage switches.

- The existing Filter Building electrical system has a single radial feeder and no redundant back-up. The new scope includes the design and installation of a new feeder (cable and conduit in underground duct bank) from MVSWGR-1 to provide redundant feed to the Filter Building. The new MVSWGR-1 has a spare breaker cell that will be used to provide the redundant feeder to the existing radial system. The design modifications include the addition of a new overhead conduit from MVSWGR-1 to manhole P-8, using the existing spare conduit from P-8 to P-9, P-9 to P-10, P-10 to P-11, P-11 to P-12, and from P-12 to the Filter Building Transformer medium voltage switches.

- CDM Smith conducted a standby power system study for the plant that identified a recommended generator configuration to accommodate full plant backup power. The recommended approach includes constructing the system in three stages. The first stage is to provide permanent generator connection facilities to the existing distribution system so that portable generators can be quickly connected to the switchboards. The design will allow quick connection of portable generators so that power to the entire plant may be

quickly restored in the event of a utility or local power outage. The second and third stages of the recommended approach for plant standby power are to install permanent generators in a central standby power plant. The second and third stages are not included in this proposal as this time.

- CDM Smith will design permanent facilities to accommodate connection of portable generators to key switchboards throughout the plant. The switchboards that will be provided with connections are as follows, LVDC 1, LVDC 2&3, LVDC 4, LVDC 5, Influent PS, and LVDC 6. The design will include new Quick Connect Generator Switchgear (tap box) with a feeder circuit breaker for the generator(s) at each location. Portable Generator(s) will be required to connect to each of the tap boxes as required to supply standby power when necessary. The portable generator(s) can be purchased or rented or some combination of both. CDM Smith will provide specifications for a 1000kW portable generator as part of the project. The purchase of the generator may or may not be included in the scope of the construction of this project as requested by the City.

- A permanent portable generator connection for the blower MCC is not included in this project. A new medium voltage switch with a step down transformer for the generator tap box at the influent pump station MCC location will be included in the design.

- Prepare additional single line diagrams for the project showing the additional improvements included in this addendum.

- Prepare additional demolition plans to indicate the modifications required for the equipment replacement identified in this addendum.

- Modify the existing drawings that will be affected by the new equipment replacements and provide record documents to indicate the modifications required in the scope of services

- Modify the "Maintenance of Plant Operations Plan" (MOPO) included in the original scope of the project to include the above listed new scope items included in the addendum. Modify and update the existing detailed electrical design including a drawing list, electric single line diagrams, electric power distribution drawings and schematics, motor list and schematics, motor control schematics, power and control drawings, lighting panel schedules, junction box layout drawings, control schematics that are not shown on the motor control schematics, relay panel wiring diagrams, conduit schedule and conduit layout, and power panel changes.

- Modify the pre-design report to include the additional scope of the addendum. New submittal will include the scope of services included above and will coordinate the design and construction requirements with the City staff and confirm the design criteria.

- Provide any needed demolition drawings for electrical equipment being removed due to the new scope of services included in the addendum.

- Increase the existing project scope to include an updated engineer's opinion of probable cost within +/-30% which will include the equipment replacement cost and an estimate of design/construction intervals required for an upgrade.

Modify the original contract scope of services to include additional layout drawings showing locations of all terminal boxes and instruments and the associated local device interfaces, panel drawings, wiring diagrams for power, communication, and grounding necessary to install all new I/O hardware interface. CDM Smith's proposal includes a separate updated detailed scope of services work and estimates of expenditures provided as the following appendices:

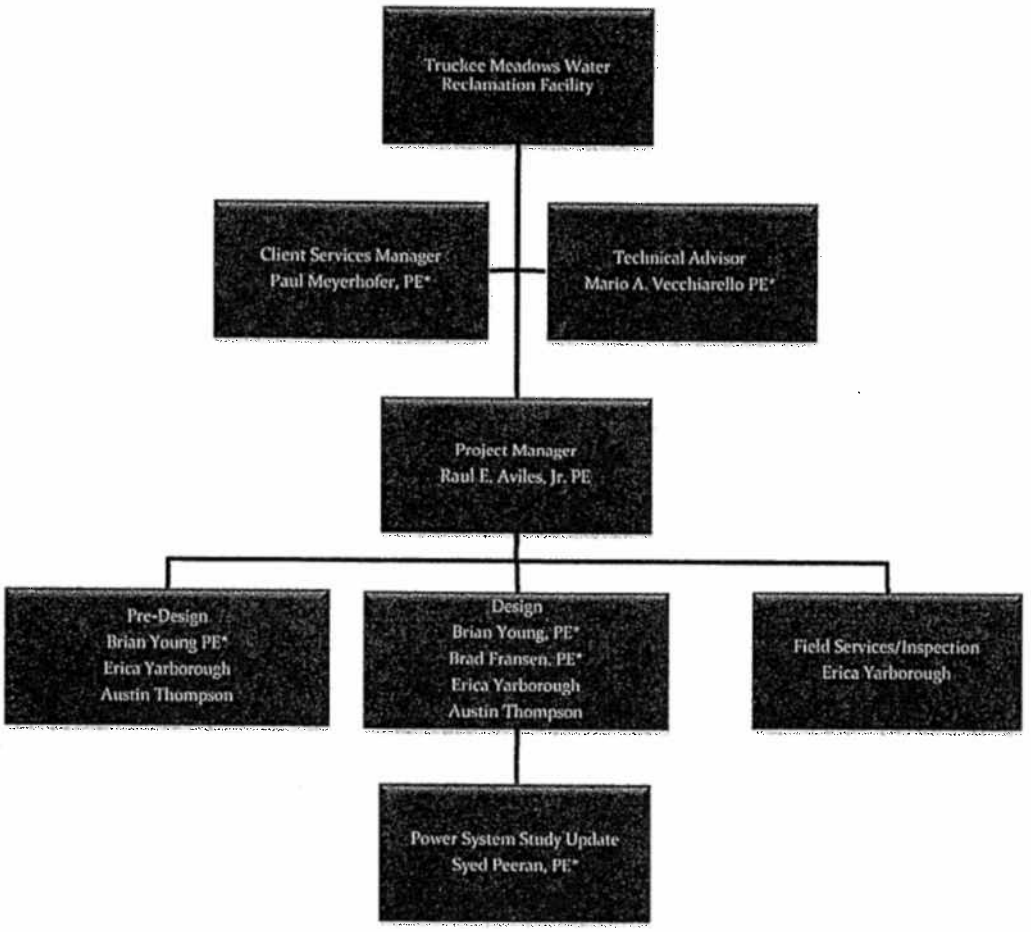
- Attachment 1 – Updated Electrical System Upgrades 2012 Scope of Services

- Attachment 2 – Estimate of Expenditures –Amendment for Electrical System Upgrades 2012 Project

- Attachment 3 – Proposed Schedule

2. Project Team and Management

CDM Smith is committed to providing services from our Carson City, Nevada office. CDM Smith proposes a project team led by Raul Aviles who served as project manager for the 2012 TMWRF Electrical Systems Upgrade project. He will serve as the primary contact with the City and be responsible for communications, budget, schedule, quality assurance, and deliverables.



***Not registered in Nevada**

CDM Team Member Collaborative Experience

To meet the aggressive schedule requirements, CDM Smith has assembled the most qualified group of engineers to perform the project. The team selected to support this project has extensive experience with electrical retrofits and equipment replacement.

Responsibilities of CDM's Key Personnel

Raul E. Aviles, Jr., PE

Mr. Aviles will serve as the Project Manager and direct point of contact for the City. He has over 20 years of experience in the field of design engineering and maintenance. His design experience involves electric power engineering, including power distribution, power generation, control and power system analysis; cogeneration, steam turbines and standby engine generator systems. His experience includes control system integration, including programmable logic controllers, instrumentation, control panel design, PLC logic development, and programming. Mr. Aviles has managed and provided engineering support for numerous projects that included feasibility studies, energy audits, development of capital investment proposals, cost justifications, equipment specifications, procurement, bid contracts, installation, field supervision, inspection, instrument calibration, cost estimation, budget management and start-up of electrical, instrumentation and control systems for wastewater and water treatment, industrial, electronics, and research facilities.

Prior to joining CDM Smith, Mr. Aviles spent 10 years in the pulp and paper industry as a maintenance engineer and maintenance/process manager. His industrial experience included the maintenance and operation of large electrical power plant and wastewater power distribution industrial systems (200 MVA) with multiple steam turbine generators, hydro-generators, and networked distribution systems. Mr. Aviles' experience also included detailed engineering and maintenance for manufacturing and power generation systems; as well as supervision, capital budget management, and process optimizations.

Paul Meyerhofer, PE*

Mr. Meyerhofer has over 37 years of experience focused on the planning, design and construction of water and wastewater projects. The total construction value of projects designed and constructed under his supervision exceeds $500 million. Mr. Meyerhofer is also experienced in several aspects of alternative project delivery, including CM-at-risk, design build, and concurrent design and construction. He has also taught engineering courses and seminars at universities in California, Colorado, and Utah. He will be supporting Mr. Aviles to insure he has the resources and full support of the firm in completing this important project and meeting the City's expectations.

Mario A. Vecchiarello, PE*

Mr. Vecchiarello will serve as the Project Technical Advisor and has more than 23 years of experience in electrical engineering. Mr. Vecchiarello is the Electrical Practice Leader for CDM

Smith and will oversee the project through completion. He has been responsible for engineering design, cost estimating, and services during construction of electrical systems for municipal water and wastewater systems; high technology treatment facilities for the food processing, biotechnology, and pharmaceutical industries; as well as a variety of facilities at military installations.

Brad Fransen, PE*

Mr. Fransen's 25-year background in electrical engineering with multiple engineering firms has given him valuable experience and insight into the various ways and methods electrical designs can be performed. This allows him to be able to determine the best way to do an electrical design based on the client's needs and project requirements leading to successful electrical designs. Mr. Fransen's experience includes sterling engine solar power, paralleling of multiple power sources, power distribution, control and instrumentation design, developing budgets, providing engineering and construction cost estimates, construction phase services, resident engineering, start-up, troubleshooting, flood damage inspections, engineering management, and construction supervision. Mr. Fransen has performed these services on a wide array of systems including medium and low voltage, industrial controls, and instrumentation in the United States and Israel. This experience has been gained as a consulting engineer and as a manufacturing engineer. He also has expertise in low-voltage and medium-voltage variable frequency drive (VFD) applications.

Syed M. Peeran, Ph.D., PE*

Dr. Peeran is a senior electrical engineer with over 20 years of experience in electrical distribution systems. He provides technical consulting on quality assurance/quality control (QA/QC), electrical system analysis and coordinating with CDM Smith overseas office in Chennai, India. His expertise includes design of low voltage and medium voltage electrical distribution for wastewater treatment plants (WWTPs) and telecommunication data centers, selection, specification and testing of large variable frequency drives, short-circuit studies, protective device coordination and stability studies, power quality assessment and failure analysis of large electrical equipment.

3. Management Control Program

The project will be executed by CDM Smith under the direction of Mr. Paul Meyerhofer, serving as Client Services Manager, and Mr. Raul E. Aviles serving as Project Manager. Mr. Meyerhofer's responsibility will be to ensure that all of CDM Smith's quality management practices, budget, and schedule are adhered to and the appropriate personnel are dedicated to

this project. Mr. Aviles' role will be to oversee the day-to-day execution of the project by coordinating the work of CDM Smith's staff and communicating project status and issues to TMWRF. Mr. Aviles will communicate the progress of the project on a monthly basis. In addition to managing the design portion of the project, CDM Smith will work with TMWRF in managing the total project, including procurement, construction, and operation to meet all project goals.

Cost and Schedule Control Methodology

Mr. Aviles will use CDM Smith's computer-based Project Management Control System consisting of numerous tools and reports to control all elements of project costs. This produces weekly and monthly reports that provide accurate, complete, up-to-date information that will aid Mr. Aviles in effectively tracking the progress of project tasks, and to identify early any deviations to planned budget and schedule so that corrective actions can be implemented. System reports show details of expenditures versus estimates and provide budget tracking on an earned value basis and the analysis and updating of budget projections.

Quality Control

Overreaching all of these systems is CDM Smith's commitment to quality assuring that the City is satisfied with the end result. Procedures for maintaining quality include:

- A project kick-off meeting with the City and key CDM Smith team members.
- Personal commitment by all team members to provide high quality products.
- Internal cross checking and coordination procedures on all deliverables.
- A quality assurance sign-off sheet completed by each responsible professional for every project deliverable attesting that all quality control procedures have been performed.

4. Proposed Schedule

Our team is available and ready to begin working immediately on this important system design effort. Our proposed schedule, as shown in Attachment 3, shows anticipated progress of work, key milestones, and review periods.

5. Project Fee

Per the additional tasks identified in this amendment, the additional fees are $274,190, and include $50,000 contingency. The contingency will not be used without written approval by the City's Project Manager.

Based on the original approved agreement fees of $455,480, the total agreement value upper limit with this amendment is $729,670, and will be based on time and materials not to exceed the upper limit of the contract. CDM Smith will invoice the City of Reno on a monthly basis.

CDM Smith appreciates the opportunity to work with TMWRF on this important project. CDM Smith is very excited about this opportunity to continue the work we started in 2010 with both the City's staff and the TMWRF Operations and Maintenance Staff in delivering a successful project. Please feel free to contact Raul at 602-281-7900 or any of our team members, should you have any questions. We would be happy to meet with you to review our amendment in detail.

Very truly yours,

Paul F. Meyerhofer PE, BCEE
Senior Vice President
CDM Smith Inc.

Raul E. Aviles PE, CPE, CEM, CEA, GBE
Vice President
CDM Smith Inc.

Attachment 1

Electrical System Upgrades 2013
Scope of Services - Addendum

The following scope of services provides preliminary design detailed design, bid services, and construction services for the Truckee Meadows Water Reclamation Facility (TMWRF) Electrical Power Distribution Equipment Replacement project. ***All new addendum modifications are shown in italic and bold font.***

In order to accomplish these goals, the CONSULTANT will perform the following tasks:

1.0 Project Management and Quality Control

1.1 Project Management

The objective of this task is to manage the project to produce a quality set of design documents, on time, and within budget. Major activities include project administration, meetings and workshops, and quality assurance/quality control.

1.1.1 Project Administration:

1. Prepare a Project Management Plan (PMP). The PMP will provide team members information on the project-specific procedures to be employed on the project. The PMP will be an internal CONSULTANT working document but will be made available to TMWRF.
2. Oversee and coordinate the activities of CONSULTANT project team members assigned to this project.
3. Communicate regularly with TMWRF's project manager.
4. CONSULTANT will prepare a Gantt chart at the subtask level that will be used to show the Schedule.
5. CONSULTANT will submit monthly invoices to TMWRF's project manager.
6. CONSULTANT will provide an electronic document room (e-room) for document management and sharing throughout the duration of the project.
7. ***CONSULTANT will include additional project management services to coordinate the amendment scope as described in this document.***

1.1.2 Project Meetings:

Regular team meetings and specific project meetings will maintain effective communication between CONSULTANT and the Cities of Reno and Sparks staff. The following meetings will be conducted during the project:

1. ***Consultant will add an additional two meetings to organize and conduct a series of project team meetings required to address the modified scope of services.*** Organize and conduct a series of project team meetings. Project team meetings will occur regularly during the core

period of the design. Budget for discipline lead team members is allocated under their specific tasks. CONSULTANT staff will be joining via teleconference.

2. Attend a kick-off meeting. Meeting will be held at TMWRF and include design team and all appropriate TMWRF staff to discuss the overall goals of the project and learn key issues that need to be addressed in the pre-design phase.
3. ***Conduct an additional workshop meeting to include the additional scope of services and clarify and document the selection of the electrical systems upgrades to be included in the project.***
4. ***Modify Pre-design Memoranda/30 Percent Design Document Review Meeting to include addenda items as described herein. Meeting to review pre-design memoranda and 30 percent design documents.***
5. 60 Percent Design Document Review Meeting. Meeting to review 60 percent design documents.
6. 90 Percent Design Document Review Meeting. Meeting to review the 90 percent design documents.
7. Final Design Document Review Meeting. Meeting to review the Final Design documents.
8. Installation Contract Pre-Bid Meeting. Meeting for pre-bid presentation and discussion to interested bidders for the installation contract.

1.2 Quality Assurance (QA)/Quality Control (QC):

1. CONSULTANT will conduct reviews of major design criteria and calculations on an ongoing basis. Design calculations performed by the various disciplines will be reviewed.

2. CONSULTANT will provide reviews of the 30 percent, 60 percent, 90 percent, and Final Design documents. Drawings and specifications will be reviewed.

Assumptions: The following assumptions were made in preparing the budget for the above described task items.

- ***Consultant is including three additional days of quality assurance/quality control to address the amended scope of services for the project.***
- Prior to all specific project meetings, an agenda will be prepared and provided to the TMWRF project manager.
- Subsequent to all meetings minutes of the meetings will be prepared and sent to the TMWRF project manager.
- TMWRF staff will review and make comments prior to review meetings for specific project milestones.
- TMWRF staff will consolidate comments into a single document to be provided to the CONSULTANT at the review meetings for specific project milestones.

Work Products:

1. One copy of the original and one copy of all significant updates of the Project Management Plan.
2. Initial project schedule and updates.
3. Monthly invoices.
4. Agenda for each of the above described meetings.
5. Minutes from each of the above describe meetings.

2.0 Pre-Design Services

CONSULTANT understands that the Cities of Reno and Sparks want to continue improving the reliability and safety of the existing electrical system. This effort started in 2010 with the Electrical Systems Improvement 2011 Project which addressed critical upgrades and improvements to the existing plant electrical system. The scope items are required in order to address the critical priorities identified during the October 2011 CIP Risk Assessment and Prioritization workshop. This effort will require the definition of the electrical design criteria, develop the necessary design standards, and define the proper equipment specified for the upgrades.

CONSULTANT participated in the CIP FY 2012 Risk Analysis and discussed the potential improvements to the existing electrical system. This included the following:

- Review and design of the improvements for the protection relaying scheme of the Plant's Power Building Transformers A & B. The Square-D Arc Flash Study has identified the transformers protection settings as "dangerous" due to the potential to harm the plant staff and the resulting downtime that an arc flash failure can cause the plant.

- Provide data collection and field work to support the design development for the project. TMWRF maintenance staff time is limited; CDM Smith will provide engineering support to collect data, field measurements and documentation necessary to produce the drawings and specifications for the 30, 60, and 90% design submittals. This includes three plant site visits and working in the existing plant drawing archives located in the maintenance building of the facility. Design of the Nitrification transformers A and B replacements. In the latest SD Myers transformer testing report, the oil test indicated steady degradation of the transformer insulation.

- Design of the of the Nitrification Building LVDC 5 switchboard replacement. The Square-D Arc Flash Study has identified the Low Voltage Distribution Center protection settings as "dangerous" due to the potential to harm the plant staff and the resulting downtime that an arc flash failure can cause the plant. The switchboard is 25 years old and is approaching the end of its service life.

- Design of the Filter Building transformers A and B replacements. In the latest SD Myers transformer testing report, the oil test indicated steady degradation of the transformer insulation.

- Design of the Filters Building LVDC 4 switchboard replacement. The Square-D Arc Flash Study has identified the Low Voltage Distribution Center protection settings as "dangerous" due to the potential to harm the plant staff and the resulting downtime that an arc flash failure can cause the plant. The switchboard is 25 years old and is approaching the end of its service life.

- Design of the Filters Building LVDC 4A switchboard replacement. The Square-D Arc Flash Study has identified the Low Voltage Distribution Center protection settings as "dangerous" due to the potential to harm the plant staff and the resulting downtime that an arc flash failure can cause the plant. The switchboard is 25years old and is approaching the end of its service life.

- Design of the Utility C feeder LVDC 6 switchboard replacement. The Square-D Arc Flash Study has identified the Low Voltage Distribution Center protection settings as "dangerous" due to the

potential to harm the plant staff and the resulting downtime that an arc flash failure can cause the plant. The switchboard is over 25 years old and is approaching the end of its service life.

- Design of the remaining priority Arc Flash Study items. The Square-D Arc Flash Study has identified the MCC 29 and MCC 3 as with the potential to harm the plant staff and the resulting downtime that an arc flash failure can cause the plant. The switchboard is over 25 years old and is approaching the end of its service life.

- Prioritize, coordinate, and assist with the relay and breaker setting modifications included in the Square-D Arc Flash Hazard Analysis Table classified equipment under Dangerous, Category 4, Category 3, and Category 2.

- CONSULTANT will prepare the Arc Flash Equipment Labels (total of 24) for the equipment included in the scope described above.

2.01 Additional Scope of Services

- *Electrical design to replace the existing MVSWGR-1 Medium voltage switchgear with new Eaton Electric medium voltage switchgear. This includes the addition of new bus ducts from the facility's existing 5000 kVA transformer 2.4 kV secondary sides. This task also includes bidding support, and services during construction for the MVSWGR-1.*

- *Current project scope includes the design engineering services required to upgrade the Nitrification Building's two existing 1500 kVA transformers and the 2000A LVDC-4 switchboard with equal capacity equipment. Following the August 2013 CDM Smith load study results, it was recommended to upgrade the switchboard and transformers to 2000 kVA capacity and the switchboard to a 3000 A bus rating. Structural scope includes switchgear, medium voltage switch and transformer concrete pads and fire wall modifications for the transformers, and new parallel underground duct banks to increase the capacity of the Nitrification building.*

- *The existing Nitrification Building electrical system has a single radial feeder and no redundant back-up. The new scope includes the design and installation of a new feeder (cable and conduit in underground duct bank) from MVSWGR-1 to provide redundant feed to the Nitrification Building. The new MVSWGR-1 has a spare breaker cell that will be used to provide the parallel redundant feeders to the existing radial system. The design modifications include the addition of two new overhead conduits from MVSWGR-1 to manhole P-8, 3 conduits from P-8 to P-9, 2 conduits from P-9 to P-10, 2 conduits from P-10 to P-11, 3 conduits from P-11 to P-12, and 2 conduits from P-12 to the Nitrification Building Transformer medium voltage switches.*

- *The existing Filter Building electrical system has a single radial feeder and no redundant back-up. The new scope includes the design and installation of a new feeder (cable and conduit in underground duct bank) from MVSWGR-1 to provide redundant feed to the Filter Building. The new MVSWGR-1 has a spare breaker cell that will be used to provide the redundant feeder to the existing radial system. The design modifications include the addition of a new overhead conduit from MVSWGR-1 to manhole P-8, using the existing spare conduit from P-8 to P-9, P-9 to P-10, P-10 to P-11, P-11 to P-12, and from P-12 to the Filter Building Transformer medium voltage switches.*

- *CONSULTANT conducted a standby power system study for the plant that identified a recommended generator configuration to accommodate full plant backup power. The recommended approach includes constructing the system in three stages. The first stage is to provide permanent generator connection facilities to the existing distribution system so that portable generators can be quickly connected to the switchboards. The design will allow quick connection of portable generators so that power to the entire plant may be quickly restored in the event of a utility or local power outage. The second and third stages of the recommended approach for plant standby power are to install permanent generators in a central standby power plant. The second and third stages are not included in this proposal as this time.*

- *CONSULTANT will design permanent facilities to accommodate connection of portable generators to key switchboards throughout the plant. The switchboards that will be provided with connections are as follows, LVDC 1, LVDC 2/3, LVDC 4, LVDC 5, Influent PS, and LVDC 6. The design will include new Quick Connect Generator Switchgear (tap box) with a feeder circuit breaker for the generator(s) at each location. Portable Generator(s) will be required to connect to each of the tap boxes as required to supply standby power when necessary. The portable generator(s) can be purchased or rented or some combination. CDM Smith will provide specifications for a 1000kW portable generator as part of the project. The purchase of the generator may or may not be included in the scope of the construction of this project as requested by the City.*

- *A permanent portable generator connection for the blower MCC is not included in this project. A new medium voltage switch with a step down transformer for the generator tap box at the influent pump station MCC location will be included in the design.*

- *Prepare additional single line diagrams for the project showing the additional improvements included in this addendum.*

- *Prepare additional demolition plans to indicate the modifications required for the equipment replacement identified in this addendum.*

- *Modify the existing drawings that will be affected by the new equipment replacements and provide record documents to indicate the modifications required in the scope of services*

- *Modify the "Maintenance of Plant Operations Plan" (MOPO) included in the original scope of the project to include the above listed new scope items included in the Addendum. Modify and update the existing detailed electrical design including a drawing list, electric single line diagrams, electric power distribution drawings and schematics, motor list and schematics, motor control schematics, power and control drawings, lighting panel schedules, junction box layout drawings, control schematics that are not shown on the motor control schematics, relay panel wiring diagrams, conduit schedule and conduit layout, and power panel changes.*

- *Modify the pre-design report to include the additional scope of the addendum. New submittal will include the scope of services included above and will coordinate the design and construction requirements with the City staff and confirm the design criteria.*

- *Provide any needed demolition drawings for electrical equipment being removed due to the new scope of services included in the addendum.*

- *Increase the existing project scope to include an updated engineer's opinion of probable cost within +/-30% which will include the equipment replacement cost and an estimate of design/construction intervals required for an upgrade.*

Modify the original contract scope of services to include additional layout drawings showing locations of all terminal boxes and instruments and the associated local device interfaces, panel drawings, wiring diagrams for power, communication, and grounding necessary to install all new I/O hardware interface.

After determining the preferred sequencing plan and configuration of the new electrical improvements, CONSULTANT will prepare a modified single line diagram for the project showing connections to the existing system. CONSULTANT will modify the existing scope of services to include the additional scope of services to evaluate the necessary modifications and identify issues associated with long delivery and extended outage requirements.

CONSULTANT will review the existing electrical single line drawings and control diagrams and prepare revised single line drawings including the necessary preliminary demolition and modification drawings.

After determining the preferred sequencing plan and configuration of the new electrical improvements, CONSULTANT will prepare a single line diagram for the project showing connections to the existing system. *CONSULTANT will include the new scope of services items included in Section 2.01and evaluate the necessary modifications and identify issues associated with long delivery and extended outage requirements.* In addition, CONSULTANT will evaluate up to three equipment replacement options and determine the most economically feasible option to reduce the outage duration and O&M costs for the plant. *CONSULTANT will provide an amended technical memorandum to be included in the pre-design report including the additional scope of services items included in the amendment with the recommended options and the equipment selected.*

CONSULTANT will review the existing electrical single line drawings and control diagrams and prepare revised single line drawings including the necessary preliminary demolition and modification drawings.

2.1 Project Workshops

During the project workshop, the TMWRF/CONSULTANT team will prioritize a list of project objectives, create a list of the potential electrical upgrades, and evaluate the list using the identified objectives to validate and confirm the electrical system upgrade solutions. This workshop will provide a documented decision path to arrive at the most appropriate electrical system upgrades for TMWRF. The documentation and buy-in that results from this process will establish a firm foundation for confidently moving ahead with the design.

In preparation for the workshop CONSULTANT will review cost and replacement information on your current electrical system and prepare list of alternatives. *CONSULTANT will modify the existing scope to include the additional items included in Section 2.01 of this document. Additional two days of workshops are included to address new items of the Phase II scope.* CONSULTANT will facilitate the comparison of alternatives in terms of ability to meet prioritized objectives. By evaluating the cost,

risk, and the practical aspects of the outage time requirements, CONSULTANT working with the Cities will present the best economic alternatives for replacement.

The workshops will focus on the strategy for implementing the electrical plant improvements. By combining the plant's maintenance staff knowledge and CONSULTANT experience with replacements and retrofits the team will develop the replacement plan to be used during the design phase. This way the efforts will be focused on equipment replacement that will maximize the plant's electrical system reliability and minimize any unnecessary outages to the plant operation. This is critical to consider and confirm prior to commencing on the final design.

2.2 *Predesign Memoranda*

Predesign Memoranda and a 30 percent document set will be completed which will describe the approach recommended by the design team for development of the facility electrical improvements and equipment replacement. Predesign Memoranda are described in Subtask 2.2.1, 2.2.2 and content of the 30 percent Design Documents is described in Subtask 2.2.3.

The following predesign memorandum will be prepared by the CONSULTANT. The memorandum will address the items identified by TMWRF as key to the electrical improvements to the facility. The memorandum will serve as the basis of design and will provide direction to determine appropriate equipment selected for and priorities for replacement.

2.2.1 Electrical Power Equipment Replacement Memorandum

CONSULTANT will amend existing scope of services as described in Section 2.01 to include the additional scope of services. Switchboard, Motor Control Center, and transformer replacement considerations will cover equipment manufacturers, layout, and construction sequencing. Interconnection requirements to the existing system will be described. The existing electrical system will be evaluated to determine if it is suitable for reuse. Any problems that are discovered during preliminary review of the electrical system will be addressed. Significant impacts that could affect the plant operability and any equipment installation constraints such as size, access, and clearance from two selected manufacturers will be identified. Recommendations for design directions will be made to resolve any deficiencies identified.

2.2.2 Construction Cost and Sequencing Memorandum

A construction cost and schedule will be developed based on the anticipated design direction determined through the pre-design memoranda and 30 percent design documents.

2.2.3 Standby Generator Design Memorandum

CONSULTANT will provide a preliminary design technical memorandum that will include the connection of portable generators to key switchboards throughout the plant. The switchboards that will be provided with connections are as follows, LVDC 1, LVDC 2/3, LVDC 4, LVDC 5, Influent PS, and LVDC 6. The design will include new Quick Connect Generator Switchgear (tap box) with a feeder circuit breaker for the generator(s) at each location. Construction cost and schedule will be developed based on the anticipated design defined in the Substation design memorandum and the 30 percent design documents.

2.2.4 30 Percent Design Documents

The 30 percent design documents will cover the following areas to allow TMWRF to approve a design approach for the project. The 30 percent design documents will include the following items:

- Preliminary equipment layout drawings
- Preliminary single line demolition diagrams
- Preliminary single line diagrams
- Preliminary layout drawings
- Equipment list

Layout drawings will include major equipment and will be generic in nature until final equipment selection for the switchboard, motor control center, and transformers are completed.

- Electrical Rooms.
- Electrical field equipment replacements such as switchboards, motor control centers, and transformers.

Assumptions: The following assumptions were made in developing the scope and budget for this task.

- The Predesign Report will consist of a pre-design memoranda developed as a brief, independent document that is associated with the 30 percent design documents to provide additional background and descriptions to support the information provided in the drawings.
- Switchboard, motor control center, and transformer considerations will be limited to the main providers that the CONSULTANT has successful experience with.
- This scope assumes that modifications to the existing building will be limited. Any unforeseen modifications will be considered outside the scope of this document. No new buildings will be required.
- The 30 percent design documents will include the above mentioned drawings and a list of specifications. Drawings will be provided both in half size hard copy format in the quantities described below and in AutoCAD 2008 format. AutoCAD drawings will conform to CDM Smith CAD standards.

Work Products:

1. One original and five copies of the 30 percent Design Documents to TMWRF for review and comment.
2. *One original and five copies of the items included in* 2.2.
3. Copy of the Electronic Files located in the current CDM Smith/TMWRF E-Room.
4. One original and five copies of the Pre-Design Report.
5. Preliminary Construction Cost Estimate.

3.0 Consultant provided Maintenance and Coordination Services

At TMWRF request, CONSULTANT is providing efforts required to assist the OWNER's maintenance staff in coordination of information gathering and field services. This will be used to properly schedule the time and availability for the assigned staff to work with the OWNER's project team. CONSULTANT level of effort estimate is the following:

- *Kick off facility tour and CONSULTANT staff familiarization with new work areas - 24 hours(increase from 16 hours)*

- *Workshop – 32 hours (increase from 16 hours)*
- *Field Investigation – 64 hours (increase from 40 hours)*
- *Weekly conference calls – 60 hours(increase from 40 hours)*
- *Technical reviews/ assessment / equipment specs – 60 hours (increase from 40 hours)*
- *Visit schedules/logistics/vendor meetings – 52 hours (increase from 40 hours)*
- *Total estimated effort for support staff- 292 (increase from 192 hours)*

4.0 Design Services

Once the key decisions are made in the pre-design phase and the equipment replacement priority is determined, detailed design will begin. The drawings and specifications will be suitable for obtaining competitive construction contractor bids. Design submittal packages, including revised engineer opinion of probable cost estimates, will be submitted for review at the 60 percent, 90 percent, and final stages. Final approved design drawings will be submitted on full sized sheets and generated in AutoCAD. Each design submittal package is to include an updated cost estimate and updated construction schedule. ***CONSULTANT is including additional labor to address amendment scope items included in Section 2.0 of the amended scope of services document.***

4.1 Electrical Equipment Selection

CONSULTANT will design the electrical system improvements listed above and determine the design criteria and specifications required to meet the design requirements. CONSULTANT will meet and work with several electrical equipment vendors to identify the proper equipment replacement. CONSULTANT will work with the plant electrical staff to identify the necessary equipments and modifications to the existing electrical system.

CONSULTANT will provide the following:

- CONSULTANT will prepare preliminary specifications to obtain budgetary quotes and preliminary drawings to prepare the design documents.
- CONSULTANT will review the vendors documentation and quotes to make sure the required equipment will fit in the existing space and the budgetary cost will be within the TMWRF allocated Capital Investment Plan.
- CONSULTANT will modify the specifications and make the necessary changes to the equipment design to meet the intent of the equipment replacement cost.
- CONSULTANT will use the information obtained in this task in the preparation on Task 5.0 – Engineer's Opinion of Probable Cost.
- ***CONSULTANT is including additional labor to address amendment scope items included in Section 2.0 of the amended scope of services document.***

4.2 Electrical and Structural Design

CONSULTANT understands that the TMWRF wants to continue improving the reliability and safety of the existing electrical system. The scope items are required in order to address the critical priorities identified during the October 2011 CIP Risk Assessment and Prioritization workshop. CONSULTANT

will work with the plant electrical staff to identify the necessary modifications to the existing electrical system.

CONSULTANT will provide the following:

- ***CONSULTANT is including additional labor to address amendment scope items included in Section 2.0 of the amended scope of services document.***
- CONSULTANT will prepare a single line diagram for the project showing connections to the existing feeders, motors, and transformers/low voltage power panels.
- CONSULTANT will prepare the demolition plans to indicate the modifications required for the equipment replacement. This will include the equipment prioritized during the workshop phase of the project.
- CONSULTANT will modify the existing drawings that will be affected by the new equipment replacements and provide record documents to indicate the modifications required in the scope of services.
- "Maintenance of Plant Operations Plan" (MOPO). It is envisioned that the work under this scope must be coordinated with the Plant Operating Personnel and accomplished in a logical order to maintain the process flow through the plant and to allow construction to be completed within the time allowed by the project schedule. Working together with the maintenance staff, CONSULTANT will develop a plan to address the construction phase and to coordinate the activities with the other contractors, if any, to allow orderly and timely completion of all the work and minimize the disruption of plant operations.

The design effort will include the following:

- CONSULTANT will complete the detailed electrical design including a drawing list, electric single line diagrams, electric power distribution drawings and schematics, motor list and schematics, motor control schematics, power and control drawings, lighting panel schedules, junction box layout drawings, control schematics that are not shown on the motor control schematics, relay panel wiring diagrams, conduit schedule, and conduit layout, and power panel changes.
- CONSULTANT will provide any needed demolition drawings for electrical equipment being removed due to the project work.

Assumptions

- The City will provide electrical field assistance to trace and determine the best suitable power sources for the design.

- The City will provide updated record drawings of the existing facility including electrical system. CONSULTANT work will depend on these drawings as being accurate and comprehensive.

4.3 Power System Study

IEEE Standard 141-1993 – Electric Power Distribution for Industrial Plants recommends that a short circuit analysis and protective device coordination be performed at least every five to ten years if no

major system changes have occurred in a facility that dictate a new study. IEEE further recommends that a power system study should always be performed if changes are made to the primary system, additional service are provided from alternate sources, the addition of larger loads or the installation of generator(s) on the primary electrical distribution system. It is understood that the plant just performed an Arc Flash Study for the entire facility. CONSULTANT will use as much of the information used in the Arc Flash Study to prevent the duplication of efforts. All additional modifications to the system not included in the Square-D Arc Flash Study will be provided by CONSULTANT.

A power flow study will be modified to determine the power system power and reactive flow, bus voltages, and transformer taps for varies operating modes.

The short circuit analysis performed in the Electrical Systems Improvements 2011 project will be modified to determine the magnitudes of the currents flowing in the modified power system at various times after the occurrence of a short circuit fault. The study will include three-phase and single phase to ground faults at different locations throughout the system. The information will be used to verify if the existing electrical protective devices have sufficient short circuit capabilities to interrupt a short circuit and provide guidance in the determination of the proper sizes of circuit breakers, fuses, and switchgear.

The ultimate goal of this study will be to achieve an appropriate balance between equipment protection and fault isolation.

4.3.1 Power Flow Study

A power flow analysis of the plant's electrical system will be performed to determine the steady state voltage and power flow characteristics. These characteristics shall be used to form a picture of the system performance for a particular operating state. Several single-line configurations coupled with various operating conditions will be used to determine an accurate understanding of the system. Calculations are to be done with a personal computer using a SKM Power Tools. The areas that will be covered in the study are:

- Steady state voltages.
- System reactive power flows.
- Utility intertie flows and power factor
- System performance under emergency or startup conditions.
- Transformer taps optimization.
- Capacitor placement and sizing optimization.

As part of the study CONSULTANT will provide the following:

- Single-line diagram showing system studied and computer bus numbers, if used.
- Report presentation showing MW and MVAR flows and bus voltages.
- Commentary for each case shall be based on these one-lines.
- Tables, as necessary, to highlight different conditions such as overloaded lines, voltage problems, etc.
- A discussion will be provided of the procedure used and the assumptions made.
- Impedance data and a sample solved solution computer output will be included the report.

The analysis will focus on the following cases:

- Normal conditions (select and coordinate case with TMWRF)
- Emergency conditions (select and coordinate case with TMWRF)
- Alternate conditions (select and coordinate case with TMWRF)

The system to be studied includes the existing system as shown in the City of Sparks Wastewater Treatment Facility single line diagram. The calculations for equipment verification shall conform to ANSI Standards C37.010-1999, C37.13-1981, NEMA-AB1 and UL-489.

4.3.2 Short Circuit Study
The specific requirements for the short circuit study are:

- Single-line diagram showing system studied and computer bus numbers, if used.
- Maximum three first-cycle asymmetrical and symmetrical interrupting short circuit currents for each 4.16 kV bus in the system.
- Maximum line-to-ground short-circuit current on the solidly-grounded portion of the system.
- Fault point X/R ratios at each bus (tabulated or in computer printout).
- Symmetrical current contributions for each branch connected to the fault.
- Detailed equipment duty tables for breakers, fuses, and switches shall be provided for first-cycle and interrupting currents. Tables shall include equipment ratings and calculated duties. Any overdutied equipment shall be identified and recommendations provided.
- A discussion shall be provided of the procedure used and the assumptions made.
- Impedance data and a sample short circuit computer output shall be in the reports.
- The Coordination and Device Settings Study will be provided from 480V buses up to the 24.9 kV Sierra Pacific Power Electric Utility service. The existing protective device setting at the wastewater facility will be considered changeable. The recommended settings will quickly isolate the fault and minimize system damage and downtime.

4.3.3 Protective Device Coordination (new work only)
The Protective Device Coordination Study scope requirements are:

- Settings for overcurrent relays, voltage relays, current relays, and generator relays. The system protection is comprised of low voltage breakers with undervoltage and overcurrent protection and cut-out pole mounted fuses for the pad mounted transformers. Overload settings will follow NEC and ANSI requirements.
- Detailed analysis and discussion of the equipment settings and characteristics with respect to their coordination and protective capability will be provided for transformers, and generator protection. Equipment determined to be inadequate will be highlighted, and recommendations will be provided.
- Phase and ground time current and instantaneous overcurrent relays should be shown on time-current coordination curves
- Time current curves will be drawn for limiting conditions. For each bus a time-current curve will include the largest downstream protective device, the feeder, and incoming breakers.
- Any time-current curves furnished will be neatly drawn or computer generated.

- For transformer feeders, the time-current will show inrush currents, continuous ratings, and transformer damage curves as described in ANSI C57.109-1984.
- Cable protection will consider overload and short circuit damage points as outlined in the NEC, ANSI, and applicable technical manuals.
- Protective device settings will be tabulated and cross-referenced to the appropriate time-current curve.
- Calculation sheets will be provided for relays that cannot be shown in the time current curves.
- If additional relays are recommended, where appropriate, provide either the model number with the suggested settings or settings in primary amperes and time.
- The protective device settings will be for the present system. In this protection study or other studies associated with this scope, if recommended system or relay changes would affect the protective device settings, these areas are to be identified.
- The following specific information will be shown on the time current curves.
- One-line diagram of the system under study
- Protective device identification and settings
- Current ratio for the curves
- Transformer damage curves and NEC reference loading benchmarks
- Transformer inrush points
- Motor starting and protection curves
- Melting, and clearing curves for fuses
- Protective device time current curves
- Protective device settings
- Arc Flash Study to determine proper safety warning labels, clothing, equipment, and boundaries to meet code requirements, including a summary of arc flash values for each bus.
- The short circuit analysis and Protective Device Coordination will include three standard cases:
  - Normal Conditions (Sierra Pacific Electric Utility Feed)
  - Both Engine Generators Operating
  - Single Engine Generator Operating.

CONSULTANT will perform data collection for the study. Data collection shall consist of a review of available as-built drawings and documentation, single-line diagrams, and field inspection. The TMWRF will provide an electrician to help locate the equipment for data collection. Historic data will be provided by the TMWRF and will include as-built drawings and documentation, data collected from previous studies (if any), field metering, outage reports, relay test, and setting sheets.

The data provided to CONSULTANT by the TMWRF will include:

- A complete and accurate one-line diagrams of the facility.
- Manufacturer and model of interrupting equipments.
- Listing of high-voltage relay settings, types, model numbers, CT ratios, and VT ratios.
- Listing of low and medium voltage breaker settings, type of breaker, type of trip, current rating.
- Maximum demands for substation loads.
- Cable sizes, lengths, number, and conductor material.
- Busway current rating, lengths, conductor material, and manufacturer.

The study will include a system one-line diagram of the power system modeled. The Short Circuit and Protective Device Coordination report shall identify potential problem areas and recommendations to correct them. Five copies of a bound report will be included. The final report shall include the following:

- Introduction
- Summary of results
- Recommendation
- Data and any assumptions used
- Discussion of studies and results
- Single-line diagrams
- Tables
- Time Current Coordination Curves
- The recommended protective device or settings will be in tabular forms in the report. Protective settings will be grouped by area.
- A meeting will be held to review the scope of the study, define data requirements, and establish a familiarity with the City's special requirements and engineering personnel. It is recommended that the City of Sparks designate a responsible individual to be the principal contact on all technical matters involved in the study. CONSULTANT and City of Sparks contact person will work together during this initial meeting to define case conditions for the study. Interim engineering meeting(s) will be scheduled at major milestones to review initial findings and to reaffirm the study direction or cases to be examined.
- A total of two virtual meetings are included in this task. The final meeting will be scheduled to present the study report and to discuss in detail the findings and recommendations of the study. This meeting will be scheduled after delivery of the report to give the City's staff time to review the contents of the study.

4.4 Instrumentation & Control (I&C)

CONSULTANT's instrumentation staff will work with the City's project team to determine the requirements for power metering equipment that would be tied to the plant's DCS system. A preliminary instrument list will then be prepared and used throughout the design.

After determining the I/O requirements for the project, CONSULTANT will make a recommendation on the need to install analog and/or discrete marshalling panels. This would allow individual conduit runs from switchgear or switchboard to the remote terminal panels and take advantage of the existing connection to the Foxboro DCS.

The design effort will include the following:

- CONSULTANT will specify, and review all metering and controls required for the DCS I/O hardware and related hardware.
- CONSULTANT will provide layout drawings showing locations of all terminal boxes and instruments and the associated local device interfaces, panel drawings, wiring diagrams for power, communication, and grounding necessary to install all new I/O hardware interface. CONSULTANT will provide any needed demolition drawings for instrumentation being removed due to the project work.

Assumptions

- CONSULTANT has not included the preparation of instrument data sheets or loop sheets in its scope of work.
- The existing DCS control system equipment has sufficient capacity to allow the addition of power metering equipment, second engine generator and auxiliary electrical, and process equipment controls.
- The City will provide electrical/instrumentation field assistance to trace and determine the best suitable power and controls sources for the design.
- The City will provide updated and accurate record drawings of the existing electrical power distribution system and the existing DCS system.

4.5 Final Design Documents

The scope of work for the detailed design is based on producing a set of contract documents for installation of the replacement electrical power equipment. ***Detailed design will be based on results from Section 2.0, Pre-Design Services and Section 2.01 additional scope services***

4.5.1 60 Percent Design Submittal

CONSULTANT internal review comments and TMWRF comments on the 30 percent submittal will be incorporated into the 60 percent submittal. The 60 percent design submittal will include demolition single line diagrams, new work single line diagrams equipment layout plans, and 60 percent level of completion for other documents. Written comments received from TMWRF will be addressed and incorporated into the 90 percent submittal.

4.5.2 90 Percent Design Submittal

CONSULTANT internal review comments and TMWRF comments on the 60 percent submittal will be incorporated into the 90 percent submittal. Written comments received from TMWRF will be addressed and incorporated into the final submittal.

4.5.3 Final Design Submittal

CONSULTANT internal review comments and TMWRF comments on the 90 percent submittal will be incorporated into the final submittal. The Final Design submittal will be submitted to the City ready for bidding and permitting.

Assumptions:

- Assumptions made under Section 2.0 regarding design criteria will carry through the design phase. ***Modifications to the original scope are shown in bold italic.***

- The number of construction drawings for the project is estimated as follows by discipline:
    - General - 4
    - Electrical – 93
    - Structural – 13

The preliminary list of the final estimates drawings for the Phase II project is included below:

Phase II Electrical Upgrades

No.	Drawing Name
G-1	COVER SHEET
G-2	INDEX SHEET
E-1	ELECTRICAL LEGENDS AND ABBREVIATIONS I
E-2	ELECTRICAL LEGENDS AND ABBREVIATIONS II
E-3	*ELECTRICAL OVERALL SITE PLAN*
E-4	*EXISTING DISTRIBUTION SINGLE LINE DIAGRAM*
E-5	*NEW DISTRIBUTION SINGLE LINE DIAGRAM*
E-6	*MAIN SERVICE SINGLE LINE DIAGRAM*
E-7	*MAIN 2400V SWITCHGEAR (MVSWGR-1) RELAY SINGLE LINE DIAGRAM*
E-8	EXISTING LVDC 5 SINGLE LINE DIAGRAM
E-9	NEW LVDC 5 SINGLE LINE DIAGRAM
E-10	EXISTING LVDC 4 SINGLE LINE DIAGRAM
E-11	NEW LVDC 4 SINGLE LINE DIAGRAM
E-12	EXISTING LVDC 4A SINGLE LINE DIAGRAM
E-13	NEW LVDC 4A SINGLE LINE DIAGRAM
E-14	EXISTING LVDC 6 SINGLE LINE DIAGRAM
E-15	NEW LVDC 6 SINGLE LINE DIAGRAM
E-16	EXISTING MCC 13 SINGLE LINE DIAGRAM
E-17	NEW MCC 13 SINGLE LINE DIAGRAM
E-18	EXISTING MCC 14 SINGLE LINE DIAGRAM
E-19	NEW MCC 14 SINGLE LINE DIAGRAM
E-20	EXISTING MCC 14 SINGLE LINE DIAGRAM
E-21	NEW MCC 14 SINGLE LINE DIAGRAM
E-22	EXISTING MCC 29 SINGLE LINE DIAGRAM
E-23	NEW MCC 29 SINGLE LINE DIAGRAM
E-24	EXISTING MCC 3 SINGLE LINE DIAGRAM
E-25	NEW MCC 3 SINGLE LINE DIAGRAM
E-26	DEMOLITION POWER PLAN I (POWER BUILDING TRANSFOMRERS A & B)
E-27	*DEMOLITION POWER PLAN II (LVDC 5)*
E-28	*DEMOLITION POWER PLAN III (NITRIFICATION BUILDING TRANSFORMERS A & B)*
E-29	*DEMOLITION POWER PLAN IV (LVDC 4)*
E-30	*DEMOLITION POWER PLAN V (FILTER BUILDING TRANSFORMERS A & B)*
E-31	DEMOLITION POWER PLAN VI (LVDC 6)
E-32	DEMOLITION POWER PLAN VII (MCC 13 & 14)
E-33	DEMOLITION POWER PLAN VIII (MCC 29)
E-34	DEMOLITION POWER PLAN VIIII (MCC 3)

E-35 *DEMOLITION DUCTBANK ROUTE I*
E-36 *DEMOLITION DUCTBANK ROUTE II*
E-37 *DEMOLITION DUCTBANK ROUTE III*
E-38 *DEMOLITION DUCTBANK ROUTE IV*
E-39 *NEW POWER PLAN I (POWER BUILDING TRANSFORMERS A & B)*
E-40 *NEW POWER PLAN II (LVDC 5)*
E-41 *NEW POWER PLAN III (NITRIFICATION TRANSFORMERS A & B)*
E-42 *NEW POWER PLAN IV (LVDC 4)*
E-43 *NEW POWER PLAN V (FILTER BUILDING TRANSFORMERS A & B)*
E-44 *NEW POWER PLAN VI (LVDC 6)*
E-45 NEW POWER PLAN VII (MCC 13 & 14)
E-46 NEW POWER PLAN VIII (MCC 29)
E-47 NEW POWER PLAN VIIII (MCC 3)
E-48 *NEW DUCTBANK ROUTE I (FILTER AND NITRIFICATION)*
E-49 *NEW DUCTBANK ROUTE II (FILTER AND NITRIFICATION)*
E-50 *NEW DUCTBANK ROUTE III (FILTER AND NITRIFICATION)*
E-51 *NEW DUCTBANK ROUTE IV (FILTER AND NITRIFICATION)*
E-52 ELECTRICAL SCHEMATICS I (MCC 3 - 16 SCHEMATICS)
E-52 ELECTRICAL SCHEMATICS II (MCC 3)
E-54 ELECTRICAL SCHEMATICS III (MCC 3)
E-55 ELECTRICAL SCHEMATICS IV (MCC 14 - 10 SCHEMATICS)
E-56 ELECTRICAL SCHEMATICS V (MCC 14/13)
E-57 ELECTRICAL SCHEMATICS V1 (MCC 13 - 09 SCHEMATICS)
E-58 ELECTRICAL SCHEMATICS VII (MCC 29 - 8 SCHEMATICS)
E-59 ELECTRICAL SCHEMATICS VIII (MCC 29)
E-60 ELECTRICAL DETAILS I
E-61 ELECTRICAL DETAILS II
E-62 *ELECTRICAL DETAILS III*
E-63 *ELECTRICAL DETAILS IV*
S-1 *STRUCTURAL GENERAL NOTES*
S-2 *STRUCTURAL PLANS AND SECTIONS I*
S-3 *STRUCTURAL PLANS AND SECTION II*
S-4 *STRUCTURAL PLANS AND SECTIONS III*
S-5 *STRUCTURAL PLANS AND SECTION IV*
S-6 *STRUCTURAL PLANS AND SECTION V*
S-7 *STRUCTURAL PLANS AND SECTION VI*
S-7 *STRUCTURAL DETAILS I*
S-8 *STRUCTURAL DETAILS II*

MVSWGR-1 Design Project Task (Bid Separately)

G-01 *COVER SHEET*
G-02 *INDEX SHEET*
E-1 *LEGEND & ABBREVIATIONS I*
E-2 *LEGEND & ABBREVIATIONS II*
E-3 *ELECTRICAL SITE PLAN*
E-4 *EXISTING DISTRIBUTION SINGLE LINE DIAGRAM*

E-5	*NEW DISTRIBUTION SINGLE LINE DIAGRAM*
E-6	*MAIN DISTRIBUTION SINGLE LINE DIAGRAM*
E-7	*MAIN 2400V SWITCHGEAR (MVSWGR-1) RELAY SINGLE LINE DIAGRAM I*
E-8	*MAIN 2400V SWITCHGEAR (MVSWGR-1) RELAY SINGLE LINE DIAGRAM II*
E-11	*MAIN SERVICE SWITCHGEAR ARCHITECTURE*
E-18	*2400V SWITCHGEAR ELEVATIONS*
E-30	*ELECTRICAL CONDUIT SCHEDULE*

Emergency Power Design Project Task (modification to the following drawings)

E-1	*LVDC 1 DEMOLITION SINGLE LINE DIAGRAM*
E-2	*LVDC 2&3 DEMOLITION SINGLE LINE DIAGRAM*
E-3	*INFLUENT PS DEMOLITION SINGLE LINE DIAGRAM*
E-4	*LVDC 1 SINGLE LINE DIAGRAM*
E-5	*LVDC 2 &3 SINGLE LINE DIAGRAM*
E-6	*LVDC 1 SINGLE LINE DIAGRAM*
E-7	*INFLUENT PS SINGLE LINE DIAGRAM*
E-8	*SCHEMATIC INTERLOCK DIAGRAMS*
E-9	*SCHEMATIC INTERLOCK DIAGRAMS*
E-10	*SCHEMATIC INTERLOCK DIAGRAMS*
E-11	*DETAILS*
E-12	*DETAILS*
E-13	*DETAILS*
E-14	*SCHEDULES*
E-15	*REFERENCE DRAWINGS I*
E-16	*REFERENCE DRAWINGS II*
E-18	*REFERENCE DRAWINGS III*
E-19	*REFERENCE PHOTOGRAPHS*
S-1	*STRUCTURAL PLANS AND SECTIONS I*
S-2	*STRUCTURAL PLANS AND SECTION II*
S-3	*STRUCTURAL PLANS AND SECTIONS III*
S-4	*STRUCTURAL DETAILS I*
S-5	*STRUCTURAL DETAILS II*

- *Contract Documents will be developed based on a single Base Bid format for Phase II.*
- As built drawings will be provided to the CONSULTANT. CONSULTANT may rely on these documents as accurate and comprehensive.
- Design budget does not include application engineering for facility DCS and HMI configuration and programming.
- 60 Percent Design Submittal: TMWRF will provide one consolidated set of TMWRF comments on the 60 percent submittal.
- 90 Percent Design Submittal: TMWRF will provide one consolidated set of TMWRF comments on the 90 percent submittal. It is anticipated that no changes, other than corrections or clarifications, will be incorporated into the Final Submittal documents.

- Final Submittal: The final submittal will be stamped and sealed, biddable document originals. Full-size drawings will be plotted on velum and specifications will be camera ready. Half-size drawings will also be plotted in a form and of a quality suitable for photocopy reproduction at half-size.

Work Products:

1. 60 Percent Design Submittal: One original, ten copies of half-size drawings and specifications. Updated construction cost estimate, project schedule, and list of specific elements requiring special TMWRF staff attention during review.
2. 90 Percent Design Submittal: One original and ten copies of half-size drawings and specifications. Updated construction cost estimate, project schedule, list of specific elements requiring special TMWRF staff attention during review, and all design calculations.
3. Bid-ready 100 Percent Submittal: One original, ten full size and five half-size copies of drawings and specifications. Updated construction cost estimate; one CD-ROM containing PDF scanned copy of the drawings and specifications and a single DVD-ROM copy of the final project drawings and specifications in ACAD format.

5.0 Engineer's Opinion of Probable Cost

CONSULTANT will prepare an intermediate cost estimate at 60 percent complete and a final cost estimate at the 100% bid document level.

6.0 Bidding and Procurement Services

6.1 Bidding Assistance for Installation Contract

CONSULTANT will provide technical input and review of construction bids during the invitation for bids. ***CONSULTANT has modified this task and expanded the scope to include the existing Phase II contract services.***

CONSULTANT will assist TMWRF in responding to technical questions during the bidding phase. Technical addenda will be prepared as required. The budget assumes that there will be one pre-bid meeting.

Assumptions:

- TMWRF will print and distribute the bid documents to the potential bidders, maintain the bidders list, copy and distribute addenda, and assist with the bid opening.
- A maximum of two addenda will be written by CONSULTANT during the bidding period.
- A permit set will be prepared for the City of Spark's Building Department.

Work Products

1. Record of bid phase questions and responses.
2. Technical Addenda.

7.0 Services During Construction

Services during construction have been modified to include items in Section 2.01 and have been increased as described herein. During construction, CONSULTANT will provide (20) RFI responses, (20) submittal reviews, (3) change order reviews, (12) site visits, (12) construction meetings, and preparation of reference drawings.

7.1 Shop Drawing and Submittal Review

CONSULTANT will review shop drawings and other technical submittals provided by the Contractor or equipment suppliers, respectively, to TMWRF.

TMWRF will transmit shop drawings and other technical submittals to CONSULTANT. TMWRF Construction Manager will use his submittal tracking and numbering system. CONSULTANT will maintain a separate submittal spreadsheet log for its use in tracking and documenting submittal reviews, which will list both TMWRF's and Contractor's respective submittal number.

Assumptions:

- CONSULTANT will write a summary memorandum of comments rather than annotate all copies of the submittal.
- *Budget assumes a total of 20 (from the original 15) submittal responses, including all disciplines and two re-submittals per shop drawing.*

7.2 Interpret Plans and Specifications

During the construction period, the Contractor will ask questions on details of the contract, substitutions, and alternative approaches that are best answered by the designer. The purpose of this subtask is to provide written clarifications for TMWRF review and use.

CONSULTANT will interpret the contract documents, review conditions claimed by the contractor to be unforeseen, and review alternative approaches presented in Requests for Information (RFIs) as requested from TMWRF.

Assumptions:

- TMRWF's general approach to construction management is to document most changes to the construction documents with RFIs.
- *Budget assumes a total of 20 RFI responses, including all disciplines and any RFIs which require multiple responses.*

7.3 Change Order Assistance

CONSULTANT will prepare change order descriptions, sketches, etc. as requested by TMWRF. Prepare construction cost estimates for proposed change orders as requested by TMRWF.

Assumptions:

- Construction change orders will support the project scope of work as bid.

- Change order documentation will not be developed in AutoCAD format unless hand drawn sketches of markups of the drawings will not adequately describe the nature of the change to the contractor.
- *Budget assumes up to 3 change order reviews (from 2) change orders will be prepared.*

7.4 Specialty Inspection Services

CONSULTANT will provide specialty electrical inspection services as requested by TMWRF up to the limit of the budget assumed below. The inspection consists of factory witness testing and field witness testing for conformance of the switchgear, switchboard, and transformers to the design documents.

Assumptions:

- *The electrical engineer will make ten one-day (from eight days) site visits during the construction phase.*

7.5 Construction Meetings

A representative from CONSULTANT will attend weekly construction meetings, starting with the preconstruction meeting. *The budget has assumed a total of 12 (from 10 included in the original scope) meetings will occur during this time.*

7.6 Record Drawings

CONSULTANT will prepare record drawings of the final facility layout. It is assumed that the Contractor has made accurate markups of the Contract Document drawings during the course of the work. No additional hours have been included for field verification of Contractor modifications, adaptation of RFIs, and other such as change orders documents by cross-reference into the record drawings. *CONSULTANT has increased the level of effort in accordance with Section 2.01 of this addendum.*

Work Products

1. RFI documents.
2. Submittal review comments.
3. Change order review comments.
4. *Record drawings in electronic (AutoCAD) 2010 format.*

8.0 Project Commissioning Services

8.1 Startup Assistance/Training and O&M Manual

CONSULTANT will provide startup support to assist Owner in understanding the design and operational intent of the new facilities. CONSULTANT will support TMWRF staff in preparation of an O&M Manual upon completion of the construction phase, but prior to the conclusion of startup. *CONSULTANT has increased the level of effort in accordance with Section 2.01 of this addendum.*

Work Products

1. Comments on contractor's startup plan
2. Training handouts.

3. Materials for inclusion in the existing plant O&M Manual (paper version).

PCL XL Error

Subsystem: KERNEL

Error: IllegalAttribute

File Name: kerlib.c

Line Number: 8904