

JTA Skyway Modernization Program
U²C Operation & Maintenance Basic Requirements
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1 Introduction

The Ultimate Urban Circulator (U²C) Program is a phased approach that will ultimately expand and convert the existing Jacksonville Transportation Authority’s (JTA) Automated Skyway Express train monorail system into a state-of-the-art Autonomous Vehicle (AV) technology system referred to herein as the AV system. The AV system will be configured as shown in Figure 1-1. In addition to converting the existing Skyway monorail system, the U²C Program includes the following extensions that together with the existing Skyway will form a multi-network AV system:

- North – Main Street/UF Health Shands
- West – Brooklyn/Riverside
- South – San Marco / District
- East - Stadium (Bay Street Innovation Corridor)

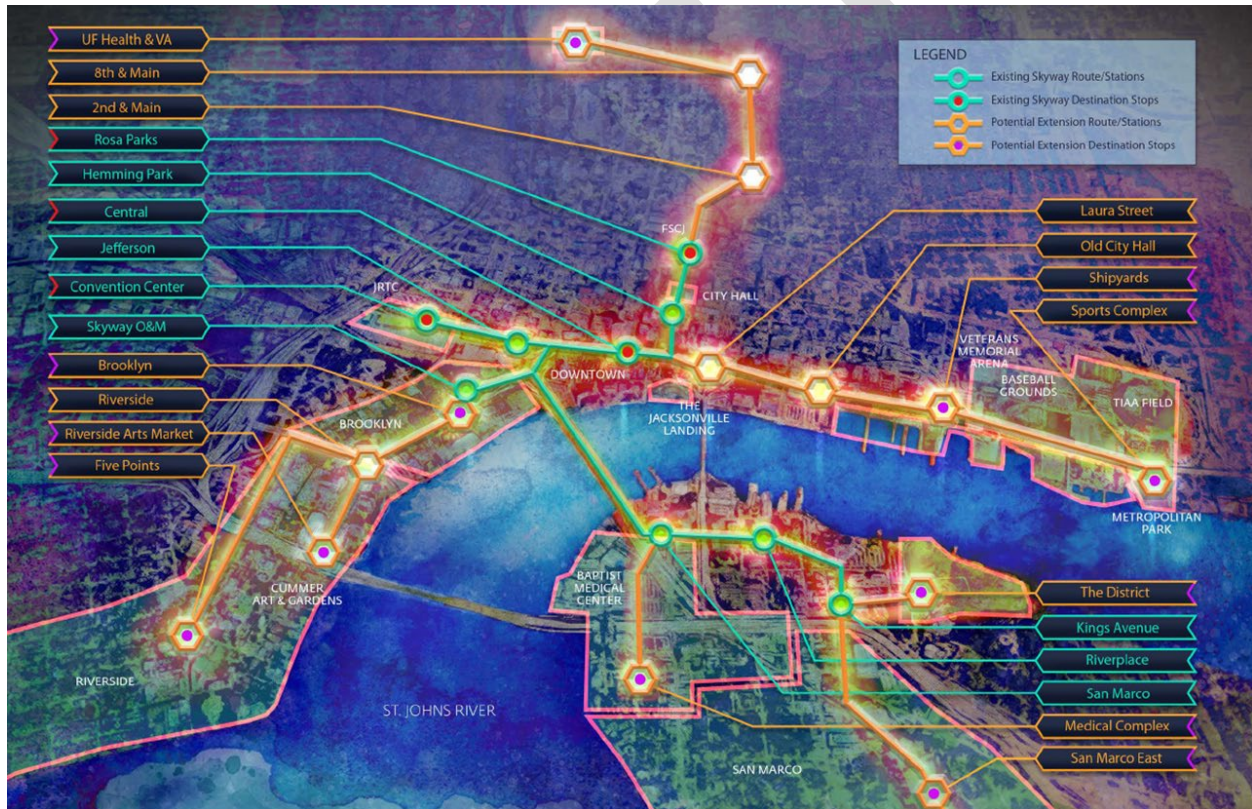


Figure 1-1: U²C Program – AV System Overview

Currently JTA’s plans to implement the East Extension as the first of its multiple AV system networks scheduled for 2025 through the award of the federal BUILD Grant.

1.1 Scope and Purpose

The purpose of this document is to outline the basic operations and maintenance (O&M) requirements for JTA’s U²C Program that would later be used to develop the O&M procurement documents. JTA’s U²C Program includes the following elements: vehicles, supervisory controls, communications, fare

collection, stations, roadways, and other facilities. Basic technical requirements for other U²C Program elements, including security and cybersecurity will be addressed in separate documentation. JTA's current vision for procurement and implementation of the U²C Program includes the possibility of outsourcing all or part of the operations and maintenance for at least the initial two (2) years of operations followed by a transition to JTA.

These O&M requirements are intended to outline, on a high-level, the basic O&M requirements that will be further defined in subsequent project development stages prior to development of the O&M procurement documents. JTA has implemented a seven-step process as outlined below:

1. Initiation – O&M Workshop
2. **Outline Basic O&M Requirements (this document)**
3. Market Study Analysis
4. Market Soundings
5. Issue RFI with Draft Requirements
6. RFI Responses
7. Adhere to JTA System Safety Program Plan (SSPP)

This document addresses step 2. JTA has authorized the first three steps as part of this U²C Planning Business Case and Market Analysis. Step 2, Outline Basic O&M Requirements, is based on the input received during the August 19, 2019 U²C O&M workshop (step 1). Step 3, Market Study Analysis, will be addressed in a separate document. Steps 4 through 7, if authorized by JTA, will be performed through a separate task order.

2 U²C Program O&M Procurement Options

Based on discussions at the August 19, 2019 meeting, JTA had not finalized the authority's procurement approach to O&M for the U²C Program. This document will therefore consider three (3) possible O&M procurement approach Options for JTA's consideration. These Options are defined as follows:

- Option A: Full Turnkey Approach – JTA contracts all O&M work to the AV system supplier/contractor for a minimum of two (2) years.
- Option B: Hybrid Approach – Under this option, JTA would operate the AV system by staffing the central control (dispatch center) and providing on-board AV attendants. JTA would contract all maintenance for the vehicles, supervisory controls and fare collection equipment for a minimum of two (2) years.
- Option C: JTA assumes all O&M responsibilities from the start of AV system services.

The contracted O&M work under Options A and B would transition to JTA who would ultimately operate and maintain the entire AV fleet and associated equipment, with an exception for highly specific services, such as cybersecurity and software updates to AVs, supervisory control and fare collection equipment.

Section 3 will outline basic O&M requirements and identify the applicable Option for each. Also, Section 4 will outline specific basic O&M requirements that are expected to be the responsibility of JTA or others and therefore, would not be included as contractor requirements in the O&M procurement documents. In addition, Section 5 and 6 will discuss the advantages of each Option and list decision factors for JTA to consider when determining the best O&M procurement Option.

3 Basic O&M Requirements

Basic O&M requirements will consist of the General Conditions (GCs) and the Special Provisions (SPs). These O&M requirements will apply to the procurement Options considered under the U²C Program where maintenance (or operations) of the AV system is outsourced. Also, these O&M requirements will need to be further defined prior to the next step of developing the O&M procurement documents. The GCs include the basic terms and conditions and the SPs will include the specific services and technical O&M requirements that includes:

- Scope of work (specific services)
- Management
- Availability
- Payment
- Adherence to JTA System Safety Program Plan (SSPP)

Tables 3.1 and 3.2 lists the basic O&M requirements for the U²C Program and identifies the specific O&M requirements that would need to be considered when developing any of the O&M procurement Options described in Section 2. In other words, the “X” will denote that the requirement that would need to be included with the O&M contract documents of the corresponding O&M procurement Option.

3.1 O&M General Conditions Outline

It is anticipated that JTA will utilize the authority’s general terms and conditions boilerplate front-end documentation for procuring new products or services; therefore, the below outline will mainly focus on terms and conditions that are unique to this AV system. A sample GC outline that is typical is provided in Appendix 1. The following is an outline of basic O&M GC requirements specific to AV systems and each Option, as defined in Section 2.

Table 3.1 – Basic O&M General Condition Requirements

ID	U ² C Basic O&M Requirements – General Conditions (GC)	Procurement Option		
		A	B	C
	AV Maintenance Contract Agreement			
3.1-1	Maintenance agreement would need to include specific insurance requirements since the AVs will be operating on dedicated public roadways.	X	X	
3.1-2	Maintenance agreement would need to define liquidated damages (JTA risk & legal).	X	X	
3.1-3	Maintenance agreement between JTA and fare collection supplier. (May be a separate agreement).	X	X	
3.1-4	Options for Maintenance agreement extensions should be considered and included in agreement.	X	X	
3.1-5	Management/Assignment of warranties from AV and equipment supplier (including the battery performance-based warranties).	X	X	X

3.2 O&M Special Provisions Outline

The O&M Special Provisions (SP) includes scope of work, management requirements, availability requirements, payment, and adherence to the JTA SSPP for the new U²C system in accordance with FDOT/NHTSA mandates/guidelines and JTA requirements. The below table includes basic O&M SP requirements and applicable Option for each. A sample SP outline that is typical is included in Attachment 2.

Table 3.2 – Basic O&M Special Provision Requirements

ID	U ² C Basic O&M Requirements	Procurement Option		
		A	B	C
	Scope of Work - Responsibilities			
3.2-1	Central control and/or dispatch center will be staffed continuously (all shifts).	X	X	
3.2-2	Staffing at central control or dispatch center for AV operations.	X		
3.2-3	Staffing to monitor all CCTV feeds.	X		
3.2-4	AVs will have on-board attendants. Attendants will be part of JTA staff and be trained/certified to deal with passengers as well as manually operate and assist central in trouble shooting faults. Based on the JTA, the AV technology for the initial phase is anticipated to be a SAE Level 3 requiring on-board attendants. The JTA plan is to ultimately phase-out the on-board attendants.	X		
3.2-5	Central control and/or dispatch staff will be re-certified annually.	X	X	
3.2-6	AV system operations (plan) will be defined, controlled and managed by JTA.	X	X	
3.2-7	As a requirement of the Golden 20, AV vehicles will have battery capacity sufficient to operate continuously (under max loading including HVAC, lights and other vehicle loads) for 12 hours before requiring a full recharge. JTA's Operations plan will be developed (by Others) based on this requirement.	X	X	
3.2-8	Operations Plan will need to consider that the AV system will serve the City's daily commuters and special events.	X	X	
3.2-9	Incident/response procedures with local first responders will be developed by JTA, in collaboration with other Stakeholders, prior to commencement of AV passenger service.	X	X	
3.2-10	AV system will be safety certified by the AV supplier in coordination with JTA and in accordance with the applicable FTA/FDOT requirements prior to passenger/revenue service. Authorization to carry passengers will be provided by the FDOT/NHTSA.	X	X	X
3.2-11	Maintenance of vehicles, supervisory system, automatic car wash system and other communications equipment will initially be provided by the supplier of the equipment.	X	X	
3.2-12	Minor fare collection equipment maintenance (paper ticket jams, basic trouble shooting, resetting faults, etc.).	X	X	
3.2-13	Major fare collection equipment maintenance and software upgrades.	X	X	X

ID	U ² C Basic O&M Requirements	Procurement Option		
		A	B	C
3.2-14	Maintenance contractor will keep (and continually replenish) a 1-year stock/inventory of spares and consumables.	X	X	
3.2-15	Maintenance of the AV, supervisory control, and fare collection software (updates and support).	X	X	X
	Management Requirements			
3.2-16	Train and certify staff in the proper maintenance of vehicles, and other communications equipment. Ultimately, JTA will perform all training and certifications.	X	X	X
3.2-17	Maintenance contractor, in close collaboration with JTA, will develop plan/program for updating and correcting the rule book and the AV equipment maintenance and operational manuals.	X	X	
3.2-18	Maintenance manuals will be provided in text searchable files.	X	X	X
3.2-19	Training program will be established for certifying new maintenance technicians & operators as well as for the continuous re-certification of existing technicians & operators.	X	X	X
3.2-20	All initial training classes will be video recorded and distributed to JTA.	X	X	X
3.2-21	Maintenance contractor will implement a maintenance management software that at a minimum will include the following functions: <ul style="list-style-type: none"> - Schedule and record preventive maintenance activities - Record all non-scheduled maintenance activities - Schedule and record all Mid-life Overhauls - Manage spares and consumables inventory (Instant critically low inventory notification) - Tools to analyze maintenance data (Trend analysis) - Additional tools for analyzing availability and performance data (per vehicle, route, network, etc.) - Training/Record keeping 	X	X	X
	Availability and Payment Requirements			
3.2-22	Maintenance agreement between JTA and maintenance contractor would need to be performance-based where monthly payments to contractor are based on minimum availability requirements/targets and other performance indicators.	X	X	
	Safety and Security Requirements			
3.2-23	Maintenance contractor must adhere to the FDOT/NHTSA approved SSPP.	X	X	
3.2-24	Management of Cybersecurity (updates, vulnerability testing) of the AV system will be contracted by JTA.	X	X	X

4 Basic O&M Requirements By Others

Based on the August 19, 2019 workshop, there a few AV system basic O&M requirements that are not anticipated to be part of the O&M procurement documents. These O&M requirements will be the responsibility of JTA and others. These requirements are listed in Table 4.1 below.

Table 4.1 – Basic O&M Requirements By Others

ID	U ² C Basic O&M Requirements By Others
4.1-1	Maintenance of at-grade roadways, Dedicated Short-Range Communications (DSRC) equipment, right-of-way (ROW), including clearing of debris(sweeping) or removal of large objects will be provided by the City of Jacksonville. To be confirmed.
4.1-2	Maintenance of elevated guideway will be provided by the JTA.
4.1-3	Fare collection evasion prevention and enforcement will be by JTA.
4.1-4	Maintenance of O&M facilities will be the responsibility of JTA. (Janitorial, utilities, security, fire protection, etc.)
4.1-5	Multiple maintenance facility “hubs” will be strategically located throughout the AV system for servicing and storing of AVs. To be confirmed by the City of Jacksonville and JTA.

5 O&M Procurement Approach Options Discussion

This document has outlined the basic O&M requirements taking into consideration the three O&M procurement approach Options described in Section 2. This section will discuss each of the Options and provide a recommendation; however, it will ultimately be JTA ‘s policy decision based on established priorities, long term goals and other internal considerations. The following will describe the advantages of each of three O&M procurement approach Options from Section 2.

Option A: Full Turnkey Approach:

With a full turnkey approach, the AV systems supplier/contractor would design, construct, install, commission and then operate and maintain the AV system. All risk associated with design, construction, commissioning and the O&M of the AV system is passed on to a single entity under this approach. JTA would only need to oversee and manage the turnkey contract; commonly known in the industry as design-build operate and maintain (DBOM) contract. Also, the turnkey approach is also common with a Public-Private-Partnership (P3) procurement as this approach has been implemented in other transit new starts. Discussion of capital procurement approaches is beyond the scope of this Basic O&M Requirements deliverable and will not addressed.

Using this turnkey approach, JTA would contract all O&M duties for at least two years or a time period yet to be finalized by the JTA. This time period would be sufficient for the O&M contractor to work out all the “bathtub” failures and complete the reliability growth of the AV system. In other words, it is expected that, after two years, unforeseen failures that surface after commissioning would have been

eliminated and processes would have been put in place that positively impact AV system service availability and the passenger service experience.

Disadvantages of this approach during the O&M contract period would be:

- JTA would not have full control of the O&M activities. JTA would provide contract oversight and management staff which may add additional costs to JTA.
- “Learning curve” for new O&M contractor staff would be higher when compared to JTA’s experienced staff.
- Costs for O&M would likely be more, due to the need for the O&M contractor to be fully staffed organization. Further cost analysis would be required to confirm this assumption.
- Succession/Phasing plan would need to be developed and implemented prior to JTA assuming the O&M duties. More on this succession/phasing plan is discussed below.

Prior to the JTA taking over the O&M duties a succession/phasing plan would need to develop that would include:

- Training of new personnel (training should also be provided to JTA staff during the capital phase of the project and should be defined in the capital contract agreement);
- Retention of key O&M personnel
- Establishing agreement(s) for continual support of proprietary AV system software and fare collection software as updates and fixes will be required during the life of the system.
- Spare parts agreement (should be defined in the capital contract agreement).

The successful implementation of this plan would be critical to facilitate a seamless transition between the O&M contractor and JTA. The Succession/Phasing plan should be developed during the capital phase of the AV system project and updated during the operations and maintenance period as required.

Option B: Hybrid Approach:

Under this Option B Hybrid approach, JTA would provide the staffing at central control and the AV attendants. Only the maintenance of the AV system would be contracted out to the AV system supplier. The advantage of this approach is that JTA already has experienced automated transit central control operators who would be better qualified to assume the AV system center control duties when compared to new inexperienced personnel with higher “learning curve” that a contractor would train for the position. JTA has over 20 years of experience in operating the Skyway automated monorail system and in dealing with riding passengers. The same would apply for the AV attendants.

Contracting the maintenance portion of the AV system or at least two years or a time period to be finalized by the JTA provides the same advantages described for Option A with regards to the reliability growth of the system during this period. The hybrid approach provides greater flexibility to the JTA since it entails sharing responsibilities with one or several contractors.

Disadvantages of this approach during the maintenance contract period would be:

- JTA would not have full control of the maintenance activities. JTA would provide contract oversight and management staff, which may bring additional expense to JTA.

- Costs for the maintenance of the AV system would likely be more, due to the need for the maintenance contractor to be fully staffed as a maintenance organization. Further cost analysis would be required to confirm this assumption.
- Succession/Phasing plan would need to be developed and implemented prior to JTA assuming the O&M duties.

Option C: JTA Assumes All O&M Responsibilities From The Start:

Under this Option JTA would assume responsibilities for all operations and maintenance activities and therefore also assumes all risk associated with operating and maintaining the AV system. The advantage of this Option is that JTA would have complete O&M control of the AV system. The main disadvantage of this Option is that JTA would not benefit from the transference of risk to the O&M contractor, which provides JTA a “peace of mind” during the initial two years of service and operation.

Table 5.1 summarizes the major O&M elements and identifies the responsible party based on the O&M procurement approach Options described in Section 2.

Table 5.1 – Responsible Party for Major O&M Elements

	Option A	Option B	Option C
Maintenance of Equipment & Software			
Vehicle	Contractor	Contractor	JTA
Supervisory and Vehicle Software ¹	Contractor	Contractor	Contractor
Automatic Car wash	Contractor	Contractor	JTA
Wayside Equipment (station equipment, not maintained by the City)	Contractor	Contractor	JTA
Fare Collection Equipment	Contractor	Contractor	JTA
Fare Collection Software ¹	Contractor	Contractor	Contractor
Safety Certification of AV system	Contractor	Contractor	JTA
Staffing			
Operators at Central Control	Contractor	JTA	JTA
On-board vehicles (vehicle attendants during the transition phase being considered by the JTA)	Contractor	JTA	JTA
Maintenance of AV equipment	Contractor	Contractor	JTA
M&SF Building Maintenance	Contractor	JTA	JTA

	Option A	Option B	Option C
Training of All Personnel	Contractor	JTA	JTA

Note: 1. Due to their inherent complexity and risk, it is recommended that these O&M elements be outsourced to the AV and fare collection supplier.

6 O&M Procurement Option Evaluation

In determining the best O&M procurement Option for JTA, below is a review of the decision factors that would facilitate the determination of the best O&M procurement approach. Based on established JTA priorities, long term goals and other internal considerations these decision factor should be weighed against each other to determine the best option. This section will discuss each of the decision factors and provide a recommendation, but it will ultimately be JTA’s policy decision. The decision factors are based on the following priorities:

- Safe AV System – Safety is JTA’s top priority and the Option selected must assure the AV System will continue to operate after testing and commission without compromising safety. This will include continual safety training and adherence to JTA’s SSPP.
- Reliable AV System – Is also a JTA priority and the Option selected should be the one that is expected to provide the best approach to maximizing the AV system reliability and availability.
- Control of O&M Activities – The ability to have complete control of O&M activities is important to JTA. JTA has provided transportation services to the public for decades and have established processes for dealing with operational special events, shutdowns and extended failures. The selected Option must not impact the established processes.
- Passenger Service – Having the ability to deal with passengers and properly respond to incidents or emergencies is important to JTA.
- Minimize Cost – Balancing costs and the services provided is important. The selected Option should provide the best approach to service while minimizing costs.

Considering the above decision factors, the Table 6.1 lists these decision factors and identifies which of the Options provides an advantage to JTA.

Table 6.1 – Advantage of Each Decision Factors

Decision Factors	Option A	Option B	Option C
Safe AV System	Advantage	Advantage	Advantage
Reliable AV System¹	Advantage	Advantage	
Control of O&M Activities			Advantage
Minimize Cost			Advantage

As shown in Table 6.1 (and discussed in Section 5), the Options A & B provide the advantage when considering the reliability of the AV system however, the control and costs would not be as advantageous as Option C. Option A transfers all risks to contractor. Option B allows a gradual acquisition of most/all O&M services. JTA can elect to take responsibility for some O&M elements and gradually increasing its scope as it gains a better understanding of the O&M challenges.

This document has outlined the basic O&M requirements and the O&M procurement Options under JTA consideration. The selection of the O&M procurement Option will depend on the weight assigned to each decision factor discussed in this document together with JTA's established priorities, long term goals and other policy. If JTA considers the AV system reliability to be top priority and in line with established priorities, goals and policy, then Options A or B would be a viable O&M procurement approach. Similarly, if JTA considers cost and O&M control to be top priority and in line the established priorities, goals and policy then Option C would be a viable Option.

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Appendix 1 – O&M General Conditions Outline

General Condition (GC) requirements will be based on JTA’s boilerplate GCs that outline the terms & conditions of the O&M contract. The following is preliminary outline of the GC requirements that is intended to be general and it is expected to be customized to fit the appropriate O&M procurement Option:

- GENERAL
 - ENTIRE AGREEMENT
 - MODIFICATIONS
 - EFFECT OF WAIVERS
 - EXERCISE OF CONTRACT RESPONSIBILITIES
 - PUBLIC RECORDS
 - FUNDS, BUDGET AND FISCAL PROVISIONS AND TERMINATION IN THE EVENT OF NON APPROPRIATION
 - MAXIMUM COSTS
- OWNER
 - DEFINITION
 - OWNER’S SITE OFFICE
 - ACCESS TO THE WORK
 - OWNER’S RIGHT TO STOP OR REJECT WORK
 - OWNER’S RIGHT TO CARRY OUT THE WORK
 - OWNER’S RIGHT TO SUSPEND THE WORK
- CONTRACTOR
 - DEFINITION
 - REPRESENTATIVE AND AUTHORITY
- SERVICES CONTRACTOR AGREES TO PERFORM
- OWNER PROVISION OF APM SYSTEM
 - APM SYSTEM AND FACILITIES
 - CONTROL OF PREMISES
- COMPENSATION
- FINAL BID TAKE OFF
- TAXES
- PAYMENT DOES NOT IMPLY ACCEPTANCE OF WORK
- CONTRACTOR’S QUALIFIED PERSONNEL, WARRANTY AND GUARANTY
- RESPONSIBILITY FOR EQUIPMENT, PROPERTY AND RELATED CLAIMS
- INDEPENDENT CONTRACTOR
- INSURANCE
- INDEMNIFICATION
- DAMAGES
- OWNER OBLIGATIONS TO CONTRACTOR

- LIQUIDATED DAMAGES
- TERMINATION
- TIME IS OF THE ESSENCE
- NO THIRD-PARTY BENEFICIARIES
- WOMAN AND MINORITY OWNED BUSINESS ENTERPRISE (“W/MBE”)
- PROPRIETARY OR CONFIDENTIAL INFORMATION OF OWNER
- NOTICES TO THE PARTIES
- OWNERSHIP OF RESULTS AND TITLES TO MATERIALS
- AUDIT AND INSPECTION OF RECORDS
- SUBCONTRACTING
- ASSIGNMENT
- FLORIDA PUBLIC ENTITY CRIMES
- CONTRACT MADE IN FLORIDA AND FULLY INTEGRATED
- NONDISCRIMINATION/AFFIRMATIVE ACTION
- COMPLIANCE WITH AMERICANS WITH DISABILITIES ACT
- NON-WAIVER OF RIGHTS
- MODIFICATION OF CONTRACT / CHANGES
- ADMINISTRATIVE REMEDY FOR CONTRACT INTERPRETATION
- PUBLIC RELATIONS AND ADVERTISING
 - DISRUPTION OF ACCESS TO AIRPORT TENANTS
 - SITE TOURS
 - CONTRACTOR ADVERTISING AND PROMOTION
- OTHER RESTRICTIONS
- SAFETY AND SECURITY
 - SAFETY OF PERSONS AND PROPERTY
 - APM SYSTEM SAFETY PROGRAM
 - SECURITY
- INSPECTION
- CLAIMS BY CONTRACTOR
 - GENERAL
 - PROCEDURE
 - CERTIFICATION
 - CLAIM FORMAT
 - EXCLUSIVE REMEDY
- FEDERAL RIGHT TO RECLAIM
- NON-LIABILITY OF OWNER REPRESENTATIVES
- COMPLIANCE WITH LAWS
- SEVERABILITY
- INUREMENT
- FINAL CONTRACT PAYMENT

Appendix 2 – O&M Special Provisions Outline

The SP basic O&M requirements will include specific services and technical requirements. The following is preliminary outline of the Special Provisions that is intended to be general and it is expected to be customized to fit the appropriate O&M procurement Option:

- INTRODUCTION
- STATEMENT OF WORK
- TERMS
- PAYMENT
 - ECONOMIC PRICE ADJUSTMENT
 - MONTHLY PAYMENTS
 - SYSTEM SERVICE PERFORMANCE PAYMENT ADJUSTMENT FACTOR
 - INVOICES
 - FINAL CONTRACT PAYMENT
- CONTRACT MODIFICATIONS
- SYSTEM AVAILABILITY
 - SYSTEM SERVICE AVAILABILITY
 - DOWNTIME EVENT LIMITS
 - CORRECTIVE ACTION
 - ALTERNATE SYSTEM SERVICE AVAILABILITY REPORT
- REPAIR AND REPLACEMENT OF DAMAGED PARTS, COMPONENTS OR MATERIALS
 - REPAIRS AND REPLACEMENTS
 - REPLACEMENT OF MATERIALS
 - COMPENSATION FOR REPAIR AND REPLACEMENT
 - OWNER ACCESS TO RECORDS
 - PAYMENT PROCEDURES
- REPORTING OF ACCIDENTS AND INCIDENTS
- CAPITAL ASSET REPLACEMENT PROGRAM PLAN (CARPP)
- OPERATIONS AND MAINTENANCE ADMINISTRATION AND MANAGEMENT
 - OPERATIONS AND MAINTENANCE MANAGEMENT
 - TRAINING OF PERSONNEL
 - OPTION TO TRAIN OWNER-DESIGNATED PERSONNEL
 - INVENTORY CONTROL
 - MANAGEMENT REPORTS AND RECORDS
 - CONTRACTOR PERFORMANCE
 - OBLIGATIONS OF THE OWNER
 - SYSTEM DESIGN AND CONFIGURATION AND EXPERIMENTATION
 - DRAWINGS AND DOCUMENTS
 - PROVISIONS FOR TESTING AND ACCEPTANCE OF UPGRADES AND EXPANSION WORK
 - Safety Program
 - Emergency Procedures Plan

- Hazardous Chemical Records
- OPERATIONS REQUIREMENTS
 - SYSTEM ASSURANCE MONITORING
 - OPERATING SCHEDULE TEMPORARY CHANGES
 - OPERATIONAL READINESS TESTING
- MAINTENANCE REQUIREMENTS
 - Subsystem Maintenance
 - Cleaning and Janitorial Services
 - Treatment of Effluents
 - Spare Parts and Equipment, Expendables, and Consumables
 - Maintenance Tools and Equipment

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