APPENDIX "C" (49 pages)

TECHNICAL SPECIFICATIONS

CONTENTS

Note to Proposers: The Technical Specifications include the Design and Construction Requirements and the Secondary Technical Criteria. The distinction between these two categories of Technical Specifications is in the Design-Builder's ability to make changes. The Design and Construction Requirements may only be changed during the design stage of the project after approval by County of the requested changes. During the design phase a complete review of the specifications will be conducted jointly by County and the selected Design-Builder. This review will allow for revisions or corrections to the specifications as required based on the technology offered by the Design Builder and in the best interests of the project and in the best interests of the County. The Design-Builder will have a greater degree of flexibility with respect to the Secondary Technical Criteria. Secondary Technical Criteria will be identified in the negotiation of the Contract based on the information in the Statement of Qualifications. Proposers should consider all requirements set forth in these Technical Specifications to be Design and Construction Requirements.

TS 1.0 – Project Overview

The Project is to be located in Pima County, Arizona. Pima County (County) has identified a location (the Project Site) within the Tres Rios Water Reclamation Facility (WRF) for the installation of the Project. The Project Site, shown Attachment 4 is owned by Pima County and operated by its Regional Wastewater Reclamation Department (RWRD). The County will make the Project Site available for the Project construction.

This Project is a Design-Build project to provide a fully functional Biogas Purification System at the Project Site. The Design-Builder (the D-B) is responsible for:

1) Preparation of biogas purification technology evaluation report and recommendation
2) Design of the Project
3) Procurement of all Project components except those specifically identified in the Agreement as being County-supplied
4) Securement of all necessary permits and permissions except those specifically identified in the Agreement as being County-supplied
5) Construction of the Project
6) Start up and commissioning
7) Performance testing

The mission of the County is to protect public health, safety, and environment by providing quality services, environmental stewardship, and renewable resources. This requires providing high quality wastewater services at a reasonable cost, while balancing social, economic, and environmental impacts of wastewater collection and treatment.

The County commissioned the development of a System-Wide Biosolids and Biogas Utilization Master Plan (Master Plan). The Master Plan, published in August 2012, considered current conditions of the County's wastewater treatment facilities, and recommended the implementation of a number of projects of importance to the overall treatment operations. One of the projects recommended was the design and installation of a Biogas Purification Facility to utilize and market biogas produced from the Tres Rios WRF digesters.

A secondary object of the Project is to capture high purity carbon dioxide offgas for purposes of process use at the Tres Rios WRF. Provisions shall be made to capture the high purity carbon dioxide under a future project.

To implement this recommendation, County is installing a biogas purification system at the Tres Rios WRF with the goal of purifying the biogas to biomethane which meets the Southwest Gas distribution system standards. The biogas purification system must provide biogas purification results consistent with the

requirements set forth herein and, be capable of producing biomethane of a suitable standard for distribution, sale, and utilization.

The County's objectives for delivery of the Project are as follows:

Quality:	Provide a Biogas Purification Facility with equipment that will be sustainable and will reliably produce biomethane in accordance with the contractual standards set forth in these Technical Specifications.
Operations:	Minimizes operational and maintenance complexity.
Cost:	Minimize life-cycle cost.
Schedule:	Achieve the schedule completion date for design, construction, and performance testing of the Project.
Risk:	Achieve an optimal balance of risk allocation between the County and the D-B.
Safety:	Implement an effective safety program during construction and during all follow-up operations incorporating best industry practices.

Background

Pima County RWRD operates a Regional Biosolids Management Facility (RBMF) responsible for treating all solids from its various Water Reclamation Facilities. The RBMF is located at the Tres Rios WRF, where six sludge digesters are currently operating. The six digesters produce biogas. Currently, ferric chloride is added upstream of the digesters to suppress hydrogen sulfide production. Biogas generated is used on-site as an energy source for the boilers, while any unused gas is flared.

TS 2.0 – System Description and Components

The biogas purification system technology shall be selected from proven, commercially available technologies. The technology recommendation shall be determined by the D-B following an alternatives evaluation study which addresses the following requirements:

- Satisfies capacity and treatment objectives
- Reliable, proven operation
- Low life cycle costs
- Ease of Operations and Maintenance
- Facility meets all applicable standards and regulations
- Flexibility to treat future increased capacities

The County intends to sell the entirety of the produced biomethane product in the renewable energy markets. The County has had discussions with Southwest Gas regarding access to the Southwest Gas natural gas network for injection of biomethane. However, the County may reserve the right to use a portion of the biomethane for its own purposes in the future. The D-B will be required to work with Southwest Gas regarding the specific coordination and connection requirements. The Southwest Gas connection shall include provisions for future expansion of the system.

Main components of the Biogas Upgrading System are described with more detail below.

TS 2.1 – Biogas Purification System

The biogas purification system shall be selected and sized by the D-B after a thorough technical evaluation of biogas purification technologies is performed and the Report recommendation accepted by Pima County.

TS 2.2 - Biogas Analyzer

An analytical instrument that is suitable for the accurate analysis of all applicable biogas components, under the anticipated operating conditions shall be installed between the biogas purification system and the distribution pipeline. The analyzer shall be used to test the produced product to verify the product meets the specifications set forth by Southwest Gas. Therefore, the analytical instrument must be approved by Southwest Gas.

TS 2.3 - Biomethane Service Line

The line shall serve as the service line between the biogas purification system and Southwest Gas's pipeline.

TS 2.4 - Natural Gas Pipeline and Stubout

A natural gas system connection with Southwest Gas for the insertion of biomethane will be provided through a pipeline stubout provided by Southwest Gas adjacent to the Project Site.

TS 2.5 - Yard Piping and Valves

Project yard piping includes, but is not limited to:

- Biogas feed pipeline *(Pima County will provide a pipeline to the Project site)*
- Biomethane service line
- Natural gas pipeline stubout connection *(Southwest Gas will furnish the connection stubout)*
- Service Water Pipeline, if required
- Drain Pipeline to Plant Drain
- All necessary valves and piping required for biogas purification facility processes
- All necessary underground electrical service required at the site (*Pima County will provided underground electrical service to the Project site)*
- All process control and instrumentation infrastructure required at the site *(Pima County will provide underground fiber optic cable to the Project site for connection the plant SCADA system)*

TS 2.6 - Future Expansion

The Project must provide the necessary space and infrastructure to accommodate an expansion that will treat future projected biogas production rates. Accommodations for at least 50 percent and 100 percent expansion of biogas purification production will be included in the design for future construction.

TS 3.0 – Technology Selection and Design Requirements

The design phase of the project shall include a Technology Selection phase, in which the D-B shall review biogas purification technologies that are applicable to the Project and make a technology recommendation for the Project.

TS 3.1 - Technology Selection Criteria

The Technology Selection Phase of the Project shall include a detailed Biogas Purification Technology Evaluation Report which reviews available and applicable technologies for the Project, followed by a recommendation. The Technical Report shall include at minimum, the following:

- Introduction
- Summary of Background Materials

- Overview of Biogas Purification Production Technology Alternatives
- Water Wash Technology
- Pressure/Vacuum Swing Adsorption Technology
- Membrane Technology
- Alternatives System Costs
- Alternative Evaluations and Discussion
- Recommendation

Details of the minimum content expected in the Biogas Purification Technology Evaluation Report can be found in **Exhibit 1 To Appendix C**.

TS 4.0 – System Performance Requirements

The Biogas Purification Facility will reliably process and purify biogas at the Tres Rios WRF on a continuous basis. The Biogas Purification Facility will be properly sized to remove undesirable constituents from biogas in amounts necessary to achieve and maintain concentrations below the threshold concentrations set forth by Southwest Gas. It is the D-B's responsibility to determine the biogas composition and ensure compliance with this obligation.

Though the Biogas system will operate on a continuous basis, it is not considered a critical process at the Tres Rios facility. However, the County shall require that the Biogas Purification Facility maintain an uptime of at least 95% per year, or, a minimum uptime of 8,322 hours per year. The uptime requirements shall exclude periodic major maintenance and system condition overhauls that may be recommended by the equipment manufacturer on a periodic basis *(such as a five or ten year basis).*

The Biogas composition specifications, as set forth by Southwest Gas, are available in *Exhibit 2 to Appendix C*. A summary of key produced Biomethane properties and constituent limits are summarized in *Table 3-1*. Further information regarding compliance and expectations set forth by Southwest Gas are described in *Exhibit 2 to Appendix C*.

Table 3-1

Biogas Composition Goals

Minimum Energy Content	900 BTU per scf
Wobbe Number Range	**Minimum:** 1280 **Maximum:** 1385
Maximum Sulfur Content	**Total sulfur:** 5 grains per 100 scf (80 ppm) **H_2S:** 0.25 grain per 100 scf (4 ppm)
Maximum Inert Gas Contents	**Total Inert Content:** 4.0% **Maximum O_2:** 0.2% **Maximum N_2:** 3.0% **Maximum CO_2:** 2.0%
Gas Temperature Range	40°F to 120°F
Maximum Hydrocarbon Dewpoint	20°F
Maximum Water Content	7 lbs per 1,000,000 cf (1 MMscf) of gas

The Project must meet the Acceptance Test Procedures and Standards, and the Performance Guarantees, when treating the supplied Biogas at the range of expected flow rates. Historical biogas production rates and quality data are discussed in subsequent sections.

TS 5.0 – Construction Requirements

A contractor appropriately licensed by the State of Arizona will perform all the work necessary to provide a complete and operational Biogas Purification Facility. All work will be done only within locations approved by County and in compliance with all current local, state, and federal codes. All permits for construction will be the responsibility of the D-B. All onsite equipment, materials, and supplies will be stored only in areas designated by County for that purpose. All personnel will enter the WRF through approved access points and must comply with all County security and safety processes and procedures while on County property.

The Contractor shall design and construct the Biogas Purification Facility to achieve Biomethane that meets or exceeds the standards and specifications for the current Project. The Project must also provide sufficient space and infrastructure to accommodate a future expansion of the Biogas Purification Facility, to process increased biogas production rates. The Facility design must also include the following elements:

- All structures will be designed to withstand against the 100 year flood event. For purposes of this requirement, the term Structures includes all elements of the Biogas Purification Facility (process equipment, buildings, general site improvements, etc.) with the exception of on-site roads. The D-B will obtain flood information through direct coordination with the Pima County Regional Flood Control District, by contacting its Floodplain Permitting Division Manager at 201 N. Stone, 9th Floor, Tucson, Arizona, 85701; (520) 724-4600.
- The D-B will provide a PLC to receive real time SCADA information for the parameters furnished by Pima County and are listed below:
    - Digester Lid Elevations
    - Digester Internal Pressures
    - Digester Biogas Stored Capacity
    - Biogas Feed Pressure
    - Biogas Flowrate
    - Biogas Feed Temperature
    - Service Water Flow
- The PLC shall send real time information to the plant SCADA for the parameters listed below and up to ten other parameters that may to be determined during the design phase:
    - Influent Biogas Composition *(all measured constituents)*
    - Effluent Biomethane Composition *(all measured constituents)*
    - Effluent Biomethane Flowrate to Southwest Gas
    - Effluent Biomethane Temperature
    - Effluent Biomethane Pressure
    - Service Water Flow, if required
    - Power Usage

Instrumentation and Control

The D-B will provide the necessary systems to connect the Project furnished PLC to the Tres Rios WRF's Operations Control Center.

TS 5.1 - O&M Training

Six months prior to start-up the D-B shall submit to Pima County a complete draft O&M manual for review and comment by Pima County. The O&M Manual shall be specific for the subject Project and in a form acceptable to Pima County. The O&M Manual shall be provide in hardcopy and electronic format. The final O&M Manual shall be submitted two months prior to start–up of the system. Six hardcopies copies and two electronic versions of the O&M Manual shall be provided.

Training of County O&M staff shall be performed by qualified instructors and will use the O&M Manual as the basis of the training. Training will include classroom presentations and hands-on exercises. Supplemental training materials may be used with approval by Pima County. O&M Training will include means of determining the comprehension of materials provided during training. Areas of non-comprehension training shall be repeated.

TS 5.2 - Start Up and Commissioning

After all O&M training is complete, the D-B shall proceed to startup of the process and systems in a logical sequence as presented in the O&M Manual. The startup and commissioning shall be performed by D-B furnished personnel. The County O&M staff shall observe all of the start-up processes and procedures. After the commissioning the equipment warranties and guarantees shall be furnished to Pima County.

During start-up, if adjustments to the O&M Manual materials, an addendum to the O&M Manual shall be prepared and provided to the County.

TS 5.3 - Performance Test

After commissioning the D-B shall operate the Biogas Purification Facility for a period of 3 months. The system shall maintain Southwest Gas system compliance during the performance test. Non-compliance will be cause to restart the performance test.

TS 6.0 – Historical Data

Biogas production at the Tres Rios WRF occurs as a result of anaerobic digestion of recovered sludge. The total produced biogas originates from the six, on-site anaerobic digesters. Production of the biogas is continuous and is monitored through the plant SCADA. Due to seasonal fluctuations of wastewater flow, there are seasonal fluctuations in biogas production. Historical biogas production rates range from 350,000 scf per day to 1,200,000 scf per day. These historical production rates are for reference only, and are not intended to reflect nor predict current and future biogas production rates. Additionally, the County has performed gas quality analyses on the produced Biogas. Past gas quality analyses suggest that the produced biogas quality is fairly constant.

Historical biogas production and quality data are available in Attachment 5. *All data and values provided in Attachment 5 are historical and are provided for reference only*. It is the D-B's responsibility to perform whatever additional analyses it deems necessary to achieve a robust and contract-compliant design. It should be noted that the provided data are only for those constituents analyzed in the past, and for biogas production rates that have observed to date. If additional biogas constituents, parameters, and production rates have the potential to impact the Biogas Purification Facility operation, or the quality of the produced Biomethane, it is the D-B's responsibility to measure and interpret those parameters, and design the Biogas Purification Facility appropriately.

Of note is the County's intended implementation of biogas composition analyzers in the biogas feedline. The analyzers are expected to be installed prior to the construction phase of this project. The D-B is encouraged to review available data from the analyzers and use as needed in the design and construction of this Project.

TS 7.0 – Reliability/Redundancy Criteria

The Biogas Purification Facility is not a critical facility at the Tres Rios WRF. Therefore, there are no required redundancy criteria in its design. However, the Biogas Purification Facility shall maintain an uptime of at least 95% per year, or, a minimum uptime of 8,322 hours per year. A sufficient quantity of spare parts, to bring the facility online in a reasonable time in the event of equipment failure, shall be made available at start up.

TS 8.0 – Reference Standards

TS 8.1 - Design Documents

All wastewater treatment facilities constructed in Arizona must comply with the applicable recommendations and requirements of ADEQ Bulletin No. 11. Any deviations from the applicable recommendations and requirements of ADEQ Bulletin No. 11 must be consistent with the Design and Construction requirements, and must be approved by ADEQ.

TS 8.2 - Codes and Standards

The list below provides Project designers with guidance to applicable codes and standards for civil, structural, architectural, mechanical, and electrical design disciplines. The D-B will perform the Design-Build Work in accordance with the Contract Standards, which include, among other things, all applicable permits, ordinances, codes, standards, and regulations. The D-B will use the latest requirements of the Governmental Body having jurisdiction if different from those indicated below. The lists of codes and standards provided in this Section are not intended to be all-inclusive. The D-B will be responsible for identifying and complying with all codes and standards that are applicable to the performance of the Design-Build Work in accordance with Applicable Law and Good Engineering and Construction Practice.

TS 8.2.1 - Civil

The Contract Standards applicable to the performance of all civil design and construction work for the Project including, but are not limited to, the following:

- Pima County Regional Flood Control District, Pima County Drainage Standards for Local Drainage and the Pima County Floodplain and Erosion Hazard Management Ordinance, as amended to date.
- ADEQ Best Management Practices
- Arizona Department of Transportation (ADOT) Standard Specifications (where applicable).
- American Association of State Highway and Transportation Officials (AASHTO), Policy on the Geometric Design of Highways and Streets.
- U.S. Department of Transportation Federal Highway Administration (FHWA), Manual on Uniform Traffic Control Devices [MUTCD 2009 MUTCD with Revisions 1 and 2, May 2012.
- Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities, 2006 revisions.
- 2015 International Building Code and Local Amendments
- 2015 International Energy Conservation Code and Local Amendments
- 2015 International Fire Code and Local Amendments
- 2017 National Electrical Code and local Amendments
- 2015 Uniform Plumbing Code and local Amendments
- 2015 International Plumbing Code and local Amendments

- 2015 International Mechanical Code and local Amendments
- American Institute of Steel Construction (AISC), Manual of Steel Construction, 14th Edition
- American Welding Society (AWS) Welding Code
- American Society for Testing and Materials (ASTM)

TS 8.2.2 - Structural

The Contract Standards applicable to the performance of all structural design and construction work for the Project include, but are not limited to, the following:

- Standards and Codes established by the Northwest Fire District
- The currently adopted editions of the following codes by Pima County Developmental Services Department:
    - International Building Code (IBC) 2015
    - ASCE 7-05 "Minimum Design Loads for Buildings and Other Structures", as referenced by IBC 2006.
    - American Institute of Steel Construction (AISC) Manual of Steel Construction, 14th Edition
    - American Welding Society (AWS) Welding Code
    - Seismic Provisions for structural steel buildings ANSI/ AISC 341-05
    - Aluminum Design Manual

TS 8.3 - Architectural

The Contract Standards applicable to the performance of all architectural design and construction work for the Project include, but are not limited to, the following:

- 2015 International Building Code and local Amendments
- 2015 International Energy Conservation Code and local Amendments
- 2015 International Fire Code and local Amendments
- 2017 National Electrical Code and local Amendments
- 2015 Uniform Plumbing Code and local Amendments
- 2015 International Plumbing Code and local Amendments
- 2015 International Mechanical Code and local Amendments
- Swaback Partners report, "Water Reclamation Campus Architectural Theme and Character."

TS 8.4 - Process Mechanical

The process mechanical design will comply with applicable industry standards for piping, valves, and process equipment. The Contract Standards applicable to the performance of all process mechanical design and construction work for the Project include, but are not limited to, the codes and standards published by the following organizations:

- American Water Works Association (AWWA)
- American Society of Mechanical Engineers (ASME)
- American National Standards Institute (ANSI)
- Hydraulic Institute (HI)

TS 8.5 - Building Mechanical

The Contract Standards applicable to the performance of all building mechanical design and construction work for the Project include, but are not limited to, the following Building Codes:

- Building: 2015 International Building Code (IBC)
- Electrical: 2017 National Electrical Code (NEC)
- Energy: 2015 International Energy Conservation Code (IECC) with local amendments
- Fire: 2015 International Fire Code (IFC) with local amendments
- Mechanical: 2015 International Mechanical Code (IMC) with local amendments
- Plumbing: 2015 International Plumbing Code (IPC) with local amendments
- Standards and Regulations:
- Air-Conditioning and Refrigeration Institute (ARI)
- Air Moving and Conditioning Association (AMCA)
- American Conference of Governmental Industrial Hygienists (ACGIH)
- American National Standards Institute (ANSI)
- American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE)
- American Society of Mechanical Engineers (ASME)
- American Society of Plumbing Engineers (ASPE)
- Americans with Disabilities Act (ADA), Title III, Current Edition
- Associated Air Balance Council (AABC)
- National Environmental Balancing Bureau (NEBB)
- National Fire Protection Association (NFPA)
- Occupational Safety and Health Administration (OSHA) Standards for General Industry
- Sheet Metal and Air Conditioning Contractor's National Association (SMACNA)

TS 8.6 - Supervisory Control and Data Acquisition (SCADA)

The Contract Standards applicable to the performance of all Supervisory Control and Data Acquisition (SCADA) and instrumentation design and construction work for the Project include, but are not limited to, the codes and standards published by the following organizations:

- American National Standards Institute (ANSI)
- American Society of Testing Materials (ASTM)
- American Society of Mechanical Engineers (ASME)
- Electronic Industries Association (EIA)
- Federal Communications Commission (FCC)
- Institute of Electrical and Electronic Engineers (IEEE)
- Instrument Society of America (ISA)
- National Electrical Code (NEC)
- National Electrical Manufacturers Association (NEMA)

- Occupational Safety and Health Administration Standards (OSHA)
- Scientific Apparatus Makers Association (SAMA)
- Underwriters Laboratories, Inc. (UL)

TS 8.7 - Electrical

The Contract Standards applicable to the performance of all electrical design and construction work for the Project include, but are not limited to, the following:

- 2017 National Electrical Code (NFPA 70)
- 2006 Pima County Outdoor Lighting Code
- 2015 International Energy Conservation Code
- All other applicable local standards and regulations.

Load studies stating connected and operating loads with applicable demand factors to substantiate the sizing and ratings of all electrical equipment associated with the design will be provided. All materials specified will be UL listed.

TS 9.0 – Sitework Design

The Biogas Purification System (BPS) must be properly sized to process all Biogas received from digesters at the BPS. The digesters process solids received from the Tres Rios WRF, the Agua Nueva WRF and from our regional facilities. The BCS design and constructed facility must also provide the necessary infrastructure and space for future expansion of the BCS.

In addition, the D-B will design the Project Site in compliance with all Applicable Law and will meet the following general objectives:

- The Project will be designed and constructed in a manner that is both environmentally compatible with the Project Site and environmentally sustainable, in accordance with the requirements of the Pima County Development Service's Building Safety and Sustainability Division.
- The Project will be designed in a manner, including grouping functions, to provide easy and efficient operation and monitoring, and to optimize the collection, storage, and use of operating data.
- The Facility will be arranged on the Facility Site to provide efficient and safe access into and throughout the Project Site, including compliance with fire/safety vehicle requirements. The D-B will cluster individual buildings and equipment to the extent practicable.
- Buildings, structures, and pipelines will be designed using materials and equipment consistent with a minimum 50-year physical service life, based on industry standard practices.
- The materials and equipment will be selected to assure the maximum service life expectancy with a low incidence of failure and a high probability of continued manufacturer support and service.
- Equipment selection, building design, landscaping, and other Project elements will be selected to minimize the frequency of maintenance while presenting a well-kept and pleasing appearance.
- Project structures must be protected against the 500-year flood.

TS 10.0 – Specific Site Design Criteria

Criteria for Project Site design, reliability and redundancy, and process control are listed below:

- Arrange the Project Site layout so that facilities generally fit within the constraints shown on Attachment 4, the Site Location Map, attached hereto. These constraints include the Biogas Influent and Effluent pipelines and ancillary facilities, storm water detention ponds, service roads, and access driveways.

- All process units will be covered and provide appropriate odor control.
- Operators must have reasonable access to all equipment (walk-up access to all equipment; means to get equipment greater than 100 pounds to a cart).
- Vehicular maintenance access to all facilities (boom truck/flatbed).
- Maintain minimum setbacks required by zoning classification.
- Height limit not to exceed any applicable requirements including but not limited to the Pima County design code and the architectural concepts developed in the Swaback Partners report, "Water Reclamation Campus Architectural Theme and Character."
- Provide systems for containment and treatment all surface runoff within the developed Project Sites, including runoff from all access driveways serving the Project Sites. Separately contain and treat surface runoff from areas that may contain spills from treatment processes.
- All process units capable of causing nuisance odors will be covered or enclosed in buildings. Exhaust air from these structures will be routed to appropriate odor scrubbing facilities. Monitoring and controls will be in accordance with Applicable Law and the Odor Guarantee.
- All equipment with significant noise generation will be enclosed within buildings or shrouded within sound attenuation structures. Noise levels will not exceed 50 dbA at the Treatment Facility boundary per the Arizona Administrative Code Title 18, Chapter 9, Part B201.
- All buried carbon steel components will be protected from corrosion by cathodic protection, unless the manufacturer provides documentation that the protection is not required at this location.
- Facility lighting will minimize off-site impacts and provide a safe working environment for the staff. Photo-electrically controlled, low-level, low-glare exterior lighting, meeting Illumination Engineering Society of North American foot candle level requirements as stated in the Recommended Practice Manual, and in the City of Tucson / Pima County Outdoor Lighting Code, Reference Document #20, will be provided at the Facility Site entrances and along roadways, parking areas and sidewalks to enhance security and allow for safe movement in the dark. Switch-controlled task lighting will be provided in the immediate vicinity of unit processes and other areas that may require maintenance and operation at night. L.E.D. technology shall be used whenever feasible.

TS 11.0 – Excavation, Filling, and Backfilling

TS 11.1 - Responsibility for Fill

The D-B will be responsible for furnishing all supervision, labor, tools, materials, and equipment; performing all operations in connection with excavation of materials regardless of the character of that material; obtaining fill and backfill material approved by a licensed professional engineer specializing in soil mechanics to achieve final grade lines; and all activities necessary for disposal of excess excavated material. All necessary arrangements for obtaining fill material and topsoil from off-site borrow areas will be the responsibility of the D-B.

TS 11.2 - Professional Engineer

The D-B will employ a professional engineer registered in the state of Arizona specializing in soil mechanics to provide recommendations for the work, including excavation, fill, backfilling, compaction, dewatering, subgrade preparation and stabilization, shoring, and drainage from protection of excavated areas.

TS 11.3 - Excavation

The D-B will perform all necessary excavation for construction of the Project. Excavations for footings will be made sufficiently wide for the installation of form work and to the depths required. The D-B will prevent

the foundation area from becoming destabilized due to the flow of water into the excavation or from cave-ins. Where soils are not suitable for sustaining design loads, the D-B will take appropriate action in accordance with the requirements of appropriate established codes and good Engineering and Construction practices. Backfill material will consist of suitable clean soil.

TS 11.4 - Excess Fill

To the maximum extent possible, the D-B will locate facilities to balance cut and fill and place surplus excavated materials above that required for backfilling in areas of the Project Sites consistent with the D-B's clearing and grading plans or in disposal areas approved by the County. The D-B is encouraged to use excess excavated material for landscaping features or other beneficial purposes on the Project Sites. To the extent that excess excavated material cannot be placed in these areas, the D-B will be responsible for all activities necessary to dispose of the excess material at an approved off-site location. It will be the D-B's responsibility to obtain the disposal site for the disposal of excess material.

TS 11.5 - Grading and Drainage

Design of all storm drain systems will be in accordance with the Pima County Regional Flood Control District's Hydrology Manual for Engineering Design and Flood Plain Management within Pima County, Arizona as well as the Pima County Drainage Standards for Local Drainage and the Pima County Floodplain and Erosion Hazard Management Ordinance.

A stormwater management plan will be prepared for the Project Sites that complies with requirements of the Pima County Department of Environmental Quality Stormwater Guidelines. The plan will address surface and roof drainage as well as the quality and quantity of storm runoff. The storm water management plan will follow the minimum design criteria as set forth in the County's Storm Water Management Program.

TS 12.0 – Landscaping

TS 12.1 - County Standard

Landscaping will be in compliance with the Pima County Landscape Design Manual and the Swaback Partners report, "Water Reclamation Campus Architectural Theme and Character."

TS 12.2 - Appropriate Materials

Landscaping and irrigation will use environmentally appropriate materials that are tolerant of the climate of the Service Area and compliant with all applicable Contract Standards. The proper use of plant materials and other design elements must demonstrate environmental responsibility.

TS 12.3 - Design Considerations

All landscape will be designed with minimum maintenance, maximum security and maximum water conservation in mind. Any landscape irrigation will be carried out with reclaimed water, including maximum use of captured stormwater runoff. Potable water may be used for irrigation only during the construction phase prior to the availability of reclaimed water to assist in establishing landscaping placed prior to Facility startup. All portions of the Project Sites landscaping must be regularly maintained.

TS 13.0 – Roads, Sidewalks, Parking, and Traffic Circulation

TS 13.1 - General

Main access requirements will be finalized during the Facility Site development for the Project. At a minimum, the width of the facility access roads will conform to *Pima County Codes* as well as *Uniform Fire Codes* for fire department access requirements and be constructed of either asphalt or concrete pavement. Pervious pavement will not be used for roads and driveways. The general flow of onsite traffic will separate

heavy vehicle traffic from other vehicular traffic to the extent practicable. Adequate traffic signage will be provided to promote safe movement around the Project Sites. At various facility structures, driveways are to be designed to provide access for building and equipment maintenance.

TS 13.2 - Turn Radius

All roadways will have adequately sized turning radii so that a WB-50 design vehicle can traverse the Facility Site. All roads will facilitate the capture of surface water runoff. All roadway widths and turning radii will meet *Pima County Codes* as well as *Uniform Fire Code* requirements.

TS 13.3 - Road Material

The facility access road and the interior roads will be constructed of asphalt or concrete pavement designed for a minimum of HS-20 loadings unless otherwise indicated or required.

TS 13.4 - Chemical Unloading Areas

Areas for chemical unloading from trucks will have containment curbs and will be paved with Portland cement concrete. Coatings, if required, on the concrete surfaces will be determined by the consideration of the chemicals being handled in the area. Grades around these areas will be sloped away from the containment area to minimize surface water runoff into the containment area. Located inside the containment area will be a series of catch basins to capture rainfall and to facilitate drainage within the area. These catch basins will prevent any chemicals from entering the storm drainage system. The contained water is then to be conveyed to the headworks.

The D-B will design, construct, and maintain the Project Sites road system to meet the following objectives:

- Ingress and egress locations to the Project Sites will be designed with adequate sight distances and turning radii to allow for control and safety of all turning movements.
- Adequate Project Sites roadways, parking, and maneuvering areas will efficiently and safely provide for anticipated traffic levels including Facility staff, visitors, and standard trucks and semi-trailers used for chemical deliveries, and for emergency vehicles including firefighting equipment.
- Circulation patterns and Facility Site roadways will be established in a manner that minimizes the interaction of trucks with staff and visitor vehicles.
- Paved on-site walkways and sidewalks will be located to facilitate routine foot traffic between unit processes and around those units where washdown or other operations will be done from the ground level.
- Sub-base and pavement design will be appropriate for the type and level of use, especially with respect to use by heavy trucks, and soil conditions. Prior to placement of any pavement materials, the subbase will be adequately prepared and stabilized.
- Proper access will be provided for emergency vehicles and equipment, including fire trucks.
- Signage, constructed to ADOT design standards, will clearly direct chemical delivery trucks to the chemical/delivery and storage areas.
- The D-B will design, construct and maintain all drainage systems necessary to accommodate drainage from all access driveways serving the Project Sites.

TS 14.0 – Site Management During Construction

TS 14.1 - Fencing

The Design Builder will provide a temporary chain-link perimeter fence during construction to ensure the security of the Project Site and safeguard operations within the Construction Work Limits. The temporary fence is to be removed after construction is complete.

TS 14.2 - Erosion Control

Erosion control measures will be applied before and while construction activities are taking place. To reduce the amount of sediment being transported from the Project Sites, sediment fences will be installed at the toe of new slopes, around stockpiles, and downhill of disturbed areas. There will also be a gravel construction entrance at the limits of construction to help mitigate construction debris from being transported away from the Project Sites. Loss of material from erodible stockpiles and other disturbed areas will be mitigated. All erosion control measures will be shown and implemented in accordance with Pima County Department of Environmental Quality *Best Management Practices* and the Pima County Regional Flood Control District's *Hydrology Manual for Engineering Design and Flood Plain Management within Pima County, Arizona*, Pima County Drainage Standards for Local Drainage and the Pima County Floodplain and Erosion Hazard Management Ordinance.

TS 14.3 - Security

The Project Site is located within the County's secured area. However, D-B is solely responsible for providing security within the Project Site.

TS 15.0 – Utility Requirements

TS 15.1 - Non-Potable Water

The D-B will provide a connection from the County's existing non-potable water system to the Project. Non-potable water will be provided by County at approximately 65 psig. D-B will provide all necessary equipment to increase the non-potable water pressure to levels required for operation of the equipment and systems supplied pursuant to the Contract.

TS 15.2 - Potable Water

Operational potable water will be available from the County's WRF supply lines. D-B will provide a connection to County's potable water system. D-B will install a backflow preventer in any location where potable water discharges to a non-potable system. At a minimum, backflow prevention equipment will meet the requirements of Applicable Law.

TS 15.3 - Fire Water

The D-B will provide a fire water system sized and designed based on the materials and design of the Project Structures and meeting the requirements of the Northwest Fire Department. This system will be separate from the other water supply systems and will be fed directly from the Tucson Water system. Facility access for firefighting and the number and location of fire hydrants will comply with the requirements of the Northwest Fire Department.

TS 15.4 - Natural Gas

The D-B is responsible for connecting to the SWG gas supply system for delivery of the Clean Biogas.

TS 15.5 - Electrical System

D-B will be responsible for assessing the electrical load required to operate the BCS. D-B will be able to connect the BCS facility to the County's existing electrical supply grid if the existing system is capable of supporting the loads. If the D-B determines that the current County system is not able to support the expected loads, the D-B will be responsible to procure the proper connection point with Tucson Electric Power (TEP). D-B will provide all necessary electrical management equipment, controls, and wiring after the tap point.

TS 16.0 – Structural Design

TS 16.1 - Professional Engineer

All structural design work will be prepared under the direct supervision of a structural engineer licensed in the State of Arizona. The D-B will design all structures for a service life of not less than 50 years, in accordance with the most current applicable codes and standards.

TS 16.2 - Design Loads

The International Building Code (IBC) will apply to all building structures not otherwise covered. American Concrete Institute (ACI) 318-14 Building Code requirements will supplement the design of concrete structures. American Institute of Steel Construction (AISC) Allowable Stress Design standards will supplement steel structure design.

The recommendations of ACI 350R Environmental Engineering Concrete Structures will be requirements for the design of:

- Concrete water containing structures.
- Buildings with high humidity
- Concrete structures exposed to repeated washdown or to chemical or process spills.
- Concrete structures below ground.
- Concrete structures built or placed in the water.

TS 16.2.1 - Dead Loads

Loads resulting from the weight of all permanent loads, equipment, fixtures, etc., such as walls, partitions, floors, roofs, equipment bases, earth for buried structures, and all permanent non-removable stationary construction are dead loads.

TS 16.2.2 - Live Loads

Live loads are all loads other than dead loads that are applicable and must be considered in the design to satisfy applicable code and specific project requirements. At a minimum the live loads are:

Table 16-1
Minimum Live Loads

Location/Parameter	Load
People-only areas (All Floors general)	100 pounds per square foot (psf)
Heavy Storage	250 psf

Location/Parameter	Load
Light Storage	150 psf
Process slabs	200 psf
Stairways/access way	100 psf
Corridors	100 psf
Electrical rooms	300 psf
HVAC Mechanical Rooms	150 psf
Pump stations, Process Building and Slabs	200 psf
Vehicular access areas	HS20
Roof loads (no reducible)	20 psf
Sidewalks & Driveways	250 psf & Concentrated load per IBC
Fixed stairway	100 psf & 1000 lbs concentrated
Buried structures	Per AASHTO guideline
Process tank elevated roof slabs	100 psf uniform or equipment concentrated load

TS 16.2.3 - Seismic Design Loads

Building structures will be based on IBC Section 1613 and American Society of Civil Engineers (ASCE) 7-05 Chapters 11 and 12. The Maximum considered Earthquake (MCE) values SS and S1 will be the maximum value required by the IBC 2006/ ASCE 7-05, U.S. Geological Survey (USGS) National Seismic Hazard Map 2007 or Geotechnical report.

- I = 1.25 (Category III – wastewater treatment facilities, IBC Table 1604.5 and ASCE Table 11.5.1).
- Characterization of the Project Sites will be in accordance with Table 1615.1 of the International Building Code (IBC).
- Seismic Design Category will be calculated per IBC table.
- Seismic design of all non-structural components will be in accordance with Chapter 13 of ASCE 7-05.
- Non-Building structures will be designed in accordance with Chapter 15 of ASCE 7-05, in which separate design requirements are provided for different types of structures. MCE values will be the same as for the building structures.

TS 16.2.4 - Wind Loads

Design wind loads will be determined based on Chapter 6 of the American Society of Civil Engineers (ASCE) 7-05 per the IBC.

IBC 90 miles per hour (mph) (3-second gust), Exposure Category C, and Importance factor (I) of 1.15 (Category III- wastewater treatment facilities, IBC Table 1604.5).

TS 16.2.5 - Groundwater Loads

Any encounter of groundwater in the exploratory borings drilled at the Project Sites will be reported in the D-B's Geotechnical Report. If none is discovered at the specified boring depths, review of well logs will indicate the approximate location of groundwater.

TS 16.2.6 - Impact Loads

For crane support girders and monorails – refer to American Institute of Steel Construction (AISC) requirements for horizontal and vertical impact forces.

For light machinery supports - 20 percent minimum or manufacturer's recommendation.

TS 16.2.7 - Liquid Loads

Liquid holding basin walls will be designed for maximum liquid levels with the following conditions:

- Full of liquid, no backfill
- Backfill and groundwater with tank empty
- Any tank cell empty or full in any combination
- Hydrodynamic loads due to seismic forces including sloshing effect
- Static earth pressure plus surcharge with tank empty

Operational level will include maximum flooded condition unless passive methods are provided to prevent flooding. Passive methods include overflow weirs; upstream or downstream hydraulic controls not dependent on pumps, monitors, electronic controlled valves, or operators. If passive level controls are present, then the maximum operational level is defined as the liquid elevation when those controls are in effect.

TS 16.2.8 - Lateral Earth Pressure

Based upon its review of Project Sites geotechnical data, the D-B will determine and document appropriate value for:

- Active pressures
- At-rest pressures
- Passive pressures

In addition, the D-B will use the following:

- Surcharge pressures: Use a minimum of 2 feet of earth for walls where vehicular loads can come within H/2 of the wall.
- Lateral loads on retaining walls due to earthquakes as required by the building code of the County.

TS 16.2.9 - Load Combinations

The D-B will design the facilities for all loads including dead, live, snow, wind, impact, temperature variations, moving, and liquid loads required by the appropriate codes and standards. The design will also include all equipment and process loads. The most severe distribution, concentration, and combination of loads and forces will be used in the design.

TS 16.3 - Special Inspection, Structural Observation, and Quality Assurance

Special inspection, testing and inspections, structural observation, quality control and quality assurance as required by Section 17 of IBC and by Applicable Law will be provided. These requirements will be incorporated in the design documents and construction specifications.

TS 16.4 - Deflections

The D-B will ensure against deflections causing adverse functional or aesthetic effects over the life of the Facility. Grating and metallic basin covers will not have a deflection greater than L/360.

TS 16.5 - Geotechnical Design

D-B will develop comprehensive geotechnical design criteria to support the structural design work. The structural design provided by the D-B will include an array of above grade buildings and structures and below grade pipelines, structures and appurtenant facilities. The geotechnical information to be provided includes:

- A detailed Project Sites evaluation to identify geotechnical features that are relevant to the Facility design.
- Engineering soil properties including: active, at-rest, and passive earth pressure; surcharge pressures; weights and density of various soil materials; sliding friction coefficients; modulus of subgrade reaction; Atterburg Limits.
- Hydrologic and ground water information including maximum anticipated ground water levels.
- Seismic evaluations, including characterization of the Project Sites in accordance with Table 1615.1 of the International Building Code (IBC).
- Deep excavation information including: recommendation on deep excavation and shoring techniques.
- Foundation parameters including: allowable bearing pressures, shallow footing design recommendations; recommendation for earth retaining structures design; recommendations for backfill and structural fill materials.

TS 16.6 - Concrete Design and Construction

Crack control shall be adequate to prevent leakage of water out of water containing structures or into dry structures. The durability of the concrete structure shall be adequate to: resist abrasion and freeze-thaw cycles; resist penetration into the concrete by chemicals; protect the reinforcement from water, chemical and atmospheric attack; and maintain appearance.

Design for reinforced concrete structures shall be considered for different types of structures:

- All liquid-holding concrete structures, concrete components exposed to outside weather and backfill material, and concrete surfaces exposed to wash down or humid process conditions shall be designed per ACI 350-05 Code.
- Above-grade components of architectural non-water holding type buildings where the concrete is protected from moisture shall be designed per ACI 318-05 Code.
- Precast/Prestressed structures, if any, shall comply with the Precast/Prestressed Concrete Institute (PCI) Design Handbook.

TS 16.6.1 - General

Design Strength:

- Concrete 2000 psi — Lean concrete and pipe encasement
  4000 psi — All reinforced concrete
  4000 psi — Unreinforced concrete structures and benching
- Cement shall be "Ordinary Portland Cement", Type II.
- Corrosion protection requirements shall be found in the Geotechnical report.
- Reinforcing steel shall conform to A615, Grade 60.

TS 16.7 - Masonry Design

Masonry shall be designed in accordance with the IBC. The latest edition of Reinforced Masonry Engineering Handbook by the Masonry Institute of America shall supplement masonry design. Masonry shall not be used for the below grade support of soil loads or in earth retaining structures.

TS 16.8 - Structural Steel Design and Construction

TS 16.8.1 - Connection Design

- Use ASTM A325-SC for structural steel framing member connections.
- Use stainless steel for Aluminum member connections.
- Use Type 304 or 316 Stainless Steel (or other material that is appropriate for the conditions to be used) bolts for all sanitary type construction.

TS 16.8.2 - General

- Structural steel wide flange shapes shall conform to American Society for Testing and Materials (ASTM) A992.
- Structural steel shall be designed, fabricated and erected according to IBC as modified by ESP 550.1. The methods shall be according to either the IBC for Allowable Stress Design or the IBC for Load and Resistance Factor Design.
- Steel plates, angles and channels shall conform to ASTM A36
- Square or rectangular steel tubing shall conform to ASTM A500, Grade B and Steel pipe shall conform to ASTM A53, Grade B.
- All connection bolts shall be high-strength bolts conforming to ASTM A325N or slip critical.
- Bolts indicated as machine bolts or anchor bolts shall conform to ASTM A307 for carbon steel and A153 for galvanized steel.
- All welds shall be performed by AWS-certified welders and shall conform to AWS D1.1, latest edition.
- Stainless steel, Type 304 or Type 316 as appropriate, shall be used for bolts, fasteners, and so forth where corrosion concerns dictate, unless the Engineer specifies other material that is better suited for the conditions to be used.

TS 16.9 - Miscellaneous Materials

- Aluminum design per the Aluminum Association *Specifications for Aluminum Structures.*
- Open web metal (steel) roof truss design and specifications per the Steel Joist Institute Standard Specifications and Load Tables.
- Metal (steel) deck design and specifications per the American Iron and Steel Institute (AISI) Specifications for the Design of Light Gauge, Cold-Formed Steel Structural Members.
- Metal grating per the National Association of Architectural Metal Manufacturers *Metal Grating Manual and Heavy Duty Metal Grating Manual.*
- A manufactured-aluminum three-rail system for handrail/guardrail.

TS 16.10 - Metal Roof Deck

Design and fabrication of metal roof deck shall be in accordance with the latest specifications of the Steel Deck Institute. Steel used in the fabrication of deck units shall conform to the requirements of the AISI "Light Gage Cold-Formed Steel Design Manual".

TS 17.0 – Process and Mechanical Equipment

The D-B will be responsible for obtaining the licenses and patent agreements necessary to construct and operate the unit treatment processes. The D-B will use a system for asset numbering and equipment tagging for all process and mechanical equipment that is compatible with the County's system. The D-B will provide information on all process and mechanical equipment needed for management of these assets and in a form compatible with the County's asset management plan.

Similar pieces of equipment, including but not limited to pumps, valves, blowers and gates, will be furnished by the same manufacturer to maintain uniformity. The design and construction of the facilities will incorporate the equipment and piping system layout guidelines as follows:

- Drawings will show the amount of space required for equipment removal, replacement, and maintenance.
- The minimum clear space around equipment will be as required by applicable codes, recognized industry standards of prudent practice, or four feet, whichever is greater. Maintenance access requirements, especially on large equipment, will be taken into account when establishing the layout. Maintenance access will take into account the need to completely remove each piece of equipment at some future time.
- Arrange equipment and piping to prevent tripping hazards.
- Maintain a minimum of 10 feet vertical clearance from the floor to the centerline for all piping that may impact equipment access. Piping that would limit personnel access will have a minimum of 7' 6" vertical clearance above the floor.
- Equipment and panels will be mounted on equipment pads (minimum of 6 inches thick) to protect them from washdown.
- A minimum clearance of 4 feet will be provided on all sides around rotating equipment over 10 horsepower (hp).
- At least 4 feet of clearance will be provided between the outermost extremities of adjacent pieces of equipment or between a wall and a piece of equipment.
- Clearance in front of any equipment face or panel requiring maintenance will be 4 feet.
- Pressure vessels will be located at least 2 feet from the back wall and 3 feet apart. Sufficient space in front of the vessel will be provided for the face piping plus 4 feet.

- Provide stairs, catwalks, platforms and hatches for accessing and removing equipment. Generally, ladders should not be used for this purpose where frequent access is required.
- Provide lifting eyes for equipment weighing 100 pounds or more.
- Motorized hoists, monorails, or cranes will be provided where equipment component weights exceed 2,000 pounds and/or when frequent lifting for maintenance is necessary. Portable gantry cranes or load-rated lifting eyes will be used where more elaborate lifting mechanisms are not practical or cost effective.
- Leave space for installing future equipment where future needs are defined or readily discernable from the Facility expansion criteria.
- Install large or critical equipment motors and actuators above grade and above potential flooding levels, or otherwise select motors and actuators that can operate in a submerged condition periodically.
- Adequate lifting headroom will be provided for all equipment.
- Adequate headroom will be provided for removal of vertical turbine pumps; and shafts, shaft enclosure tubes, and columns will be specified to be in sections that are removable.
- Locate washdown drains and secondary drains for proper maintenance of equipment and buildings.
- Hose bibs will be located in logical areas to facilitate washdown and pipe flushing. In general, utility stations will be located so that the maximum length of hose required is 50 feet.
- For pumps, compressors, and other rotating equipment where parallel units are provided, the orientation of the drive and the rotation will be identical unless equipment layout dictates a more efficient layout arrangement.

TS 17.1 - Piping, Valves and Gates

The D-B will provide piping that meets all applicable codes, that have a minimum expected life of 50 years, and that are sized to meet the hydraulic performance requirements of the Project. In general, where future piping upgrades as part of an ultimate Facility expansion to 100 MGD would require removal and replacement of existing structures or structural penetrations, or require excavation and replacement of existing pipelines, piping will be provided for a 100 MGD facility.

Piping material will be compatible with the fluid transported within the pipe. Piping will be color coded with the system used for the Tres Rios WRF. That color coding system is shown in Attachment 3 To Appendix C.

The D-B will use valves appropriate for wastewater applications.

The following guidelines will be applied to the design and construction of pipelines:

- Leave adequate clearance at pipe flanges to facilitate disassembly of piping.
- Provide flexible connections for easily assembling and disassembling piping and for connections to equipment. Ensure that adequate thrust restraint is provided at each flexible coupling.
- Show or otherwise clearly define the location and type of all piping anchors and expansion joints on the design drawings or specifications. At a minimum pipes 18-inches in diameter and larger should have anchor and expansion joints shown on the drawings.
- Allow ample space for access to and maintenance of valve and gate operators. Provide adequate clearances for rising stem valves and gates in all positions.
- Water lines or ductwork will not be located above electrical equipment.

- Piping will be located with adequate headroom and such that it is not a tripping hazard, a head-banger, or a barrier to equipment access.
- Piping above blowers, compressors, large valves and gates, or pumps will be limited to facilitate lifting.
- In general, piping will be laid out close to walls where it can be supported easily, particularly in spaces with high ceilings.
- Manual air vents will be located in high points to permit purging of air from the pipeline while it is being filled with water for all pipes 6 inches in diameter and greater.
- A manual drain valve will be located on the low point of pipelines for all pipes 6 inches in diameter and greater.
- Provide adequate seismic bracing and support of all piping.
- Include operators (chain wheels) or access platforms for easy operation of all valves in piping elevated more than seven feet (centerline) above the finished floor.
- All yard piping will be ductile iron or steel or other material that is appropriate for the process service, soil conditions of the site and service life requirements.
- The minimum depth of cover for buried pipelines will be 3 feet.
- A minimum 10-foot horizontal separation and a minimum 18-inch vertical separation will be maintained between potable water and waste water pipelines, with the water pipelines located above the waste water pipelines.
- Provide sufficient numbers of valves to allow isolation of potential problem areas.

316 or 304 Stainless steel (or other material that is appropriate for the operating conditions) slide gates will be used unless the seating/unseating head requirements, or other considerations, require the use of a sluice gate. All gates will be designed for a maximum leakage of 0.1 gallon per minute per lineal foot of seating perimeter. In general, gates will be of unseating head design so that they can be serviced from the dry side when necessary. Sluice gates will be cast iron or stainless steel.

TS 17.2 - Pumps and Pumping Systems

General requirements for pumps and pumping systems are given below:

- Critical speed of all rotating members and the critical speed frequency of the motor will be at least 25 percent above the maximum motor operating speed.
- Vibration levels of the pumping unit when installed on the structural foundation will not exceed the limits recommended by the Hydraulic Institute. Vibration will be monitored.
- Provide bearings having a minimum L10 life of 50,000 hours under any normal pump operating condition. Bearings will include sensors for monitoring heat and temperature.
- Use premium efficiency motors when the anticipated duty cycle exceeds 200 hours per year.
- Size motors to operate within their nameplate horsepower ratings under all conditions of operation and provide a 1.15 service factor.
- Pumps will be selected and sequenced so they operate within their Allowable Operating Region as defined in HI 9.6.3-1998.
- Pump NPSH margins will be based on the suction energy level and water application as recommended in HI 9.6.1-1998.
- The pump intakes will be designed in accordance with the requirements of HI 9.8-1998.

- Pump seals will generally be specified as single mechanical type. Flushing water will be service water.
- For clean water services, mechanical seals without flushing water may be specified.

TS 18.0 – Architectural Features and Finishes

The purpose of this section is to summarize architectural design standards for the Facility.

TS 18.1 - Aesthetic Concept

The D-B will provide a Facility that is aesthetically attractive, compatible with surrounding uses and consistent with the Architectural Guidelines, "Water Reclamation Campus Architectural Theme and Character," established by the County for the Facility.

The overriding architectural requirement is to provide functional buildings that present an image of quality and good design, using durable, low-maintenance, corrosion-resistant, energy efficient, and environmentally responsible materials.

Orientation will be planned to maximize roof-top solar energy collection potential.

Some of the process structures may be equipped with a flat roof design featuring openings for sun/shade control.

TS 18.2 - Architectural Design

All materials selected will be chosen for their durability, weather resistance, low maintenance, and/or ease of maintenance. High quality materials and methods of construction will be employed complying with the requirements of the appropriate materials standards organizations. Construction systems will be of at least a "commercial" grade, with custom or premium levels of finishes.

In addition, the D-B will fully cooperate with the principles and objectives of the LEED certification process to ensure that the Primary Operations Building is certified as Silver according to the most current rating system of the United States Green Building Council's LEED For New Construction.

TS 18.2.1 - Major Exterior Systems

Exterior surfaces for new structures will be aesthetically pleasing, low maintenance, and energy efficient. For the Facility, the appearance of the structures will be in conformance with the Architectural Guidelines, "Water Reclamation Campus Architectural Theme and Character."

Materials and construction will be such that the County will be able to obtain, using good faith effort, a LEED silver certification for the primary operations building. If the County is unable to obtain the silver certification, the D-B will be responsible for adding or changing materials and construction such that the County can obtain LEED silver certification.

TS 18.2.2 - Architectural Materials

Requirements for materials are listed below:

Structure	**Material**
➢ Below-Grade Structure:	Cast-in-place concrete
➢ Above-Grade Structure:	Concrete, concrete masonry, or exposed and/or enclosed steel framing

Structure	Material
➢ Submerged and Periodically Wetted Structures:	Cast-in-place concrete with or without coating protection, or steel properly protected from corrosion by high quality coatings (timber construction may be considered for chlorine contact baffles).
➢ Exterior Walls:	Concrete (with architectural finishes), concrete masonry, or brick
➢ Window Walls:	Aluminum frame with low-e glazing

Structure	Material
➢ Roofing-Sloped:	Refinished (fluoropolymer coating over galvanized steel sheet or stainless steel) standing seam
➢ Roofing-Flat:	Concrete or metal deck with double membrane, and if at grade concrete with double membrane, soil, and plantings.
➢ Floors-Process Areas:	Concrete with sealer and steel troweled or broomed finish and slip-resistant surface (concrete stain may be considered). Hardener will be applied in high wear or traffic zones.
➢ Floors-Chemical Storage Areas:	Sealed or coated concrete
➢ Floors-Laboratories:	Concrete with seamless epoxy coating, or rubber
➢ Interior Partitions:	Concrete masonry in wet areas; concrete masonry, metal stud and drywall in non-wet areas
➢ Exterior Windows:	Anodized aluminum or epoxy-painted or powder coated, galvanized hollow metal. Double pane, argon filled, low-e glazing

Special attention will be paid to insure that the Facility design and construction achieves a high quality appearance of concrete surfaces on expansive (long and/or tall) building elements that are exposed to view in the completed Facility.

TS 18.3 - Occupancy and Construction Classifications

The occupancy classifications of the component structures will be established in accordance with Applicable Law.

TS 18.4 - Americans with Disabilities Act (ADA)

All design considerations will include Americans with Disabilities Act (ADA) compliance, including, but not limited to, the Control Building, maintenance buildings, electrical building(s) and equipment buildings, and any other plant facilities not exempt from ADA compliance.

TS 19.0 – Building Services

The following building services narrative addresses the heating, ventilation, and air conditioning (HVAC), plumbing, and fire-protection design concepts and provide certain minimum design criteria.

TS 19.1 - Heating, Ventilating, and Air Conditioning (HVAC)

HVAC will be provided for all buildings on the Facility Site. The HVAC components will be sized in conjunction with the ventilation requirements for the odor control system. The HVAC system will be designed in accordance with American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE) Standards and in compliance with Applicable Law. Offices, lavatories, locker rooms, laboratories, visitor facilities, and shop areas will be provided with separately zoned, thermostatically controlled heating.

Offices and other normally occupied areas will be provided with adequate air conditioning and ventilation to maintain temperatures and air quality in compliance with ASHRAE Standards 55 and 62 and in compliance with Table 3-4.

TS 19.1.1 - Outdoor Design Conditions

Climatic data for the HVAC systems will be based on County historical data. Degree day data will be taken from *Climatography of the United States,* No. 81, Supplement No. 2, dated 1971-2000, and the 2012 Pima County International Energy Conservation Code (IECC) Amendments. Prevailing wind data will be taken from the National Climatic Data Center, Climatic Wind Data for the United States during the period of 1930-1996.

Climatic data will be used for the design of HVAC systems servicing buildings that are exempt from energy code compliance. Exempt HVAC systems may include those installed in process buildings. Further climatic data will be provided for the design of HVAC systems servicing buildings that require compliance with the IECC, including areas treated by mechanical cooling and any Administration Buildings, if extensive renovation is involved. Data will be obtained from the 2005 ASHRAE Handbook of Fundamentals for Pima County and the 2012 Pima County International Energy Conservation Code Amendments.

TS 19.1.2 - Energy Code Compliance

HVAC systems and equipment for all facilities will be specified to perform at levels dictated by the IECC, as applicable. Process buildings are unmanned facilities, not designed primarily for human occupancy, and may be exempted from the energy code according to the scope of the 2012 IECC, Paragraph 101.2.

In general, the construction envelope for buildings containing conditioned spaces will be insulated in accordance with the IECC Climate Zone 2 for Pima County, Arizona.

TS 19.1.3 - Ventilation Design Criteria

Ventilation rates for HVAC systems will comply with the following standards and requirements. This list is not all inclusive or a substitute for complete compliance with all applicable Contract Standards:

- NFPA 820, "Fire Protection in Wastewater Treatment and Collection Facilities."
- ASHRAE Standard 62, "Ventilation for Acceptable Indoor Air Quality."
- All applicable building, fire, and mechanical codes.

TS 19.1.4 - Cooling System Selection

Selection of the mechanical cooling systems for each individual space will be based on its specific design requirements and will include, at a minimum, normally occupied spaces.

TS 19.1.5 - HVAC General Design Criteria

A description of the HVAC design intent for each general space usage, including ventilation rate criteria, ventilation system types, heating/cooling system types, basic operating control intent, and ventilation

equipment will be provided. In addition to the information in Table 3-4, the provisions of NFPA 70 must be met. Hazardous areas will be provided with flow sensors and alarms.

Table 19-1
General HVAC Design Criteria

Space Type	Indoor Design Cond[1]		Ventilation Occupied/Unoccupied	Cooling System
	Heating, °F	Cooling, °F		
Electrical Rooms[1]	55	85	Based on code & space heat gain.	Self-contained rooftop air conditioning units with economizer (free cooling).
Control Rooms[1]	70	75	Based on code & heat gain.	Split system AC units with economizer (free cooling).

[1] Instrumentation and PLCs and sophisticated control panels will be controlled to a maximum of 75°F.

TS 19.2 - Plumbing Systems.

TS 19.2.1 - Insulated Plumbing Piping

Insulation will be provided for the following piping: potable water (PW), potable hot water (HW), hot water recirculation (HWR), tempered water (TW), non-potable water (NPW) and roof drains.

TS 19.2.2 - General Freeze Protection

Outdoor plumbing connections will be freeze protected.

Indoor plumbing and fire sprinkler systems will be freeze protected by building heating provided by HVAC systems. Piping exposed to the elements will be heat traced, unless otherwise noted.

TS 19.2.3 - Emergency Safety Equipment

Combination emergency safety showers/eyewash units located in process areas require a water-flow switch, light, and alarm bell. Each water-flow alarm device will consist of the manufacturer's standard product. Power requirements will be coordinated with the electrical supply available to each area.

TS 19.2.4 - Cross-Connection Control

Cross-connection control will be provided in accordance with the Uniform Plumbing Code (UPC) and Arizona Administrative Code (AAC) R18-4-215.

TS 19.2.5 - Roof Drainage

Roof drainage and overflow systems for the various buildings will be sized to meet local rainfall criteria and coordinated with the architectural roof design. Roof drains will be collected by a Facility Site storm water drain system or main plant-wide drain system for use as irrigation water to the extent practical.

TS 19.3 - Fire Alarm and Suppression System

The system will be designed to Northwest Fire District, NFPA and insurance requirements. The fire alarm will be installed to alarm at an alarm monitoring company approved by the Northwest Fire Department.

Code analyses will determine the areas in need of fire suppression systems. Fire suppression systems will be automatic wet-pipe sprinkler systems designed in accordance with NFPA 13. Facility Site fire flow requirements will be developed subject to verification by the Northwest Fire Department. The quantity and location of fire hydrants will be coordinated with the Fire Marshal. Where chemical storage areas require a fire sprinkler system, the need for secondary containment will be provided.

The fire alarm monitoring system will be compatible and integrate to the existing SimplexGrinell Fire Alarm Monitoring System presently installed and in use at the Tres Rios WRF.

TS 20.0 – Instrumentation and Controls

TS 20.1 – General

The D-B will design and configure the Instrumentation and Control System (ICS) to include the necessary process monitoring and control to continuously meet the Performance Guarantees. The D-B will provide an ICS compatible with the existing County facilities. The ICS will provide complete control, monitoring, alarm processing, trending and data archiving capabilities. The ICS will apply hardware and software consistent with existing County standards and practices.

The ICS will consist of field-mounted instruments, local equipment control panels, programmable logic controller (PLC) control panels, thin client workstations and communication networks. The ICS will integrate with the existing supervisory control and data acquisition (SCADA) system that is in production at the Tres Rios WRF.

The ICS will include all necessary field instrumentation, panel instrumentation and PLC-based SCADA equipment calibrated, aligned and configured in such a way which allows effective, efficient, reliable manual and automatic control and monitoring of the Facility with provision for future expansion. The ICS will store operational data for use in reporting and optimizing Facility operations and performance.

Prime operation will be through the ICS' distributed system architecture. PLCs located within conditioned areas in the Facility will perform the remote monitoring and control functions. All field input and output signals will be connected (using homerun wired connections) to the programmable logic controllers. The PLCs will be interconnected to a Local Area Network (LAN) within the Facility. LAN-connected, thin client terminals within the Facility will display the Facility arrangement and its controls using the existing Tres Rios WRF Human Machine Interface (HMI) application. The ICS will apply an open system architecture using Component-Off-The-Shelf (COTS) hardware allowing components supplied by multiple vendors to be used in any future additions or expansion.

There will be sufficient local manual control, indication and alarming to allow safe operation of the Facility equipment and its operation in the event of a controller or SCADA system failure. The ICS will be configured to allow equipment and processes to be operated and controlled both remotely or locally as selected by the operator.

TS 20.2 - Control System Integration (CSI) Specification

D-B will be responsible for properly configuring, programming and successfully testing the PLC units as well as programing a recent release of Wonderware System Platform (the SCADA Platform). County SCADA systems has been standardized to use Allan Bradley PLC components.

The control system integration must work seamlessly integrate with the existing Tres Rios Facility. All such work must conform to the County's existing PLC coding style, provide internal PLC documentation, and apply the existing PLC tag naming convention. In addition, the , work must conform to the existing System Platform style and implementation requirements which are presently in use within all of County SCADA systems.

TS 20.3 - SCADA Fiber Optic Cabling (FOC) Specification

D-B will design, install, and successfully test a dual-homed redundant fiber optical cable (FOC) backbone to the new Facility. The dual-homed fiber backbone configuration will apply dissimilar physical paths to provide redundancy in the event of fiber segment problems.

The Facility's FOC backbone that will convey data to and from the existing SCADA Server array at Tres Rios is mission critical.

The D-B must familiarize itself with the existing fiber optic infrastructure applied throughout PCRWRD facilities and ensure that the Work is fully compatible with that infrastructure and conforms to County ITD Fiber Optic Infrastructure standards. The D-B will install, terminate, and test all fiber optic cabling needed to support a redundant, dual-homed connection arrangement to the existing two core SCADA switches at the Tres Rios WRF. The D-B will also install, terminate and test any fiber optic cabling required within the Facility.

TS 20.4 - SCADA Network Infrastructure Components

The existing Tres Rios WRF SCADA network employs a cybersecurity implementation defined within the confidential cybersecurity chapter of the PCRWRD SCADA Master Plan. The existing SCADA cybersecurity implementation has been recently reviewed by the Department of Homeland Security (DHS) and the methods employed were found to be acceptable to protect a critical infrastructure environment.

The Pima County ITD Network Group is presently responsible for managing and monitoring all of the existing SCADA networks and deploying PCRWRD's underlying SCADA cybersecurity implementation. All SCADA network switches are managed and monitored remotely in real time by Pima County's Network Operations Center (NOC).

The delivery and installation of all pre-configured managed networking switches will performed by the County. The County ITD Networking Group will procure, configure, and install all managed network switches within the Facility.

The D-B will prepare a network diagram of all Ethernet over Copper (EoC) connected network nodes (e.g. PLCs, Packaged Systems, Thin Clients, etc.). EoC connected network nodes will aggregate onto one or more managed network switches within the Facility. If there are multiple managed switches within the Facility, the D-B will select one switch to serve as the main incoming network switch (for the dual home FOC facility connection) and all other network switches will utilize a trunk over optical cable.

Each EoC connected node will be made via industrially rated Category 6 (1000 Mbps Gigabit) plenum cabling. All EoC connections will be limited to a length of less than 100 meters. Any network connections requiring a greater distance will be made using single mode fiber.

Pima County ITD Network Group will deliver and install configured Cisco Industrial Ethernet 3000 Layer 2 / Layer 3 Series Switches (IE3000) managed network switches (and any required expansion modules) to the Facility.

The coordination of Facility network infrastructure components between the Builder and County will be through the County's SCADA Manager (primary) and/or the County Project Manager (alternate).

TS 20.5 - Reference Standards

In addition to the County I&C/SCADA standards and IT standards provided Section 3.9.8, the following organizations have generated standards that are to be used as guides in assuring quality and reliability of components and systems; govern nomenclature; define parameters of configuration and construction:

- International Society of Automation, (ISA).

- National Institute of Standards and Technology, (NIST).
- Underwriters' Laboratories, Inc., (UL).
- American Water Works Association, (AWWA).
- National Electrical Manufacturer's Association, (NEMA).
- Occupational Safety and Health Administration, (OSHA).
- American National Standards Institute, (ANSI).
- National Fire Protection Association, (NFPA).
- Scientific Apparatus Manufacturer's Association, (SAMA).
- National Fire Protection Association 79, Annex "D" Standards, (NFPA).
- Institute of Electrical and Electronic Engineers, (IEEE).
- National Electrical Code, (NEC).

TS 20.6 - Environmental Conditions

The following environmental conditions will be applied to all components of the control systems as required.

TS 20.6.1 - Unclassified Field Locations

Field equipment located in interior areas, which are not classified as hazardous locations, as defined by Article 500 of the National Electrical Code, are subject to ambient temperatures varying from +10 to +120 degrees F. with relative humidity ranging from 40 to 95 percent non-condensing. There may be incidental quantities of hydrogen sulfide gas and dust. Therefore, the equipment will be designed with materials for use in corrosive areas.

In exterior areas, ambient temperatures vary from +10 to +120 degrees F. with strong direct radiation from the sun. The relative humidity in these areas may range from 10 to 90 percent with condensation occurring. All areas may have trace quantities of hydrogen sulfide gas with windblown dust, sand, and rain.

All PLC panels which are mounted outdoors must contain an air conditioning unit appropriately sized to accommodate the expected combined Tucson solar radiation and installed equipment heat load.

PLC control panels will be located in environmentally conditioned areas wherever possible.

TS 20.6.2 - Classified Field Locations

The equipment located in classified areas will be designed to meet the classification of the area in accordance with the National Electric Code, Class 1, Division 1 or Class 1, Division 2 as required.

Use of classified field locations for PLCs, panels, etc., will be avoided wherever possible.

TS 20.6.3 - Corrosive Locations

The equipment located in areas that are subject to corrosive fumes or spills will be designed of materials for use in these corrosive areas.

Use of corrosive area locations for PLCs, panels, etc., will be avoided wherever possible.

TS 20.6.4 - Equipment Enclosures and Panel Construction

All equipment enclosures will meet the following requirements:

- NEMA 12 – General purpose indoor areas – control rooms.
- NEMA 4 – Outdoor areas.
- NEMA 4X – Corrosive and/or outdoor corrosive areas.
- NEMA 7 or other NEC compliant systems for hazardous areas – Explosive (hazardous) areas.
- All control panels will be constructed to meet the UL 508A Industrial Control Panel Standard.
- All control panels will provision power from a Facility-wide UPS source.
- All PLC control panels will provision room to accommodate a Cisco IE3000-8TC network switch.
- All PLC control panels must provision sufficient room to accommodate a small Ethernet patch panel for each end of an EoC connection (each Cat 6 cable lands at a RJ45 receptacle within the enclosure). The accepted patch panel types are defined within the Pima County ITD Infrastructure Specification.
- In the event a PLC control panel exceeds a raceway length of 100 meters to the Facility's main (or a sub) network switch, the panel must provision sufficient room to accommodate a light interface unit (LIU) for termination of single mode optical fiber. The accepted types are defined within the Pima County ITD Infrastructure Specification.
- All PLC control panels will apply Allen Bradley pre-wired module cable assemblies and field I/O termination units.
- All field I/O wiring made to PLC panels must be a homerun connection.

TS 20.6.5 - Sunshields

All field instruments that are mounted outdoors with local indicating displays will be equipped with sunshields to allow viewing of the displays and to shield the instrument enclosures from the heating effects of direct sunlight. In addition, outdoor indicating instrument displays will be north facing wherever possible to prevent direct sun exposure.

Any outdoor control panel which applies a localized operator interface panel display (e.g. an Allen Bradley Panelview Terminal) will be equipped with a suitably NEMA rated, deep hinged window kit, with a UV resistant window, to protect the panel display from the outdoor environment and shield the display from the heating effects of direct sunlight.

TS 20.7 - SCADA System Design

TS 20.7.1 - Control System Compatibility and Philosophy

The Facility ICS will provide compatibility with the existing County SCADA systems and conformance to SCADA standards in effect at the time of construction.

The ICS will provide for local manual, remote manual and remote automatic control modes of operation. The remote control modes of operation will be made available from the Facility HMI screens. In the event there is no automatic control mode requirement, then only local and remote manual control modes will be made available from the Facility HMI screens.

Process set points and operator-set alarm set points will be adjustable from the Facility HMI. Process set points will be programmed within the HMI to be bounded in value as defined by the Designer's control narrative.

Set point boundaries for any Engineer-set process limit(s), process equipment capability limit(s) or process equipment safety limit(s), operator process safety exposure alarm limit(s) (e.g. LEL, H2S etc.) will not be permitted to be changed by an operator from any HMI screen.

Manual operation will be provided for all Facility equipment and processes to include any necessary wired interlocks and process safeties.

TS 20.7.2 - SCADA Controls

When the local control station selector switch is set to REMOTE, the equipment will be provided with two control modes that are selectable from the SCADA graphic display: MANUAL and AUTOMATIC. In MANUAL, the equipment can be started and stopped manually from the graphic display. In AUTO, the equipment will be controlled according to the PLC automatic control logic strategy. If there is no automatic control logic, then only the manual control will be available from the Facility HMI. Process control and alarm set points will be available from the SCADA graphic displays. (See details noted above in preceding Section 3.9.5.1).

TS 20.7.3 - General Equipment Monitoring Requirements

Equipment status and selected operating modes will be displayed on the SCADA system. Facility HMI presentation will follow existing PCRWRD's Situational Awareness presentation design model as defined within the PCRWRD SCADA Master Plan.

Individual equipment runtime and equipment start counts will be accumulated, historically logged, and displayed by the SCADA system.

Contacts from wired equipment interlocks and field process limit switches will be provided as direct inputs to the PLC with associated alarms produced within the PLC to be monitored by the SCADA Platform. All Facility alarms will be annunciated and acknowledgeable via the Facility HMI.

TS 20.7.4 - Existing SCADA Architecture

The Facility ICS will be an integral part of the existing Tres Rios WRF HMI (System Platform 2014 R1) and the existing Tres Rios WRF facility PLCs. Thin client terminals will provide operator access to the existing Tres Rios HMI and the new Facility for monitoring and control purposes.

The existing Tres Rios SCADA software (System Platform 2014 R1) provides collection and archiving of all Tres Rios plant process historical trending and reporting data. The new Facility HMI will adopt and utilize the existing redundancy and robust design architecture provided by the existing System Platform SCADA Infrastructure currently in production at Tres Rios.

There is sufficient capacity within the existing redundant System Platform implementation:

- The existing System Platform implementation can accommodate the addition of a new I/O instances supporting all of the Facility's PLCs.
- The existing System Platform implementation can add in excess of 20,000 tags to the existing redundant primary process Historian pair for the new Facility. The existing redundant Historian pair provides process data to the trend displays, records alarm history and process data. Client tools are already in place to query process data and to generate reports. The present Historian arrangement also replicates process data into second tier Historian located within a cyber secured demilitarized zone (DMZ) for access from the Pima County Business Enterprise network.
- There is existing sufficient capacity to support the needed equipment object instances for the Facility HMI.

- Up to four thin client terminals can be applied within the Facility. The thin client terminals will be supported by the existing redundant and load-balanced production Terminal Server pair. ACP ThinManager Platform 8 is presently used to configure the behavior of all the PCRWRD thin client terminals.

SCADA Workstation graphics will be developed based on those currently in use on the County's existing SCADA systems and standards.

Access to process control capability will require entry of a username, password, and domain authentication. The level of control access granted is dependent on which domain group the user is a member.

TS 20.7.5 – D-B Control System Integration Pre-Construction Training

The County's PCRWRD SCADA Group will provide five days of pre-construction training to the D-B. This training is to familiarize the D-B with PCRWRD's:

- PLC Programming Style and coding requirements (2 days).
- System Platform Implementation - programming conventions and requirements (2 days).
- Cybersecurity Implementation and login credential issuance (1 day).

TS 20.7.6 - Interaction between D-B and County during Construction

TS 20.7.6.1 - County PLC Program Submittal Requests

The County' will review and approve the programming of the PLCs by on-demand programming review submittal. The submittals are to insure ongoing conformance with the County's PLC Programming Standards (e.g. controller organization, tag naming convention, tag descriptions, rung comments, and controller program housekeeping). County will submit specific requests to D-B.

TS 20.7.6.2 - D-B Use of Existing Wonderware System Platform Development Sandbox

D-B will develop its System Platform application for the new Facility using the County's existing private virtual sandbox development Galaxy Repository.

D-B will record and log all newly created Facility template names, graphic object names, and object instance names produced for the Facility's SCADA application. The log record will be used for future template and object migration to the Tres Rios WRF production Galaxy and its subsequent deployment.

TS 20.7.6.3 - System Platform Programming Inspections

The County will periodically inspect the D-B's ongoing System Platform work. The inspection will insure ongoing conformance with the County's existing System Platform design conventions and validation that the D-B's work will migrate properly with the existing Tres Rios System Platform application.

Inspection requests will be transmitted from the County to the D-B.

TS 20.7.6.4 - Migration from Development Sandbox to TRW Production System

County will assist the D-B with the template, graphic and object instance migration to the existing Tres Rios production system as needed during the course of construction.

TS 20.8 - Local Control Stations

Controls mounted adjacent to the motorized controlled equipment will be provided with a LOCAL/REMOTE selector switch, a START pushbutton and a LOCKOUT-STOP pushbutton.

Valves and similar equipment will be provided with a LOCAL/REMOTE selector switch and OPEN/STOP/CLOSE pushbuttons, or identical functionality available at the valve operator.

Disconnects will be provided adjacent to process equipment in non-hazardous areas up to and including 200A, and disconnects will be provided adjacent to process equipment in hazardous areas up to and including 100A. Larger loads will utilize the MCC or switchboard disconnect. Local disconnects will allow isolation of equipment from the electrical service for maintenance. Local disconnect status (CLOSED status true) will be provided to the ICS for all disconnect switches.

Local control stations for equipment with variable frequency drives (VFDs) will also include a speed control potentiometer (and R/I convertor) at the local control station. For bumpless transfer from local into remote, the PLC will track its speed feedback from the VFD (the LOCAL commanded speed) to its remote speed command with the VFD while LOCAL control is selected.

TS 20.8.1 - MCC Controls

Standard piloting controls will be provided on all motor control starters (e.g. start and stop pushbuttons with pilot lamps, fault alarm reset pushbutton with alarm lamp, a local/remote selector and, if applicable, localized VFD controls). All low voltage MCCs will employ intelligent electronic motor protection offered by the Eaton E441 Motor Insight motor protection relay.

In general, MCC connections to the PLC would be a run status, local/remote status, motor overload (or common protective relay fault alarm status), status from any process limit switches and a remote run command.

VFDs will also be connected to the PLC via hardwired controls using homerun connections. Local control stations will be provided at each piece of equipment controlled by a VFD.

TS 20.8.2 - Programmable Logic Controllers and Locations

PLCs will be used to automate the process via a distributed control system. Facility Supervisory Control PLCs will be located in a conditioned environment, such as an MCC Room.

Each PLC will be powered by an Uninterruptible Power Supply (UPS) electrical source within the Facility. The UPS will provide a reliable source of uninterruptible power with no break in AC output power during a complete or partial interruption of incoming line power. The UPS will include audio/visual alarms and will be UL listed. The UPS capacity rating will be adequate to provide uninterrupted conditioned power to fully loaded conditions (for all of the connected critical PLC loads) for a minimum of thirty minutes. The status of the UPS will be monitored by the ICS. The minimum acceptable UPS status requirement is monitoring of the UPS Loss of Utility Power and UPS Low Battery alarm conditions.

Distributed PLC processors, redundant PLC power supply units, control networks and UPS power will provide system reliability for the PLC and thin client based HMI in the Facility control system.

Communications from the Facility to the Tres Rios WRF system will be via fiber optic cable, enclosed in conduit, provided and installed by the D-B, in accordance with County ITD standards.

The D-B will provide, configure, and program all PLCs at the Facility. The D-B will program the PLCs to be able to provide the required process control, data and alarms to the existing Tres Rios WRF production SCADA System (based on Wonderware System Platform 2014 Patch 01).

User Defined Types (UDTs) and ControlNet networking will be applied for synchronized status and control messaging between a Facility master PLC and associated process area PLC(s) whenever sequential operational control or continuous shared deterministic control is required.

Communication links between all PLCs and facilities will be continuously monitored and safe operating modes assumed whenever a communication failure has occurred. Normal remote operation modes may resume when communications have been restored, depending on the process, safety issues, etc. Restart procedures following a communication or power failure will be defined for each process during preliminary design and documented within the control narratives.

The licensed software required for PLC and OIT programming is comprised of the following:

- Rockwell Automation RSLogix5000 (Version 20, PLC configuration software).
- Rockwell Automation RSLinx (OPC client to CIP communications software).
- RSNetWorx for ControlNet (Communications synchronization software).
- RSView Studio Machine Edition (Version 9, Panelview Terminal programming software).

TS 20.8.3 - Packaged Systems

Package System PLCs are permitted to be located in proximity of its package system within the Facility process (plant floor) area. All Package Systems will be connected to any Facility master PLC(s) via ControlNet.

The Package System Operator Interface Terminal (OIT) will be selected from the Allen Bradley Panelview 1000 or 1500 family. The OIT will be programmed using Rockwell Automation RSView Studio Machine Edition Version 9 (or later).

User Defined Types (UDTs) will be defined within any Facility master PLC and Package System PLC to communicate information to and from any Package System applied within the Facility's design.

Remote control modes of operation will be made available from the Facility HMI screens to any Packaged System. Conversely, the Packaged System will be prepared to support remote control operation from the Facility HMI. The Packaged System will annunciate their package system alarms on their local OIT. Alarms from a Package System PLC should be passed to a Facility master PLC allowing all Package System alarms to be available on the Facility HMI.

TS 20.9 - Safety Interlocks

All safety and equipment protection shutdown/lockout interlocks will be implemented through hardwired connections to the motor control circuit. Interlocking for personnel and equipment safety and equipment protection will not be performed by the PLC. Hardwired interlock logic will provide for a local RESET pushbutton function. Shutdown/Lockout and RESET functions will be monitored by the PLC and SCADA systems. In the event a PLC is signaled of a shutdown/interlock event, the PLC will suspend any automated control logic in use and apply any logic necessary needed to return the equipment and its process to a safe shutdown state.

TS 20.10 - Field Process Commissioning

The County and/or their representatives reserve the right to witness any or all instrument and control systems testing within the Facility.

TS 20.11 - Deliverables

Deliverables will be supplied in two forms hardcopy and electronic. 5 hardcopy sets should be supplied to the County's Project Manager.

Electronic deliverables will be delivered on 2 sets of USB Drive media. Drawings will be supplied both Adobe .PDF format and AutoCAD .DWG format. For control systems, the preferred drawing size is ANSI B elongated. Rockwell Automation PLC configuration files will be supplied in their native .ACD format.

Rockwell Automation RSView Studio panel configuration files will be supplied as either a project archive (.APA) file or a compiled image (.MER) file.

TS 20.11.1 - Design Deliverables

Consistent with the County review and approval process provided in the Scope of Work, D-B will deliver the following to County:

- All Piping and Instrumentation Diagrams for the entire Facility.
- A SCADA Network Communications Block Diagram (indicating all EoC, FOC and ControlNet nodes) for the entire Facility.
- A complete set of process narratives for the entire Facility, organized by increasing control loop number. The process narratives should describe the available control modes, process interlocks, automatic control action and anticipated set point(s) to achieve expected system performance for each process area's process unit or process unit group. The process narratives should be sufficiently descriptive to allow application into functional PLC and HMI configurations.
- A detailed Instrument List for the entire Facility.
- A sample ISA 20 compliant Instrument Specification Form for instrument installation and quality assurance.
- A sample Field I/O check sheet.

TS 20.11.2 - Construction Deliverables

At completion, D-B will deliver the following to County:

- Copies of all completed and signed Field I/O Check sheets.
- Copies of all annotated ISA 20 compliant Instrument Specification Forms.
- All control panel wiring diagrams applied within the Facility (to include any control panel diagrams associated with any applied Packaged Systems).
- All field loop wiring diagrams (organized by PLC control panel and increasing loop number) applied within the Facility (to include any field wiring diagrams of any applied Packaged Systems).
- Electronic submission of any applied Package System PLC configuration.
- Electronic submission of any applied Package System OIT configuration.
- Electronic submission of all Facility PLC configurations.

TS 21.0 – CORROSION CONTROL

During the Design Phase, the proposed Facility will be analyzed to determine chemicals that are used during the process and what affect the corrosivity of the water has as it moves through the Facility.

TS 21.1 - Site Soil Corrosivity

The D-B will evaluate corrosion potential of Project Sites soils, based on its analysis of geotechnical information gathered by the D-B.

TS 21.2 - Wastewater Corrosivity

TS 21.2.1 - Hydrogen Sulfide

Appropriate materials of construction or coatings and linings will be provided to resist deterioration from hydrogen sulfide corrosion.

TS 21.2.2 - Considerations for Concrete Surfaces

Appropriate methods will be used to protect concrete surfaces from damage due to acidic conditions.

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EXHIBIT 1 TO APPENDIX C

BIOGAS PURIFICATION TECHNOLOGY ALTERNATIVES SELECTION REPORT OUTLINE

1. **Introduction**
2. **Summary of Background Materials**
    a. Biogas production quantity (3-year daily production) and quality data
    b. Southwest Gas requirements (connection and transport)
3. **Overview of Biogas Purification Production Technology Alternatives**
    a. Water Wash Technology
    b. Pressure/Vacuum Swing Adsorption Technology
    c. Membrane Technology
4. **Water Wash Technology Application at Tres Rios WRF**
    a. Outline System Elements and Utility Connections
    b. Biomethane Yield and Purity
    c. Preliminary System Layout
    d. System Schematic Diagrams
    e. Operation and Maintenance (O&M) Requirements
        i. Daily weekly, monthly, quarterly and annual maintenance
            1. Annual Hours of System Operation
        ii. Special O&M certifications
5. **Pressure/Vacuum Swing Adsorption Technology Application at Tres Rios WRF**
    a. Outline System Elements and Utility Connections
    b. Biomethane Yield and Purity
    c. Preliminary System Layout
    d. System Schematic Diagrams
    e. Operation and Maintenance (O&M) Requirements
        i. Daily weekly, monthly, quarterly and annual maintenance
            1. Annual Hours of System Operation
        ii. Special O&M certifications
6. **Membrane Technology Application at Tres Rios WRF**
    a. Outline System Elements and Utility Connections
    b. Biomethane Yield and Purity
    c. Preliminary system Layout
    d. System Schematic Diagrams
    e. Operation and Maintenance (O&M) Requirements
        i. Daily weekly, monthly, quarterly and annual maintenance
            1. Annual Hours of System Operation
        ii. Special O&M certifications
7. **Alternative System Costs**
    a. Water Wash Technology
        i. Probable Construction Costs
        ii. Estimated O&M Costs
        iii. Expected Revenue (Assume $15mmbtu)

iv. Expected costs of Marketing and Management of Biomethane Sales
v. Life Cycle Costs (20 years)

b. Pressure/Vacuum Swing Adsorption Technology
   i. Probable Construction Costs
   ii. Estimated O&M Costs
   iii. Expected Revenue (Assume $15mmbtu)
   iv. Expected costs of Marketing and Management of Biomethane Sales
   v. Life Cycle Costs (20 years)

c. Membrane Technology
   i. Probable Construction Costs
   ii. Estimated O&M Costs
   iii. Expected Revenue (Assume $15mmbtu)
   iv. Expected costs of Marketing and Management of Biomethane Sales
   v. Life Cycle Costs (20 years)

8. Alternatives Discussion

a. Advantages and Disadvantages - Water Wash Technology
b. Advantages and Disadvantages - Pressure/Vacuum Swing Adsorption Technology
c. Advantages and Disadvantages - Membrane Technology
d. Comparison of Alternatives
   i. Criteria for Compariso
   ii. Matrix for Comparison of Criteria

9. Recommendation

a. Alternative Selected
b. Basis of Selection

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EXHIBIT 2 TO APPENDIX C

SOUTHWEST GAS CORPORATION
BIOMETHANE COMPOSITION SPECIFICATION
(Rev. 11/16/2017)

The following are required specifications for alternate natural gas composition to meet Southwest Gas Corporation (Southwest) tariff, billing, safety, and operational requirements:

1. Minimum energy content: **900** BTU/scf in Arizona

2. Wobbe number: Maximum Wobbe number = **1385**
   Minimum Wobbe number = **1280**

   $$\text{Wobbe number} = \frac{BTU\ /\ scf}{\sqrt{SG}}$$

   scf = standard cubic foot of natural gas
   SG = specific gravity with respect to air

3. Maximum sulfur content:
   Hydrogen sulfide: **0.25** grain per 100 scf (**4** ppm)
   Total sulfur: **5** grains per 100 scf (**80** ppm)

4. Maximum total inert content: **4%** total
   - Maximum **0.2%** oxygen
   - Maximum **3%** nitrogen
   - Maximum **2%** CO_2

5. Temperature range: **40°** F to **120°** F

6. Maximum hydrocarbon dew point: **20°** F

7. Maximum water content: **7** lbs per 1,000,000 cubic feet (1 MMscf) of gas

8. Minimum odorization level: natural gas detectable at **0.8%** natural gas in air mixture

9. Biomethane Gas must be free from bacteria, pathogens, dust, sand, dirt, gums, oils, and/or any other substances at levels that would be injurious to the Southwest's facilities, and/or to render the gas unmerchantable.

10. Biomethane Gas must not contain any hazardous substances at concentration levels which would prevent or unduly impact the merchantability of Biomethane Gas, be injurious to Southwest facilities, or which would present a health and/or safety hazard to Southwest employees, customers, and/or the public.

11. Testing of Health Protective Constituents (Carcinogenic & Non-carcinogenic) and Pipeline Integrity Protective Constituents as follows:

    Landfill supplied biomethane: all Carcinogenic, Non-carcinogenic, and Pipeline Integrity Protective Constituents listed below.

    Dairy supplied biomethane: Ethylbenzene, n-Nitroso-di-n-propylamine, Mercaptans, Toluene, and all Pipeline Integrity Protective Constituents.

    Water & Sewage Treatment supplied biomethane: p-Dichlorobenzene, Ethylbenzene, Vinyl Chloride, Mercaptans, Toluene, and all Pipeline Integrity Protective Constituents.

Carcinogenic Constituents (Maximum):		
Arsenic:	0.48 mg/m^3	(0.15 ppmv)
p-Dichlorobenzenes:	140 mg/m^3	(24 ppmv)
Ethylbenzene:	650 mg/m^3	(150 ppmv)
n-Nitroso-di-n-propylamine:	0.81 mg/m^3	(0.15 ppmv)
Vinyl Chloride:	21 mg/m^3	(8.3 ppmv)

Non-Carcinogenic Constituents (Maximum):		
Antimony:	30 mg/m^3	(6.1 ppmv)
Copper:	3.0 mg/m^3	(1.2 ppmv)
Lead:	3.8 mg/m^3	(0.44 ppmv)
Methacrolein:	53 mg/m^3	(18 ppmv)
Alkyl Thiols (Mercaptans):	N/A	(610 ppmv)
Toluene:	45,000 mg/m^3	(12,000 ppmv)

Pipeline Integrity Protective Constituents (Maximum):	
Siloxanes:	0.1 mg Si/m^3
Ammonia:	0.001%
Hydrogen:	0.1%
Mercury:	0.08 mg/m^3
Biologicals:	4 x 10^4/scf (qPCR per APB, SRB, IOB group[1]) & commercially free of bacteria using 0.2 micron filter

[1]Acid-producing Bacteria [APB], Sulfate-reducing Bacteria [SRB], and Iron-oxidizing Bacteria [IOB]

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EXHIBIT 3 TO APPENDIX C (5 pages)

Exterior Coating Color/Labeling Scheme for Plant/Process Piping
(for labeling see specification Section TS 17.1 – Piping, Valves and Gates)

Flow Stream	Service Name	* Pipe Material	Color	Bands	Comments on Color Choice	Tnemec #	ICI Paint #	Carboline #	Devoe Paints #
CA	Compressed Air	COP	Green	Red	per ROMP	SC07	"Safety Green"	2383	Match defined colors
CHD	Chemical Drain	PVC	Yellow	--	Match existing piping	BW56	"Medium Yellow"	6666	Match defined colors
CO	Classifier Overflow	CLDI	Dark Brown	--	Match other sludge piping	YB23	"Warm Brown"	9218	Match defined colors
CT	Centrate	CLDI	Dark Brown	--	Match other sludge piping	YB23	"Warm Brown"	9218	Match defined colors
CW	Chilled Water	STL	--	--	Provide labels outside of insulation jacket.	--	--	--	--
CWR	Chilled Water Return	STL	--	--	Provide labels outside of insulation jacket.	--	--	--	--
DCW	Domestic Cold Water	COP & CLDI	Blue	--	Match potable cold water in ROMP	SC06	"Safety Blue"	S150	Match defined colors
DHWC	Domestic Hot Water Circulation	COP	Blue	Red	Match potable hot water in ROMP	SC06	"Safety Blue"	S150	Match defined colors
DHW	Domestic Hot Water	COP	Blue	Red	Match potable hot water in ROMP	SC06	"Safety Blue"	S150	Match defined colors
DS	Digested Sludge	CLDI	Dark Brown	--	Match existing piping	YB23	"Warm Brown"	9218	Match defined colors
DWS	Dewatered Sludge	CLDI	Dark Brown	--	Match other sludge piping	YB23	"Warm Brown"	9218	Match defined colors
FA	Foul Air	FRP	White	--	Gel coat per Section 23 31	--	--	--	--

Exterior Coating Color/Labeling Scheme for Plant/Process Piping (for Labeling see specification Section 10 14 00)									
Flow Stream	**Service Name**	*** Pipe Material**	**Color**	**Bands**	**Comments on Color Choice**	**Tnemec #**	**ICI Paint #**	**Carboline #**	**Devoe Paints #**
					16.16				
FC	Ferric Chloride	CPVC	Yellow	--	Match other chemicals in ROMP	BW56	"Medium Yellow"	6666	Match defined colors
FPW	Fire Protection Water	STL	Red	--	Per AHJ	SC09	"Safety Red"	5555	Match defined colors
FS	Float Sludge	CLDI	Dark Brown	--	Match other sludge piping	YB23	"Warm Brown"	9218	Match defined colors
FSP	Foam Spray	COP	Light Grey	Orange	per ROMP	EN14	--	C731	Match defined colors
FT	Filtrate	CLDI	Dark Brown	--	Match other sludge piping	YB23	"Warm Brown"	9218	Match defined colors
FW	Flush Water	CLDI			Color will depend on the source – if PW = blue; if SW=purple				
GT	Grit	CLDI	Dark Brown	--	Match other sludge piping	YB23	"Warm Brown"	9218	Match defined colors
HE	Headwork Effluent	CLDI	Dark Brown	--	Match other sludge piping	YB23	"Warm Brown"	9218	Match defined colors
HW	Heating Water Supply	STL	--	--	Provide labels outside of insulation jacket.	--	--	--	--
HWR	Heating Water Return	STL	--	--	Provide labels outside of insulation jacket.	--	--	--	--
IA	Instrument Air	COP	Green	--	per ROMP	SC07	"Safety Green"	2383	Match defined colors

Exterior Coating Color/Labeling Scheme for Plant/Process Piping (for Labeling see specification Section 10 14 00)									
Flow Stream	**Service Name**	*** Pipe Material**	**Color**	**Bands**	**Comments on Color Choice**	**Tnemec #**	**ICI Paint #**	**Carboline #**	**Devoe Paints #**
IMLR	Internal Mixed Liquor Recycle	CLDI	Dark Brown	--	Match other sludge piping	YB23	"Warm Brown"	9218	Match defined colors
IW	Irrigation Water	CPVC & CLDI	Purple	--	IW supplied via SW. Pipe supplied to the site purple in color per Section 32 8423.	--	--	--	DC9600, "Safety Purple"
ML	Mixed Liquor	CLDI	Dark Brown	--	Match other sludge piping	YB23	"Warm Brown"	9218	Match defined colors
NAOCL	Sodium Hypochlorite	CPVC	Yellow	Dark Yellow	per ROMP	BW56	"Medium Yellow"	6666	Match defined colors
NG	Natural Gas	STL	Yellow	--	Match existing piping	BW56	"Medium Yellow"	6666	Match defined colors
NPHW	Non-Potable Hot Water	COP	Light Blue	Red	Match existing piping	J8161 2040	70BG 67/126	7107	Match defined colors
NPW	Non-Potable Water	CLDI	Light Blue	--	Match existing piping	J8161 2040	70BG 67/126	7107	Match defined colors
OD	Overflow Roof Drain	CISP	Dark Grey	Red	Match drains in ROMP	IN05-61	"Silver Grey"	2525	Match defined colors
P	Polymer	CPVC	Dark Green	--	Match existing piping	G4582	"Crylight Green",90 GY 10/250	4372	Match defined colors
PA	Process Air	WS	Light Green	Red	Similar to CA, IA	AM52	"Parrot"	6361	Match defined colors
PD	Plant Drain	PVC	Dark Grey	Red	Match drains in ROMP	IN05-61	"Silver Grey"	2525	Match defined colors
PE	Primary Effluent	CLDI & WS	Dark Brown	--	Match other sludge piping	YB23	"Warm Brown"	9218	Match defined colors

Exterior Coating Color/Labeling Scheme for Plant/Process Piping (for Labeling see specification Section 10 14 00)									
Flow Stream	**Service Name**	*** Pipe Material**	**Color**	**Bands**	**Comments on Color Choice**	**Tnemec #**	**ICI Paint #**	**Carboline #**	**Devoe Paints #**
POS	Polymer Solution	CPVC	Dark Green	--	Match existing piping	G4582	"Crylight Green",90 GY 10/250	4372	Match defined colors
PS	Primary Sludge	CLDI	Dark Brown	--	Match existing piping	YB23	"Warm Brown"	9218	Match defined colors
PW	Potable Water	COP & CLDI	Blue	--	Match potable cold water in ROMP	SC06	"Safety Blue"	S150	Match defined colors
RA	Pressurization Air	COP	Light Green	Red	Similar to CA, IA	AM52	"Parrot"	6361	Match defined colors
RAS	Return Activated Sludge	CLDI	Dark Brown	--	Match existing piping	YB23	"Warm Brown"	9218	Match defined colors
RD	Roof Drain	CISP	Dark Grey	Red	Match drains in ROMP	IN05-61	"Silver Grey"	2525	Match defined colors
RS	Raw Sewage	CLDI	Dark Brown	--	Match other sludge piping	YB23	"Warm Brown"	9218	Match defined colors
SB	Sodium Bisulfite	CPVC	Yellow	--	Match other chemicals in ROMP	BW56	"Medium Yellow"	6666	Match defined colors
SCNG	Screenings	CLDI	Dark Brown	--	Match other sludge piping	YB23	"Warm Brown"	9218	Match defined colors
SE	Secondary Effluent	CLDI	Dark Brown	--	Match other sludge piping	YB23	"Warm Brown"	9218	Match defined colors
SHWR	Sludge Heating Water Return	STL	--	--	Provide labels outside of insulation jacket.	--	--	--	--
SHWS	Sludge Heating Water Supply	STL	--	--	Provide labels outside of insulation	--	--	--	--

Exterior Coating Color/Labeling Scheme for Plant/Process Piping (for Labeling see specification Section 10 14 00)									
Flow Stream	**Service Name**	*** Pipe Material**	**Color**	**Bands**	**Comments on Color Choice**	**Tnemec #**	**ICI Paint #**	**Carboline #**	**Devoe Paints #**
					jacket.				
SM	Scum	GLDI	Dark Brown	--	Match other sludge piping	YB23	"Warm Brown"	9218	Match defined colors
SPD	Sump Pump Discharge	CLDI	Dark Brown	--	Match other sludge piping	YB23	"Warm Brown"	9218	Match defined colors
SRC	Scrubber Recirculating	CPVC	Yellow	--	Match existing piping	BW56	"Medium Yellow"	6666	Match defined colors
SSL	Secondary Sludge	CLDI	Dark Brown	--	Match existing piping	YB23	"Warm Brown"	9218	Match defined colors
SW	Service Water	PVC & CLDI	Purple	--	Match existing piping	--	--	--	DC9600,
TD	Tank Drain	CLDI	Dark Brown	--	Match other sludge piping	YB23	"Warm Brown"	9218	Match defined colors
TPS	Thickened Primary Sludge	CLDI	Dark Brown	--	Match existing piping	YB23	"Warm Brown"	9218	Match defined colors
TW	Tepid Water	COP	Blue	Red	Match potable hot water in ROMP	SC06	"Safety Blue"	S150	Match defined colors
TWAS	Thickened Waste Sludge	CLDI	Dark Brown	--	Match existing piping	YB23	"Warm Brown"	9218	Match defined colors
WAS	Waste Sludge	CLDI	Dark Brown	--	Match other sludge piping	YB23	"Warm Brown"	9218	Match defined colors

* CISP = Cast Iron Soil Pipe
CLDI = Cement-Lined Ductile Iron
COP = Copper
CPVC = Chlorinated Polyvinyl Chloride
FRP = Fiberglas Reinforced Plastic
GLDI = Glass-Lined Ductile Iron
PVC = Polyvinyl Chloride
STL = Steel
WS = Welded Steel

End of Appendix "C" – Technical Specifications

EXHIBIT 3 TO APPENDIX "C"

TECHNICAL SPECIFICATIONS

APPENDIX "D" (21 pages)
DESIGN-BUILDER SPECIAL CONDITIONS

Contents

SC 1 – County Obligations

SC 1.1 - Project Information

Design-Builder acknowledges that County has provided Design-Builder with all necessary information regarding County's requirements for the Project as set forth in the Request.

SC 1.2 - County's Budget

County established an overall budget for the Project of $2.5 million to $3.5 million, including amounts allocated for design and construction, the County's other costs, and reasonable contingencies related to these costs as appropriate.

SC 1.3 - Time for Performance

County will review and approve or take other appropriate action on all design submittals of the Design-Builder within the timeframes set forth in the Scope of Work.

SC 1.4 - Purpose of County's Review

County's review, inspection, or approval of any Work, Design Documents, Applications for Payment, or other submittals will be solely for the purpose of determining whether the same are generally consistent with County's Request, the Contract, and with County standards, policies, and requirements. No review, inspection, or approval by County of such Work or documents will relieve Design-Builder of its responsibility for the performance of its obligations under the Contract for Design-Build Construction or the accuracy, adequacy, fitness, suitability, or coordination of its Design Services or the Work. Approval by any governmental or other regulatory agency or other governing body of any Work, Design Document, or the Construction Documents will not relieve Design-Builder of responsibility for the performance of its obligations under this Contract. Payment by County pursuant to the Contract for Design-Build Construction will not constitute a waiver of any of County's rights under the Contract for Design-Build Construction or at law, and Design-Builder expressly accepts the risk that defects in its performance, if any, may not be discovered until after payment, including final payment, is made by County. Notwithstanding the foregoing, prompt written notice will be given by the County to the Design-Builder if the County becomes aware of any fault or defect in the Project or non-conformance with the Contract for Design-Build Construction.

SC 1.5 - Status of County

The County will not have control or charge of construction means, methods, techniques, sequences, or procedures, or for safety precautions and programs in connection with the Work, nor will the Design-Builder, for any of the foregoing purposes, be deemed the agent of the County.

SC 2 – Design Service Requirements and Standards

SC 2.1 - Quality of Design Services

Design-Builder will be responsible for the quality, completeness, accuracy, and coordination of Design and Construction Documents. Design-Builder will provide Design Services that meet all environmental and regulatory requirements. Design-Builder will provide for all testing and inspections required by sound architectural and engineering practices and by governmental authorities having jurisdiction over the Project.

SC 2.2 - Errors and Omissions

The Design-Builder will, at no additional cost to the County, immediately make additions, changes, and corrections to any documents prepared by Design-Builder necessitated by errors and omissions in the Design-Builder's performance of its services. In addition, Design-Builder will not be entitled to any compensation or adjustment in the Guaranteed Maximum Price ("GMP") for additional work required as a result thereof, provided, upon County's written approval, Design-Builder may use contingency funds to pay for Work not included in the Construction Documents which add value to the Project (but expressly excluding any demolition or other costs related to the substitution of such Work for previously installed Work and associated design fees). The foregoing will not relieve Design-Builder for liability to County for any damages, including costs incurred by County after termination in whole or in part of the Contract, resulting from any error or omissions by Design-Builder in the course of its duties under the Contract.

SC 2.3 - Notice of Non-Compliance with Law

If Design-Builder believes or is advised by another design professional retained to provide services on the Project that implementation of any instruction received from County would cause a violation of any applicable law, Design-Builder will promptly so notify County in writing.

SC 3 - Schedule and Coordination

SC 3.1 - Design-Builder Responsible

Design-Builder will schedule and coordinate the work of its own Subcontractors on the Project, including their use of the Site. Design-Builder will keep its Subcontractors informed of the Project Schedule to enable the Subcontractors to plan and perform the Construction Work properly. Design-Builder will cooperate and coordinate with other separate contractors performing work for County on the Project. However, Design-Builder's obligation of cooperation and coordination will not operate to make Design-Builder responsible for any aspect of work performed by any separate contractors except Design-Builder's own Subcontractors.

SC 3.2 - Schedule Requirements

The Project Schedule for performance of the Construction Work will be a CPM schedule with reasonable detail, including a time-scaled network and computer printout in accordance with the following requirements:

- no activity will be longer than twenty-one (21) calendar days in length without the approval of County except fabrication and delivery activities.
- each activity must be logically tied to another activity to show its interdependency with other activities.
- installation activities must be logically tied to submittal/approval, fabrication, and delivery.
- only a single critical path will be designated.

The Design-Builder will use scheduling software acceptable to County to develop the Project Schedule. The Project Schedule will be presented in graphical and/or tabular reports as agreed upon by the Project Team. If Project phasing, as described below, is required, the Project Schedule will indicate milestone dates for the phases, once determined.

The Project Schedule will provide three (3) weeks for County to review Design Submission Documents at each sub-phase of the Design Phases and provide adequate time for government agency reviews and all other necessary approvals and permits. The Project Schedule will indicate the dates for the start and completion of the various stages of the Project, including, among others, the dates when County information and approvals are required and all necessary shutdowns or suspensions of County or separate vendor activities on the Site (if any). Design-Builder will update and reissue the Project Schedule throughout the Design Phases and the Construction Phase, as necessary and appropriate to reflect adjustments in the schedule. Updates will be subject to approval by County.

The Project Schedule will be in Days (calendar days, unless otherwise directed by County) and will indicate task duration (earliest start/latest completion) for all activities. Float times for all activities will be shown. The CPM diagram will be presented in a time scaled graphical format for the Project as a whole.

The Project Schedule will indicate all relationships between activities.

The activities making up the Project Schedule will be of sufficient detail to assure that adequate planning has been done for proper execution of the Work so that it provides an appropriate basis for monitoring and evaluating progress of the Work.

The activities upon which the Project Schedule is based will coincide with the Schedule of Values.

The Project Schedule will show all submittals associated with each work activity and the review time for each submittal.

The Project Schedule will show milestones, including milestones for all Team members.

The Project Schedule will include anticipated rain delay during the performance of the construction contract. The duration will reflect the average climatic range and conditions prevailing in the locality of the site. Weather data, provided by the Design-Builder, will be based on information from the National Weather Services or other County-approved sources.

The Project Schedule will consider the Substantial Completion date requirements showing portions of the Project having priority.

Float time will be prescribed as follows: The total Float within the overall schedule is not for the exclusive use of either County or Design-Builder, but is jointly owned by both and is a resource available to, and shared by, both parties as needed to meet contract milestones and the Project completion date.

The Design-Builder will not sequester shared Float through such strategies as extending activity duration estimates to consume available Float, using preferential logic, or using extensive crew/resource sequencing, etc. Since Float time within the schedule is jointly owned, no time extensions will be granted, nor delay damages paid, until a delay occurs which extends the Work beyond the Substantial Completion date.

Throughout the Design Phases, Design-Builder will provide updates and/or revisions to the Project Schedule for use by the Project Team, whenever required, but no less often than monthly. The Design-Builder will add detail to the previous version of the Project Schedule to keep it current throughout the Design Phases, so that the Project Schedule is ready for implementation at the start of the Construction Phase. The update/revisions will include, but not be limited to:

- A narrative analyzing the progress achieved to-date vs. planned.
- Any concerns regarding delays or potential delays, and any recommendations regarding mitigating actions.
- Revisions in Drawings and Specifications.
- The results of any additional investigative reports of subsurface conditions, drawings of physical conditions of existing surface and subsurface facilities, and documents depicting underground utilities placement and physical condition, whether obtained by County or Design-Builder.
- Unresolved permitting issues, and significant issues, if any, pertaining to the acquisition of land and right of way.
- The fast-tracking of any of the construction, or other chosen construction delivery methods.
- The requisite number of separate bidding documents to be advertised.
- The status of the procurement of long-lead time equipment and materials.
- Funding issues (i.e., delays) identified by the County.

If phased construction is deemed appropriate and County approves, Design-Builder will review the design and make recommendations regarding the phased issuance of Construction Documents to facilitate phased construction of the Work, with the objective of shortening the Construction Time and/or reducing the Cost of the Work. The Design-Builder will take into consideration such factors as natural and practical lines of work severability, sequencing effectiveness, access and availability constraints, total time for completion, construction market conditions, labor and materials availability, effect on traffic or public access, and any other factors pertinent to saving time and cost. The Project Schedule will be adjusted to allow for phased construction or for portions of the Construction Work to be accepted separately by the County, if required by County.

SC 3.3 - Submittal Schedule

Design-Builder will prepare and keep current, for County's approval, a time schedule of submittals which is coordinated with Design-Builder's construction schedule and allows County the specified time to review submittals.

SC 3.4 - Monthly Schedule Revisions

Design-Builder's schedules will be revised monthly to reflect ACTUAL conditions in the field. A copy of the revised Project Schedule and narrative report including a description of current and anticipated problem areas, delaying factors and their anticipated impact, and corrective action taken or proposed to be taken will be submitted with each Application for Payment. Submission of an updated Project Schedule meeting these criteria will be a condition to the processing of any application for payment made by Design-Builder. County's review of the Project Schedule update will not be construed as relieving Design-Builder of its complete and exclusive control over the means, methods, sequences, and techniques of construction and payment by County will not be deemed a determination that the updated schedule is acceptable. The Design-Builder understands that the updated Project Schedule will be the basis for the analysis and granting of time extensions in accordance with SC 6.13.

SC 3.5 - Other Schedule Updates

In addition to the monthly update, the Design-Builder's schedules will also be revised at appropriate intervals as required by the conditions of the Construction Work or as directed by the County with a printed and electronic copy submitted to the County in a format acceptable to the County.

SC 3.6 - Adherence to Schedule

Design-Builder will perform the Construction Work within the identified times of the most recent schedule and consistent with the established Contract Time(s).

SC 3.7 - Ownership of Float

The parties agree that if Design-Builder submits an original or updated schedule which shows the Project and/or individual milestone(s) completing earlier than required by the Contract Documents (the then adjusted Contract Time(s)), the differences between the forecasted early completion and the required completion will be considered Project-owned float available for use by both the County and the Design-Builder.

SC 3.8 - Time Extensions

Since Float time within the schedule is jointly owned, no time extensions will be granted nor delay damages paid until a delay occurs which extends the Construction Work beyond the adjusted Contract Time(s).

SC 3.9 - Demonstration of Extension Need

No time extensions will be granted nor delay damages paid unless the delay is clearly demonstrated by the updated construction schedule current as of the month the change was issued or the delay occurred and which delay cannot be mitigated, offset, or eliminated through such actions as revising the intended sequence of Work or other reasonable means.

SC 4 – Design-Builder's Responsibility for Project Safety

SC 4.1 - Division of Safety Responsibility

As among Design-Builder and County, Design-Builder will have sole responsibility for safety at the Construction Work Site, except that County will have responsibility for the acts and omissions of its officers and employees.

SC 4.2 - Scope of Responsibility; Safety Manager

Design-Builder recognizes the importance of performing the Construction Work in a safe manner so as to prevent damage, injury, death or loss to (i) all individuals at or in the vicinity of the Construction Work, whether working or visiting the Project: (ii) any Construction Work, including, without limitation, materials and equipment incorporated or stored on or off Site; and (iii) all other or adjacent property, whether owned by County or other persons. As among Design-Builder and County, Design-Builder assumes sole responsibility for implementing and monitoring all safety precautions and programs related to the performance of the Construction Work. Design-Builder will, prior to commencing construction, designate a safety manager with the necessary qualifications and experience to supervise the implementation and monitoring of all safety precautions and programs related to the Construction Work. The safety manager will make routine daily inspections of the Site and will hold at least weekly safety meetings with Design-Builder's personnel and its Subcontractors.

SC 4.3 - Legal Requirements

Design-Builder and its Subcontractors will comply with all Legal Requirements relating to safety, as well as any County specific safety requirements set forth in the Contract which do not violate any applicable Legal Requirements. Design-Builder will immediately report, in writing, to County and, if required by applicable Legal Requirements, all government or quasi-government authorities having jurisdiction over matters involving the Construction Work, any injury, death, loss, damage or accident occurring at the Site, Without limiting the foregoing, Design-Builder will, and will cause each Subcontractor to, comply with worker health and safety requirements in Environmental Law and OSHA. In addition, Design-Builder will take all reasonable necessary and appropriate steps to ensure the health and safety of persons occupying any part of the facility in which the Construction Work Site is located or in the vicinity of or passing by the Construction Work Site and will also take all reasonable necessary and appropriate steps to protect from damage or destruction the property of County and other persons in any part of the facility in which the Construction Work Site is located or in the vicinity of or passing by the Construction Work Site. Among other actions in this regard, Design-Builder will comply with the requirements of any applicable fire code.

SC 4.4 - Discontinuance of Work

If in the course of the Construction Work, any environmental, health, or safety concern exists or arises, whether relating to a Hazardous Substance, OSHA, or otherwise, then the Construction Work activities related to the concern must be discontinued until the concern is resolved. Prior to disturbing a suspected Hazardous Substance or otherwise interacting with a potential health or safety hazard, the County must be notified immediately of the concern. Construction Work will not resume until approval has been provided by County. Close coordination will be maintained between County and Design-Builder so the Project schedule is impacted the least amount possible.

SC 4.5 - Subcontractor Responsibility

Design-Builder's responsibility for safety under this SC 4 is not intended in any way to relieve Subcontractors from applicable obligations and responsibilities for complying with all Legal Requirements, including those related to health and safety matters, and taking all necessary measures to implement and monitor all safety precautions and programs to guard against injury, death, loss, damage or accident resulting from their performance of the Construction Work.

SC 4.6 - Applicability of Other Contract Requirements

The requirements in this SC 4 supplement and are in addition to the other requirements in the Contract Documents.

SC 4.7 - Pass-Through to Subcontractors

Design-Builder will provide the requirements and make the assignments of responsibilities for safety precautions and programs for the Construction Work, for temporary Project facilities, and for equipment, materials and services for common use of Subcontractors. Design-Builder will assure that this SC 4 and the applicable assignments are included in the contract between Design-Builder and each Subcontractor.

SC 4.8 - County-Designated Limited Work Areas

County may elect to designate to Design-Builder specific limitations to the area in which Design-Builder and its Subcontractors are to perform the Construction Work in order to prevent a Release of an existing Hazardous Substance on or in the vicinity of the construction site, provided that in such event County must make Design-Builder aware of the existence of the Hazardous Substance and must provide an area free from the Hazardous Substance sufficient for Design-Builder and its Subcontractors to perform the Construction Work. Whenever County does this, Design-Builder and its Subcontractors will carry out their actions in performing the Construction Work within the specified limited area. In addition, in performing the Construction Work, Design-Builder and its Subcontractors will not, intentionally or accidentally, or otherwise, traverse, scrape, or otherwise disturb soils or constructed surfaces adjacent to or outside the designated Construction Work area unless Design-Builder has requested and obtained written approval from the County. Any question about the scope of the permitted Construction Work area must be resolved by the County.

SC 5 - Site Conditions

SC 5.1 - General

D-B may only claim Uncontrollable Circumstances relief due to any surface or subsurface conditioned encountered in the performance of the Contract if the condition meets the definition of either Differing Site Conditions or Regulated Site Conditions.

SC 5.2 - Notification

Design-Builder will immediately, and before such conditions are disturbed, notify County in writing of Differing Site Conditions or Regulated Site Conditions encountered at the Site that could adversely affect the cost of the Construction Work or the timely performance thereof.

SC 5.3 - Investigation and Remedy

The County will within ten (10) days after receipt of notice from Design-Builder, or such other reasonable time as necessary, investigate the conditions reported by Design-Builder under SC 5.2. If the County finds that conditions are so materially different as to support an equitable adjustment in the GMP or the Contract Time(s), an equitable adjustment will be accomplished by written change order to the Contract Time(s) or the GMP. Adjustment of the GMP will be for the actual, demonstrated direct and indirect cost impact to address the unforeseen condition. Extensions of Contract Time(s) will be considered only when based upon submission of an updated CPM master schedule showing an actual unavoidable delay to the Project critical path resulting from the unforeseen condition. If the County determines that no Change Order will be issued, the Contract Time(s) will not be changed and there will be no change in the GMP. Regardless of the outcome, the Design-Builder will continue with the Construction Work.

SC 5.4 - Timeliness of Notice

No claim by the Design-Builder for an increase in the GMP or in the Contract Time(s) will be allowed without proper advance notice and an adequate opportunity for the County to investigate.

SC 6 – Payment of Design-Builder - Finance Controls - Open Book Costs and Audit

SC 6.1 - County Payments

The County will make payments as provided in the Contract for Design-Builder's performance of the Construction Work up to, but not exceeding, the Guaranteed Maximum Price, as such GMP may be modified as provided in the Contract.

SC 6.2 – Section Reserved

SC 6.3 - Financial Records

With respect to all Construction Work performed by the Design-Builder and its Subcontractors, Design-Builder and each Subcontractor will keep full and detailed accounts and exercise such controls as may be necessary for proper financial management, using generally accepted accounting principles and control systems approved by County. During the performance of the Construction Work and for five (5) years after Final Payment, the Design-Builder will retain and will also require all Subcontractors to retain for review, audit, or both, by the County all correspondence; meeting minutes; memoranda; electronic media; books; accounts; reports; files; time cards; material invoices; payrolls; evidence of all communications (in native format); evidence of direct, and indirect costs; and all other matters relating to the Construction Work. Upon request by County, a legible copy or the original of any or all such records will be produced by the Design-Builder at any reasonable time during or after the Construction Work as the County may request. The Design-Builder will submit to the County upon request all payrolls, reports, estimates, records, and any other data concerning the Construction Work performed or to be performed or concerning materials supplied or to be supplied, as well as Subcontractor payment applications or invoices and such Subcontractor's progress payment checks. The requirements of this SC 6.3 will be included in all contracts between the Design-Builder and its Subcontractors. The County may exercise its rights under this SC 6.3 as often as reasonably necessary in the County's sole judgment to assure the County has a complete and accurate understanding of all Project costs.

SC 6.4 - Schedule of Values

The Schedule of Values will be used as a basis for payment as provided in SC 6.5 and SC 6.6. If there are any changes in the Guaranteed Maximum Price, the Schedule of Values will be adjusted accordingly. Design-Builder will provide written approval from its surety for the approved Schedule of Values to be used as a basis for monthly progress payments.

SC 6.5 - Applications for Payment

Design-Builder will deliver to County each month a certified application for payment in the format specified by County. Each application for payment: (i) will be for an amount based on the Schedule of Values and determined by the percentage of completion of the Construction Work; (ii) will show the percentage of completion of each category of the Construction Work; (iii) will be accompanied by an updated CPM schedule and a narrative report per SC 3; and will include the following, signed certification by Design-Builder:

> The undersigned, as Design-Builder's duly authorized representative, certifies that to the best of the Design-Builder's knowledge, information, and belief, the Work covered by this Application for Payment has been completed in accordance with the Contract Documents, that all amounts have been paid by the Design-Builder for Work for which previous Certificates for Payment were issued and payments received from the Design-Builder, and that current payment shown herein is now due.

In addition, with each application for payment, Design-Builder will submit such supporting documentation as is necessary or appropriate in the reasonable judgment of County to justify all amounts paid to Design-Builder under prior applications for payment. Payment will be made in accordance with A.R.S. § 34-609.

SC 6.6 - Amount of Progress Payments

The County will pay the amount in each Design-Builder request for payment to the extent approved for payment in the certificate for payment, less retainage as set forth in SC 6.7, provided that the cumulative payment amount before retainage (i) will not exceed the aggregate amount certified in all certificates for payment and, (ii) also will not exceed the percentage of completion of the Construction Work multiplied by the Guaranteed Maximum Price (excluding items of the Guaranteed Maximum Price not subject to retainage), all as set forth in the Schedule of Values. The Design-Builder Construction Phase will be paid in accordance with the percentage of completion of the Construction Work.

SC 6.7 - Retainage

SC 6.7.1 - Design Payments

With respect to the Design-Builder's Design Phase Fees, no retainage will be withheld.

SC 6.7.2 - Construction Payments

With respect to all payments for the Construction Work, ten percent (10%) retainage will be withheld until the Construction Work is fifty percent (50%) complete. At that point in time, the County will pay one-half (1/2) of the accumulated retainage to Design-Builder provided that County has determined that the Design-Builder is making satisfactory progress on the entire Construction Work and there is no specific cause or claim relating to the Construction Work requiring a greater amount to be withheld. After that point in time. County will retain five percent (5%) of each payment until Final Completion of the Project, or a designated portion thereof. However, if at any time, County determines that satisfactory progress is not being made, ten percent (10%) retention will be reinstated for all future progress payments under the Contract pursuant to County s determination. This is in addition to the County's right to withhold payment as defined under SC 6.10. County's decision concerning satisfactory progress and the existence of specific causes or claims requiring greater retention will be final. Retainage will be released upon Final Completion of a designated portion of the Construction Work that County has agreed to accept separately. Release of retainage upon Final Completion of the Project will be as required under A.R.S. § 34-609.

SC 6.8 - Payment for On-Site and Off-Site Materials

Payment will be made on account of materials and equipment delivered and suitably stored at the Site for subsequent incorporation in the Construction Work. Payment may similarly be made for materials and equipment suitably stored offsite, conditioned upon Design-Builder furnishing evidence to County that (a) title to the materials and equipment will pass to County upon payment therefor and there are no claims of third parties; (b) the materials and equipment are adequately insured for full replacement value plus delivery with the County named as an additional insured on the insurance policy; and (c) such other matters as the County may reasonably request in order to protect its interests.

SC 6.9 - Title to Construction Work

Design-Builder warrants that title to all Construction Work covered by an application for payment will pass to County no later than the time of payment. The Design-Builder further warrants that upon submittal of an application for payment, all Construction Work for which applications for payment have been previously issued and payments received from the County will be free and clear of liens, claims, security interests, or encumbrances in favor of Design-Builder, Subcontractors, or other persons or legal entities making a claim by reason of being a creditor of Design-Builder or any Subcontractor. Design-Builder will provide conditional waivers of lien through the date of the application for payment from each Subcontractor of any tier with

each application for payment and when requested by County. Design-Builder will also provide with each application for payment unconditional waivers of lien through the date of the prior application for payment from each Subcontractor of any tier. As a condition precedent to Final Completion of the entire Construction Work or a portion of the Construction Work that County has agreed to accept separately, Design-Builder will provide unconditional waivers of lien from all Subcontractors.

SC 6.10 - Withholding Payment

The County may withhold payment from any application for payment to the extent necessary to protect County from loss because of:

- Unsatisfactory job progress as determined by the County.
- Disputed Construction Work or materials.
- Defective Construction Work not remedied.
- Claims or other encumbrances filed or reasonable evidence indicating probable filing of claims or other encumbrances by Subcontractors.
- Failure of the Design-Builder to make payment to any Subcontractors within seven (7) days after receipt of each progress payment.
- The Design-Builder's failure to perform any of its contractual obligations under the Contract Documents or any other agreement with the County.
- Deficiencies or claims asserted by County against Design-Builder arising from any other project.
- Damage to the County or a separate contractor caused by the fault or neglect of the Design-Builder or any of its Subcontractor to the extent not covered by insurance.
- Reasonable evidence that the entire Construction Work or portion of the Construction Work that the County has agreed to accept separately will not be Substantially Complete within the Contract Time(s) due to delay for which the Design-Builder is responsible, or that the unpaid balance of the Guaranteed Maximum Price will not be adequate to cover completion of the entire Construction Work and liquidated damages for any anticipated unexcused delay for which the Design-Builder is responsible.

If the above basis for withholding payment is remedied, payment will be made for amounts previously withheld. Prior to any withholding pursuant to this SC 6.10, the County will meet with Design-Builder to discuss potential withholding and attempt in good faith to resolve such issue without the need for withholding.

SC 6.11 - Substantial Completion

When Design-Builder believes the entire Construction Work or a portion thereof which County has agreed to accept separately is Substantially Complete, Design-Builder will notify County and submit to County a comprehensive list of items to be completed or corrected relating to the entire Construction Work or the portion thereof, as applicable. Within five (5) working days of receipt of Design-Builder's notice and list, County or its representatives and Design-Builder will jointly make an observation or inspection, as applicable, to determine whether Substantial Completion has occurred. If it is determined by County that the entire Construction Work or a portion thereof, as applicable, is Substantially Complete, County will issue the Punch List and the certificate of Substantial Completion stating the date of Substantial Completion which will be executed by County or its representatives and Design-Builder. The Design-Builder will proceed promptly to complete or correct Punch List items. Failure to include an item on the Punch List does not alter the responsibility of the Design-Builder to complete all Construction Work in accordance with the Construction Documents and the other Design-Builder Contract.

SC 6.12 - Final Completion and Final Payment

SC 6.12.1 - Work and Submittal Requirements

Completion of all outstanding Construction Work items noted in the Punch List and all other Design-Builder requirements is required for County to certify Final Completion of the entire Construction Work or a portion thereof that the County has agreed to accept separately. Requirements also include, but are not limited to: equipment operations training for County; satisfaction of the conditions precedent in SC 6.12.2; the Design-Builder being in compliance with the Construction Documents and the Contract as to all matters relating to the Construction Work; and submission to and approval by County of all drawings and all record and close out documents as specified in County's Project specifications, including but not limited to, all operating manuals, warranties, assignments of warranties from Design-Builder and its Subcontractors, and all other deliverables required by the Construction Documents and the Contract.

SC 6.12.2 - Documentation

Neither final payment nor any final release of retainage as to the entire Construction Work or as to a portion of the Construction Work that County has agreed to accept separately will become due until the Design-Builder submits to the County each of the following as to the entire Construction Work or the portion of the Construction Work that County has agreed to accept separately:

- An affidavit that payrolls, bills for materials and equipment, and other indebtedness Incurred in connection with the Construction Work or portion thereof, as applicable, for which County or the County 's property might be responsible or encumbered (less amounts withheld by the County) have been paid or otherwise satisfied.
- A certificate evidencing that insurance required by the Contract Documents to remain in force after final payment is currently in effect and will not be canceled or allowed to expire until at least thirty (30) Days' prior written notice has been given to the County.
- Consent of surety to the final payment and final release of retainage.
- If required by County, other data establishing payment or satisfaction of obligations, such as receipts, releases and waivers of liens, claims, security interests, or encumbrances arising out of the Contract.
- Unconditional waivers of lien from all Subcontractors.
- Evidence that all third-party warranties and guarantees have been transferred to County.
- Approval by County of the redlined drawings submitted by Design-Builder.
- A written accounting, in a form agreed by Design-Builder and County, of the Actual Cost of the Construction Work for the entire Construction Work or portion thereof, as applicable, including all supporting documentation justifying Actual Costs of the Work paid or to be paid by County required to be delivered by Design-Builder to County under the Contract.

SC 6.12.3 - Amount of Final Payment

Final payment by County to Design-Builder will be based on the Actual Costs of Construction Work for the Project, which amount will equal the aggregate amount of actual costs for the Construction Work, provided that:

- the Actual Costs of the Construction Work for the Project to be paid by County to the Design-Builder will not exceed the Guaranteed Maximum Price for the Project set forth in the Contract Documents, as such GMP may be modified in accordance with the Contract.
- the Actual Costs of the Construction Work to be paid by County for Construction Work will not exceed the Open Book Cost, including Fee.

Final payment to Design-Builder will equal the difference between the Actual Cost of the Construction Work and the aggregate sum of the progress payments (including retainage) made to Design-Builder based on the Schedule of Values, adjusted as above and subject to the terms of SC 6.12.

SC 6.12.4 - Partial Payment In Event of Final Completion Delay

If, after Substantial Completion of the Construction Work, Final Completion thereof is materially delayed through no fault of the Design-Builder or by the issuance of additional Change Orders by County, the County may upon request of the Design-Builder, and without terminating the Contract, make payment of the balance due for that portion of the Construction Work fully and properly completed. If the remaining balance for Construction Work not fully and properly completed is less than the applicable retainage, and if bonds have been furnished, the written consent of Surety to payment of the balance for that portion of the Construction Work fully and properly completed will be submitted by Design-Builder to the County, and such payment will be made under the terms and conditions governing final payment, except that it will not constitute a waiver of claims by either the Design-Builder or the County.

SC 6.12.5 - Waiver of Claims

Except for claims previously made by Design-Builder to County in writing, acceptance of final payment by the Design-Builder will constitute a waiver of affirmative claims by Design-Builder. The making of the final payment by the County will constitute a waiver of claims by the County, except those arising from (a) liens, claims, security interests, and encumbrances arising out of the Construction Work after final payment; (b) latent defects arising after final payment; or (c) the terms of warranties, guarantees, or indemnifications set forth in or required by the Contract or other rights provided under Arizona law.

SC 6.12.6 Audit Scheduling

County and Design-Builder agree to cooperate fully in the establishment of a schedule for early audit of the actual costs of construction so as not to unduly delay final payment. Audits may be conducted annually, semi-annually, on individual phases, or on any other such basis as may be agreed by County and Design-Builder.

SC 6.13 - Time

SC 6.13.1 - Time is of the Essence

Design-Builder and County recognize that any time limits set forth in the Contract Documents, as amended, are of the essence of this Contract. Design-Builder agrees that it will timely commence performance of the Construction Work, achieve Substantial Completion and Final Completion of the entire Construction Work, and achieve any interim milestones for Substantial Completion and Final Completion as required by the Contract. In addition, if County has agreed to accept separately a portion of the Construction Work, Design-Builder agrees to achieve Substantial Completion and Final Completion of each portion by the dates agreed in writing by County and Design-Builder. Failure to achieve any date or time for achievement of Substantial Completion of the entire Construction Work or any portion of the Construction Work that the County has agreed to accept separately will result in the assessment of Liquidated Damages.

SC 6.13.2 - Delay Liquidated Damages

Subject to relief in accordance with the terms and conditions of the Contract in the event of Uncontrollable Circumstances, if Substantial Completion occurs subsequent to the scheduled Substantial Completion date, then, in addition to the amounts payable to County under the Contract, the D-B will pay to the County delay liquidated damages in the amount of $8,000.00 per day for each day that the Substantial Completion date falls after the scheduled Substantial Completion date until any termination of the Contract for an Event of Default.

SC 6.13.3 - Time Extensions

If Design-Builder is delayed in the performance of the Construction Work (based upon a critical path analysis of the current Project Schedule) due to non-concurrent acts, omissions, conditions, events, or circumstances beyond its reasonable control or prevention and due to no legal fault of its own or those for whom Design-Builder is responsible under the terms of the Contract, the time for Substantial Completion or Final Completion, as applicable, of the entire Construction Work or of any portion of the Construction Work the County has agreed to accept separately and, to the extent applicable, any interim milestones, will be extended by written Change Order for the amount of time such acts, omissions, conditions, events, or circumstances added to the time to complete the entire Construction Work, portion thereof or interim milestone, as applicable. By way of example only, such acts, omissions, conditions, events, and circumstances which would entitle Design-Builder to an extension of the Contract Time(s), include, but are not limited to: acts or omissions of County or anyone under County's control, including separate contractors; changes ordered in the Project by County through a written Change Order; unforeseeable Project Site conditions (to the extent provided in the Contract Documents); wars; floods; labor disputes; unusual delays in transportation; and unusually adverse weather conditions.

SC 6.13.4 - GMP Adjustment

Design-Builder will be entitled to an appropriate adjustment of its Guaranteed Maximum Price for extended construction general conditions resulting from non-concurrent delays due to acts, omissions, conditions, events, or circumstances beyond Design-Builder's reasonable control or prevention and due to no legal fault of its own or those for whom Design-Builder is responsible under the terms of the Contract.

SC 6.13.5 - Notice of Delay

Notice of any delay in the Construction Work will be made in writing by Design-Builder to the County as soon as possible, but in no event later than three (3) days after discovery of the event giving rise to the delay. Upon discovery of the delay, Design-Builder will immediately begin to keep and maintain complete and specific records regarding the time and costs associated with the delay. The Design-Builder will provide additional details concerning the delay in writing to the County within fourteen (14) calendar days from the beginning of the delay. Failure to meet these time requirements will constitute a waiver of and absolutely bar any and all later claims. The detailed notice will indicate the cause of the delay, the anticipated length of the delay, the probable effect of such delay upon the progress and cost of the Construction Work, and potential mitigation plans. If the cause of the delay is continuing, the Design-Builder must give written notice every month at the same time it submits the updated progress narrative report to the County. Within a reasonable period of time, but in no event later than the end of the next month, the Design-Builder will submit further documentation concerning the delay and, if applicable, a formal written request covering an extension of the Contract Time(s) for such delay. The written request for time extension will state the cause of the delay, the number of days extension requested, and provide a fully documented analysis of the delay's impact on the Project Schedule, including any other data demonstrating a delay in the critical path of the entire Construction Work or the portion of the Construction Work the County has agreed to accept separately or individual milestone.

SC 6.14 - Changes to GMP and Time

SC 6.14.1 Change Order

Modifications to Contract may only be made by a written Contract amendment or Change Order executed by the Pima County Board of Supervisors or the Procurement Director, pursuant to the Pima County Procurement Code, and the Design-Builder.

a. County may, at any time, make unilateral changes to the general Scope of Work, including the addition, deletion, or modification of Work. The Design-Builder will not proceed with any change involving an increase or decrease in cost or time without an approved Change Order executed by County and will proceed in accordance with the procedures set forth in this SC 6.14. The County's

right to make changes will not invalidate the Design-Builder Contract or relieve the Design-Builder of any liability. Any requirement of notice to the Surety will be the responsibility of Design-Builder.

b. "Change Order" means a written instrument issued after acceptance and incorporation into the Contract of Design-Builder's GMP, signed by County and Design-Builder, stating their agreement upon all of the following:

- An addition, deletion, or modification to the work within the general scope of the work.
- The amount of the adjustment, if any, to the GMP (including, without limitation, an Allowance within the GMP) incorporated into the Contract, as applicable.
- The extent of the adjustment, if any, to the Contract Time(s) of performance set forth in the Contract.

c. All such changes in the Work authorized by applicable Change Order will be performed under the applicable conditions of the Contract and the County and Design-Builder will negotiate in good faith and as expeditiously as possible on the appropriate adjustments, as applicable. No GMP adjustment on account of a Change Order will include the Design-Builder's or any Subcontractor's profit, fee, home office overhead, or a formula allocation of indirect costs unless otherwise specifically allowed hereunder, except as allowed in SC 6.14.4.

SC 6.14.2 - Contract Administration Waiver

SC 6.14.2.1 - Administrative Communications

The Parties recognize that a variety of contract administrative matters will routinely arise during the Term. These matters will by their nature involve requests, notices, questions, assertions, responses, objections, reports, claims, and other communications made personally, in meetings by phone, by mail and by electronic and computer communications. The purpose of this Condition is to set forth a process by which the resolution of the matters at issue in such communications, once resolution is reached, can be formally reflected in the common records of the parties so as to permit the orderly and effective administration of the Contract.

SC 6.14.2.2 - Contract Administration Memoranda

The principal formal tool for the administration of routine matters arising under the Contract between the Parties which do not require a Contract Amendment shall be a "Contract Administration Memorandum." A Contract Administration Memorandum shall be prepared, once all preliminary communications have been concluded, to evidence the resolution reached by the County and the Design-Builder as to matters of interpretation and application arising during the course of the performance of their obligations under the Contract. Such matters may include, for example: (1) issues as to the meaning, interpretation, application, or calculation to be made under any provision of the Contract Documents; (2) notices, waivers, releases, satisfactions, confirmations, further assurances, and approvals given under any provision of the Contract Documents; and (3) other similar contract administration matters.

SC 6.14.2.3 - Procedures

Either Party may request the execution of a Contract Administration Memorandum. When resolution of the matter is reached, a Contract Administration Memorandum shall be prepared by or at the direction of the County reflecting the resolution. The Contract Administration Memorandum shall be numbered, dated, signed by the Contract Representative of each Party, and, at the request of the County, co-signed by a Senior Supervisor for the Design-Builder. The County and the Design-Builder each shall maintain a parallel, identical file of all Contract Administration Memoranda, separate and distinct from all other documents relating to the administration and performance of this Contract.

SC 6.14.2.4 - Effect

The executed Contract Administration Memoranda shall serve to guide the ongoing interpretation and performance of the Contract. Any material change, alteration, revision, or modification of the Contract, however, shall be effectuated only through a formal Contract Amendment authorized, approved or ratified by resolution of the County Board of Supervisors (or, as authorized, the County's Procurement Director) and properly authorized by the Design-Builder.

SC 6.14.3 - Minor Changes in the Construction Work

County may direct minor changes in the Construction Work consistent with the intent of the Construction Documents providing such changes do not involve an adjustment in the Guaranteed Maximum Price or Contract Time(s) and do not materially affect the design, quality, or performance of the Project. The County will promptly inform Design-Builder, in writing, of any such changes, and verify that Design-Builder has recorded such changes on the as-built documents.

SC 6.14.4 - Price, Time, or Scope of Work Adjustment

SC 6.14.4.1

The cost or credit to the County in a Change Order resulting from a change in the Construction Work, the Construction Documents or the other Design-Builder Construction Contract Documents or resulting from the cost of items covered by an Allowance exceeding the amount of the Allowance will be determined in one or more of the following ways:

- By unit prices stated in the Contract Documents.
- By the Cost of Work, properly itemized and supported by sufficient, substantiating data to permit evaluation.
- Mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to facilitate evaluation; provided, that such lump sum will not exceed that amount calculated under the Cost of Work method.

SC 6.14.1.2.

Any dispute regarding the pricing methodology or cost of a change will not relieve the Design-Builder from proceeding with the change as directed by the County. The cost or credit to the County will be determined by the County or its representatives on the basis of SC 6.14.4.1.

SC 6.14.1.3

An County-approved written Change Order executed by County and Design-Builder will be full and final settlement of all claims for direct, indirect, delay, disruption, inefficiency, and any other consequential costs related to items covered or affected, as well as time extensions. Any claimed cost, whether direct, indirect or consequential, and time extension not presented by Design-Builder for inclusion in the Change Order is irrevocably waived.

SC 6.14.1.4

If County and Design-Builder disagree upon whether Design-Builder is entitled to be paid for any services required by County, or in the event of any other disagreements over the scope of the Construction Work, the Construction Documents, or the other Contract Documents or proposed changes to the Construction Work, the Construction Documents or the other Construction Contract Documents or Contract Time(s), County and Design-Builder agree to try to resolve the disagreement consistent with this SC 6.14.

SC 6.15 - Emergencies

In any emergency affecting the safety of persons or property, Design-Builder will act, at its discretion, to prevent threatened damage, injury, or loss. Any change in the Guaranteed Maximum Price or Contract Time(s) or both on account of emergency work will be determined as provided in SC 6.14.

SC 7 – Warranty and Correction of Non-Conforming Work

SC 7.1 - Warranty

Design-Builder warrants to County that the construction, including all materials and equipment furnished as part of the construction, will be new unless otherwise specified in the Construction Documents or Contract, of good quality, in conformance with the Construction Documents and Contract, and free of defects in materials and workmanship. Design-Builder's warranty obligation excludes defects caused by abuse, alterations or unreasonable failure to maintain the construction by persons other than Design-Builder, Design-Builder's subcontractors, or others under Design-Builder's control. Nothing in this warranty will limit any manufacturer's warranty which provides County with greater warranty rights than set forth herein. Design-Builder will provide County with all manufacturer's warranties and operation and maintenance manuals upon Substantial Completion of the work. Design-Builder's warranty will be for a period of two (2) years and will commence for all portions of the Construction Work upon Substantial Completion of the entire Construction Work as determined by County under this Contract unless the Parties mutually agree otherwise in writing. All statutory or other warranties, express or implied, related to latent defects will remain in force and are not limited by this provision.

SC 7.2 - Correction of Defects and Nonconforming Work

SC 7.2.1 - Agreement to Correct

Design-Builder agrees to promptly correct any work that is found not to be in conformance with the Construction Documents, whether or not previously inspected or observed by County's Representative unless a specific written waiver of nonconformance has been provided to Design-Builder by County. This obligation will continue for the term of the warranty. Nothing in this SC 7.2.1 will waive any other rights that County has under Arizona law.

SC 7.2.2 - County Right to Correct

Upon receipt of written notice from County that the Construction Work is not in conformance with the Construction Documents, Design-Builder will, within seven (7) days (except in the case of a nonconformity that affects the safety or security of life or property or which involves an item of work on the critical path of the Project Schedule, in which case response will be immediate), commence correction of such nonconformity including, without limitation, correction, removal, or replacement of the nonconforming work and repair of any damage caused to any other part of the work attributable to the nonconforming work. If Design-Builder fails to commence correction within seven (7) days, County, in addition to any other remedies provided in the Contract, may provide notice to Design-Builder that County will commence correction with its own or other forces. In such event, Design-Builder will be responsible for all costs and expenses that County may incur in remedying the nonconformity, including, without limitation and at County's sole discretion, the cost of County's staff time and all other costs and fees incurred by County, which amount County may recover from Design-Builder by setoff or otherwise, as permitted under Arizona law. County will notify Design-Builder of its intent to make corrections at or before the commencement of corrective work.

SC 7.2.3 - County's Additional Rights Preserved

The warranty period applies only to Design-Builder's obligation to correct construction work or replace materials or equipment not in conformance with the Construction Documents and will not constitute a period

of limitation with respect to any other rights or remedies County may have with respect to Design-Builder's other obligations under the Contract or Arizona law.

SC 8 – Startup and Acceptance Testing

SC 8.1 - Startup

SC 8.1.1 - Submittal of Startup Plan

The D-B will develop a detailed plan for the startup of the Facility (the "Startup Plan") in accordance with the requirements set forth in the Project Scope. In no event will the D-B commence startup operations prior to County approval of the Startup Plan. If the D-B and the County are unable to agree upon the Startup Plan within 90 days following submission by the D-B, either party may elect to initiate dispute resolution procedures in accordance with Contract Section 14 (Dispute Resolution).

SC 8.1.2 - Notice

The D-B will give the County at least 30 days' prior written notice of the expected date of commencement of start-up operations, which notice will include a certification (to be confirmed as of the date start-up operations commence) that the D-B is in full compliance with the terms of this Service Contract, and that the Project is in compliance Applicable Law, including all conditions of applicable Governmental Approvals.

SC 8.1.3 - Commissioning and Startup

Subject to SC 8.1.1 and SC 8.1.2 of this Section and any limitation established by the Startup Plan or the Contract Documents, the D-B may commission the Project Improvements, and test equipment and systems, at its election at any time, whether prior to or subsequent to Substantial Completion. The D-B will perform startup activities in accordance with the schedule set forth in the approved Startup Plan. The D-B's cost of all commissioning-related activities, including all obligations of the D-B under the Startup Plan, regardless of their extent or duration, will be included in the GMP. All commissioning and startup activities will be conducted in accordance with the approved Startup Plan and the Contract Documents, including any specific requirements established by ADEQ.

SC 8.2 - Performance Testing

SC 8.2.1 - Submittal of Performance Test Plan

At least 180 days before the earlier of the Scheduled Performance Test Date or the date upon which the D-B plans to begin Performance Testing, the D-B will prepare and submit to the County for its approval a detailed Performance Test Plan, which will conform to the requirements of Scope of Work Task 23 (Performance Test) in all respects. As indicated in Task 23, the Performance Test Plan will include the D-B's plan for performing all necessary testing of the Facility prior to the performance of the Performance Tests. If the D-B and the County are unable to agree upon the Performance Test Plan within 90 days following such submission, either party may elect to initiate dispute resolution procedures in accordance with Contract Section 14 (Dispute Resolution Procedures).

SC 8.2.2 - Notice of Commencement of Performance Test

The D-B will provide the County with at least 30 days' prior written notice of the expected initiation of the Performance Test. At least 10 days prior to the actual commencement of any Performance Testing, the D-B will certify in writing that it is ready to begin Performance Testing in accordance with the Performance Test Plan.

SC 8.2.3 - Conditions to Commencement of the Performance Test

The D-B will not commence the Performance Tests until the following events have occurred:

- The D-B has satisfied the requirements of SC 8.2.1 and SC 8.2.2 of this Section and the County has approved the Performance Test Plan.
- The D-B has received specific authorization from all applicable Governmental Bodies to commence the performance of the Performance Tests and has provided evidence of such authorization to the County.
- The D-B has satisfied all pre-Performance Testing requirements of the D-B under the Startup Plan.
- The D-B has certified that it has complied with the pre-Performance Testing requirements of the Performance Test Plan and the Scope of Work.

SC 8.2.4 - Conduct of Performance Test

The D-B will conduct all Performance Tests in accordance with the Contract Standards, including the specific requirements set forth in the Scope of Work (Task 23, Performance Testing) and the approved Performance Test Plan. The D-B will coordinate all Performance Testing activities with the County to permit the designated representatives of the County and the County Engineering Representative to inspect the preparations for any Performance Test and to be present for the conducting of any Performance Test for purposes of evaluating compliance with the Performance Test Plan and the integrity of the Performance Test results.

SC 8.2.5 Performance Test Report

Within 30 days following conclusion of the Performance Tests, the D-B will furnish the County and the County Engineering Representative with ten copies of a certified written Performance Test report consistent with the requirements specified in Scope of Work (Performance Testing), certified as true, complete and correct by the Design-Build Manager and the Engineer-of-Record. The Performance Test report will describe and certify: (1) the Performance Test conducted; (2) the results of the Performance Test; and (3) the level of satisfaction of the Performance Test procedures specified in the Performance Test Plan and of the Performance Standards specified in the Technical Standards, and all other requirements specified in the Scope of Work. The written test report will include copies of the original data sheets, log sheets, and all calculations used to determine performance during the Performance Test as well as copies of laboratory reports conducted in conjunction with the Performance Test, including all laboratory sampling and test results. No failure of the D-B to furnish the certified Performance Test report within the 30-day period following the conclusion of the Performance Test will operate to adjust the scheduled Final Completion date.

SC 8.3 - Concurrence or Disagreement with Test Results

SC 8.3.1 - Achievement Concurrence

If the D-B certifies in its written report delivered pursuant to SC 8.2.5 (Performance Test Report) that such full Performance Test Procedures and Standards have been achieved, the County will determine, within 14 days following its receipt of such report, whether it concurs in such certification. If the County states in writing that it concurs with the D-B's certification, the Project Improvements will be deemed to have met the Performance Test Procedures and Standards as of the date of the D-B's original certification.

SC 8.3.2 - Achievement Disagreement

If the County determines at any time during such 14-day review period that it does not concur with the D-B's certification, the County will immediately send written notice to the D-B of the basis for its disagreement. In the event of any such non-concurrence by the County, either party may elect to initiate dispute resolution

procedures in accordance with Contract Section 14 (Dispute Resolution). Completion of the Performance Test requirement will not be achieved unless the Performance Test, conducted in a unified and continuous manner as provided in the Performance Test Plan, demonstrates that all of the Performance Test Procedures and Standards have been met. In the event the D-B, in conducting the Performance Tests, does not successfully meet all of the Performance Test Procedures and Standards, the D-B will, at its sole cost and expense, take all action necessary (including making all capital investments, improvements or modifications, repairs and replacements, and operating and management practices changes) in order for the Project Improvements to comply with the Performance Test Procedures and Standards and will re-test the Project Improvements in accordance with the Performance Test Plan. The D-B will provide the County with at least three days' written notice of any re-test of the Performance Test.

SC 8.3.3 - Failure to Achieve Performance Test Procedures and Standards

Subject to relief in accordance with the terms and conditions of the Contract in the event of Uncontrollable Circumstances, if, as of the last day of the Extension Period, the Acceptance Tests have not been conducted or the Acceptance Date Conditions have not been achieved, an Event of Default by the D-B will be deemed to have occurred under Contract Section 13(a) (Events of Default by the D-B) notwithstanding any absence of notice, further cure opportunity, or other procedural rights accorded the D-B thereunder, and the County will thereupon have the right to terminate the Contract upon written notice to the D-B. Upon any such termination, the County will have all of the rights provided in Contract Section 13 (Termination for Cause) upon a termination of the D-B for cause.

END OF APPENDIX "D" - DESIGN-BUILDER SPECIAL CONDITIONS

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