1 Scope of Services

1.1 Our Understanding

Our project team understands that the City currently operates an analog, conventional radio system dispersed amongst 16 remote sites. The system consists of 26 VHF and UHF channels serving the Fire, Police, Public Works and Public Utilities for the City. We have inferred through reading the RFP that the system has undergone the narrowbanding process and is seeing a reduced level of service, particularly with in-building coverage, as a result. We further note that due to the general age of the system and its components, some portions of the system may have reached an end-of-life status with regards to vendor support.

To improve the level of radio communications service provided to Fresno's public safety and public service agencies, the City of Fresno has commissioned this project to evaluate ways to improve the overall performance of the system and to investigate strategies to maintain the system once performance improvement measures are implemented.

The City is now seeking consulting assistance to:

1) Conduct an **Evaluation** to assess the condition of current radio system assets and coverage.
2) Develop a **Plan** to refresh and the radio system to meet the current and future public safety, public service, and utilities needs for a minimum of 10 years.
3) **Improve** maintenance support by investigating alternate avenues to providing radio system maintenance.

CDX Wireless commends the City for commissioning this project and for dedicating its time and budget to select a consultant to improve its public safety communication environment. We are confident our approach, which is described below and is built on our project team and experience, will deliver the outcomes necessary to allow the City of Fresno to develop a plan that improves its system to fit user needs.

1.2 Overview of Project Approach

We at CDX Wireless have reviewed the Scope of Work as it is described in the RFP and have developed a project approach that includes the following four (4) major project phases:

- Phase 1, Plan and Manage, in which we will prepare a Project Management Plan that shall further define the schedule of the project as well as the processes to be used in managing communications, issues, and risks. The "planning" aspect of this phase (i.e., the creation of the Project Management Plan) involves less than two (2) weeks but the "management" aspect involves a duration that spans the entire project's schedule.
- Phase 2, System Evaluation Planning, in which we will prepare and conduct an extensive system evaluation with inventory activities, site visits, and face-to-face interviews to collect information about the existing communications environment and the unmet and future needs of current and potential users. In this phase we will also develop a coverage analysis of the current systems and develop and submit a report that identifies system shortfalls uncovered during site visits and interviews. This phase has a duration of approximately nine (9) weeks.

- Phase 3, System Upgrade/Replacement Plan, in which we investigate relevant system options and develop a report with strategies and recommendations for implementation of the identified system options. This phase has a duration of approximately five (5) weeks.
- Phase 4, Maintenance Support Plan, in which we will develop recommendations for maintaining the City's two-way radio systems for a minimum of ten years. These recommendations will build upon the System Upgrade/Replacement Plan and provide staffing options, management models, functional skillset and training requirements, as well as budgetary estimates. This phase has a duration of approximately five (5) weeks.

In total, our approach for the above four phases has a duration of 31 weeks from initiation to the delivery of the Maintenance Support Plan.

Our project approach is described in more detail below and is supported by the following information:

- In Section 1.4, we provide a Gantt Schedule for our proposed activities
- In Section 1.5, we describe in further detail our Project Management Processes
- In Section 1.6, we list our Project Assumptions

1.3 Project Approach

1.3.1 Phase 1 – Plan and Manage

At CDX Wireless, we begin projects by creating and confirming with the client's Project Manager a Project Management Plan (PMP). This PMP will define the overall project scope, the roles and responsibilities relative to the project, and the approach to project management throughout the project's lifecycle from startup through closure. It will promote a clear understanding of the project and project management components to any relevant parties involved in or impacted by the project. We will develop such a PMP for this project with the input of the City Project Manager.

The PMP shall establish roles for key individuals and the rules for project communications and reviews and project status reporting as well as those to guide, simplify, and accelerate decision-making on project issues, risks, and changes.

Once the PMP is completed and approved, the methods for monitoring, controlling, and reporting on project progress will be used for the balance of the project's schedule.

Please see Section 1.5, "Project Management Process", below, for details on our project management processes including those that will be documented in our Project Management Plan.

The following table provides a summary of our project approach for Phase 1.

Phase 1 Summary:	**GOAL:** Establish a mutually-agreeable plan for managing and reporting on project status and progress.
	TASKS: • Prepare and Confirm a Project Management Plan • Prepare and Submit Regular Project Status Reports
	DELIVERABLE(S): Project Management Plan and Project Status Reports
	SCHEDULE: Approximately 2 weeks from project initiation to develop the Project Management Plan with Project Reporting to occur for the duration of the project.

1.3.2 Phase 2 – System Evaluation

1.3.2.1 Site Visits and Infrastructure Assessment

Upon completion of the Project Management Plan, we will begin Phase 2 by working with the City PM to schedule visits to radio sites, including central sites (those that house central control and management equipment), remote sites (those that house radio repeaters), and dispatch centers to assess existing assets. Prior to visiting any site to collect information about the site contents, structure, tower, etc., our team will review a checklist with the City PM to confirm its contents and formats. CDX Wireless has, through our work on other projects, created a template for site inventory checklist and we will work with the City PM to present and refine it as necessary.

Our site assessment template currently includes fields to collect information including:

• Location of Tower and Site
• Height of Existing Antennas
• Models of Antenna

- Base Station Attributes (including rated power)
- Back-haul equipment
- Shelter Construction
- Shelter and Site Security
- Shelter Access (ownership/control)
- Site Power and Grounding
- Site Heating/Ventilation/Air-Conditioning (HVAC)
- Site Rack Space and Occupancy
- Other conditions as necessary and appropriate

An example of a page of our template for a site assessment is shown in the following figure:

Figure - Site Assessment Checklist Sample

Following the completion of the site assessment checklist and the arrangement of site visit schedules, our team will conduct the site visits and will use the time at each site to gather the necessary details about the existing system's electronic equipment and facilities. During this time, we can also visit radio sites that are not currently used but that may be considered as viable for use in future iterations of the system. While we will not conduct detailed site structure or tower engineering and loading analyses, we will identify when such efforts are needed and our overall effort will focus on the ability of such items to be used in future designs.

The collected information, in the form of the completed checklist and any collected photos, will be available in its "raw" format but they will mainly serve to populate the reports which are to be completed as part of the report on existing assets. We will use this data in the development of a

systems lifecycle analysis which analyzes the value of existing equipment and determines its economic viability in an enhanced or replacement system design. To complete this, we will analyze and summarize the City's radio system components to determine their economic life cycles. We will review the major infrastructure components of the system, such as:

- o Repeater Stations, to include:

    - Tait TB9100 stations

- o Interconnecting Data Infrastructure, to include:

    - Alcatel Microwave Radios

    - Alcatel Multi-service Concentrators

    - Alcatel Network Management

    - Cisco switches and routers

    - ACU2000 gateways and WAIS enterprise network systems

- o Power Systems, to include

    - Eltek Power Supplies

    - PowerSafe V Battery Plants

- o Dispatch Consoles, to include:

    - Zetron Acom Consoles

- o Site and RF antenna equipment, to include:

    - Telewave receiver coupler, preselector, and transmitter combiner equipment

    - Antennas and feed lines

- o Other Ancillary Equipment

    - Fire and Police Mobile Communications Units

We will compare the age and condition of these infrastructure components to the manufacturers' published life cycle and/or maintenance support information (as available) as well as to industry standard life cycle and retirement timelines. Based on this review, our team can propose radio replacement plans in a way that complements the selected alternative design and that reuses as much existing equipment as is economically viable. These replacement plans shall include existing quantities (infrastructure and subscriber units, including spares) and shall be used in development of the implementation plan. Specific information shall include the make, model, quantity and type of major infrastructure components and subscriber (handheld/mobile) units and their recommended retirement timelines.

Additionally we will evaluate RF site conditions at each site to include performing effective receiver sensitivity measurements to determine overall noise conditions at each site. Antenna and line sweeps will also be performed at each site to verify overall antenna system performance. Measurements will be captured using an Anritsu S412E LMR Master. Any degradation noted through the course of RF site measurements will be noted for use in our coverage analysis.

As a final action of this site visit task, we will visit the four Dispatch Public Safety Answering Points (PSAPs) to inventory the existing equipment in order identify possibilities for reuse or upgrade in later iterations of the radio system. We will also use this time to identify the operational needs of the dispatchers including their current and future needs for dispatch operations such as patching, simulselect, intercom, alarms (user emergency alarms and dispatch-initiated notifications), and similar functions.

1.3.2.2 Subscriber Assessment

Our team will likewise assess a representative set of subscriber (mobile, portable, and desktop control station) radios. Working with the Stakeholders, we will work to develop a catalog for each major user agency's subscriber radio fleet that lists the following attributes:

- Quantity
- Manufacturer
- Model
- Age
- Capabilities (features and options)

Once this catalog is assembled, we will then add additional information such as the ability of the existing radios to support potential upgrades to alternate radio system configurations or architectures. As with the infrastructure assessment, we will compare the age and condition of these subscriber radios to the manufacturers' published life cycle and/or maintenance support information (as available) as well as to industry standard life cycle and retirement timelines. Based on this review, our team can propose radio replacement plans in a way that complements the selected alternative design and that reuses as much existing equipment as is economically viable.

We will also note any recommendations we have, based on our experience with similar projects or other industry best practices, for right-sizing the size or usage profile (accessories, battery management, etc.) of the varying agencies' fleets of subscriber radios.

1.3.2.3 Stakeholder Interviews

Upon completion of site visits and subscriber assessment activities, we will conduct interviews, both face-to-face and via phone, with Stakeholders to assess their needs for the radio system. Our questions will focus on functionality and operations but, when necessary, will also include relevant

questions about specific technologies. We focus on questions about the following sets of system-performance attributes:

| Performance Attribute	Details to be identified:
Capabilities	Which functions are required for the voice radio system networks? Are the systems to provide standards-based signaling and, if so, at what interfaces? Are they to provide features such as encryption, over-the-air rekeying, mixed conventional-and-trunking operations, private call, telephone interconnect, or other functions? Do certain agencies require wide-area and/or on-network (repeater-based) communications and do others require local and/or off-network (direct and/or simplex) operations? Are there any agency policies or procedures that cannot be met with current systems?
Coverage	Where is wireless access required? What levels of coverage reliability are required? What types of buildings (or other natural or man-made obstructions) are to be included in coverage requirements? Are different levels of coverage reliability, or building density, required in different areas of the facilities?
Capacity	How many users does the system need to support and what is their expected level of loading? What grade of service (GoS) is required and what level of access delay is acceptable?
Control	Who is to have supervisory access and how are those individuals to execute their supervisory rights (including dispatch but also operations such as establishing and approving system access and cross-system patching)?
Reliability	With what probability is access to the two networks required and how often, and for how long, are the networks allowed to be outage or failure mode (including failsoft for trunking systems)? What are the requirements for backup power at various sites?
Interoperability	What level of communications between departments and outside agencies is required and how are those communications established and conducted? Is interoperability required: i) between agencies that are internal to the facilities, ii) among agencies that are external to the facilities, or iii) among both internal and external to the facilities? What procedures should be established for enacting interoperability?
Security	What are the expected and/or required key external interfaces of the network, and how are they to be protected?
Support	Who are users and technicians to contact for provisioning and technical assistance, how are they contact these resources, and what levels of support (in terms of services and in terms of availability) are required? What tools shall be provided for system monitoring and management?

1.3.2.4 Coverage Drive Testing

To compare our computer models (described below) to real-world performance, our CDX Wireless team will conduct a drive survey of the County to analyze the coverage of the current system. We propose to perform a drive survey to gain a first-hand understanding of the coverage issues and challenges (as well as areas of reliable coverage) users will encounter during the conduct of their public safety operations. We will compile the results of these activities for use in the System Evaluation Report and we will use that information to confirm our coverage predictions or make any necessary adjustments to the predictions as required by the detailed findings of the drive survey.

To complete this task, we will use the Anritsu S412E LMR Master with the coverage test option. We will configure the Anritsu receiver to meet the test channel and test plan for representative VHF and UHF channels. Following these activities, we will conduct a drive test of the City, using the Anritsu's capabilities to measure signal strength and to record it and tag it with location information as received via its integrated Global Positioning System (GPS) receiver. Upon completion of the test, we will extract the data collected by the Anritsu and analyze it by plotting the received signal strength data within our coverage prediction software to generate a coverage map. This will allow the project team to visually inspect the recorded signal strength data and visually confirm any 'dead spots' as those that do not meet an established signal threshold. We will use the information from these activities to "tune" our coverage predictions and make any adjustments as identified by the field coverage test. We have accounted for approximately five days of drive testing, in order to gain representative measurements of the performance of the existing system across Fresno-Clovis Metro Area.

1.3.2.5 Computer Generated Coverage Analysis

Using information gathered through the course of site visits and further refinement through empirical coverage drive testing, we will perform our analysis using industry-leading EDX SignalPro® propagation modeling software and a set of propagation predictions will be prepared for each major system. We will evaluate coverage and system performance by adhering to guidelines and recommendations outlined in the TIA publication, TSB-88. This document is an industry accepted and widely used reference for radio frequency coverage modeling and system performance validation.
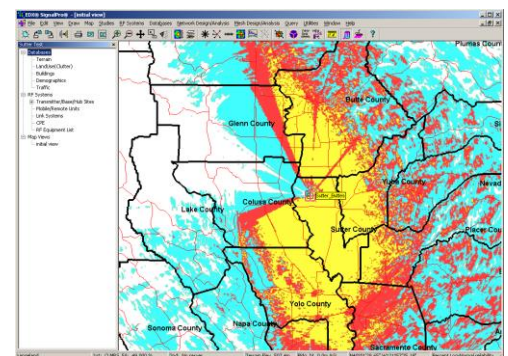
1.3.2.6 System Evaluation Report

As a final task of this phase, we will assemble the summary data from the infrastructure assessment, subscriber assessment, stakeholder interviews, coverage drive testing, and coverage analysis into one System Evaluation Report. This Report will summarize our methods, our data, and our findings (the current states and the future needs). This System Evaluation Report will be presented and reviewed with the City PM and the Project Stakeholders for review and, if necessary, revision.

Exhibit A
SCOPE OF SERVICES
Consultant Service Agreement between City of Fresno ("City")
and CDX Wireless Technology Consulting ("Consultant")
Radio System Needs Evaluation

The following table provides a summary of our project approach for Phase 2.

Phase 2 Summary:	**GOAL:** Prepare a report evaluating the condition and performance of our current public safety and public utilities two way voice radio systems.
	TASKS: • Assess current sites and infrastructure • Assess current subscriber units • Document user needs • Perform Coverage Analysis
	DELIVERABLES: • System Evaluation Report
	SCHEDULE: Approximately 11 weeks, following the completion of Phase 1

1.3.3 Phase 3 – System Upgrade/Replacement Plan

Once we have established needs and available assets via the activities described above, we will prepare design alternatives, including ones that include appropriate portions of the existing systems, to meet the user-defined needs and requirements. This will include documentation of the coverage, performance, cost, spectrum, and site attributes of a design that makes best use of existing resource to meet the identified user needs. This will also include documentation of those communications services that could be more effectively or economically be transitioned to technologies or networks other than Land Mobile Radio.

At CDX Wireless, our process of creating and evaluating alternative designs is iterative. Per our standard methods, we will begin by creating a pool of candidate alternatives. We will begin by translating functional needs and future requirements into independent design options. For example, a need/requirement may be expressed as "too much congestion on current system" or "need better clarity of signals in these locations." We will translate those into design options such as an increased number of channels (to alleviate congestion) and an increased quantity of transmitter sites or the expansion into simulcast (to improve coverage). We will also evaluate issues such as the connectivity requirements for site-to-site links.

The next step in the process is to combine these design options into system alternatives that can be modeled for their budgetary costs, benefits, schedules, and impact to the users and their equipment. We will then identify a top set of a limited number of candidate alternatives and those that do not meet basic criteria for technical viability, expected performance, cost, and ability for implementation will be eliminated. In our experience, evaluating between 3-4 alternatives and modeling their approximate costs, benefits, schedules, and impact to subscribers provides an optimal process for comparing alternatives and identifying recommendations. We will also include an analysis of various spectrum options and the ability of each to meet Fresno's needs for coverage, availability, capacity, interoperability, and other performance attributes.

Together, we will select the best alternative that will be further investigated for implementation in subsequent tasks. We will confirm the selection of one alternative in a System Upgrade/Replacement

Plan. This written plan will describe the general architecture of the upgraded/replacement system that will be configured and deployed to meet user requirements. The plan will cover all facets of the system to include: RF backbone, Microwave (and other backhaul methods), Dispatch center equipment, subscriber units, implementation issues, and funding. Technology selection will be incorporated to investigate proven public-safety LMR technologies to include: analog, digital P25, conventional, trunked, multi-site, and simulcast topologies. The plan will also address issues uncovered in Phase 1 and provide a plan to resolve system shortfalls.

We will investigate other critical public safety communications systems that are in vicinity of the City of Fresno and in nearby areas. These systems include the Public Safety Interoperable Communications Network, the video policing real time transport infrastructure, and investigating potential transport supporting Clovis and Fresno County radio networks at City sites. We will also investigate emerging technologies and systems such as the FirstNet initiative for the Public Safety Broadband Network. Finally, we will research relevant communications planning guides such as the Fresno County Tactical Interoperable Communications Plan and other identified emergency operations policies that involve radio communications.

Following the investigations and research of the other systems, we will review the selected alternative for updating or replacing the Fresno LMR system and identify ways in which they are functionally and/or technically compatible. If it is identified that they are incompatible, we will work to either alter the LMR's architecture or identify the cause and impact of the incompatibility.

As a final activity of this Phase, we will develop and document a procurement and implementation strategy that includes:

- Recommendations for funding including possible ways to fund the system's capital and operational expenses

- A roadmap for the times and major deliverables for completing the system's procurement, preparation, implementation, acceptance, transition, and operations. The roadmap will categorize deliverables into near-term (within 1 year) and mid-term (greater than 1 year) to aid in prioritizing budgets and funding streams.

- Notices of regulatory issues and requirements that could constrain the system's technology or procurement and implementation plans

We will then document all of our findings and recommendations into the System Upgrade/Replacement Plan that will further describe the other systems (existing and emerging) and guides, which lists the ways in which they support each other, that describes any necessary alterations to the LMR system's architecture, and that identifies any incompatibilities.

The following table provides a summary of our project approach for Phase 3.

Phase 3	**GOAL:** Work with City Staff preparing a comprehensive plan to refresh our two way voice radio technology and supporting infrastructure to meet current and future public safety and public utilities needs for a minimum of ten years.

Summary:	**TASKS:**
	- Develop candidate radio system designs to upgrade or repleace the current public safety and service radios systems - Develop near-term and mid-term budgetary estimates for the selected candidate design - Investigate other systems and relevant guidance for interoperability purposes and to leverage existing systems when possible - Document and, when possible, resolve incompatibilities of the candidate LMR system
	DELIVERABLES: System Upgrade/Replacement Plan
	SCHEDULE: Approximately 4 weeks, following the completion of Phase 2

1.3.4 Phase 4 – Maintenance Support Plan

Once we have established the system alternative that best fits the needs of the City, we will investigate the various maintenance alternatives that best lend itself to the selected system alternative.

We will provide recommendations for organizational oversight of the City's LMR maintenance activities through a thorough review of the City's organizational structure. Consideration of each department's maintenance capabilities for similar systems will be taken into account as well as budget information. The current radio shop's organizational structure will also be reviewed to determine the best organizational fit within other departments as well as whether the radio shop can operate as a standalone entity within the City.

Staffing levels will be reviewed to determine overall headcount necessary to maintain the selected alternative. We will also provide anticipated system shortfalls in the event staffing levels are not maintained or augmented through outsourced contracting.

The selected alternative will aid in determining the training or skillsets required to maintain the system. Training for skills that are seldom used or are expensive to maintain certification may become candidates for outsourcing. To aid in determining which skill sets are necessary we will use a ranking methodology to rank those skills which provide the most benefit relative to their cost. This ranking matrix will also incorporate headcount to aid in justifying staffing levels.

All facets of system maintenance will be incorporated into a comprehensive Maintenance Support Plan which will include budgeting scenarios for the various support options. These support options will be ranked according to our ranking matrix to produce an overall recommendation on how the City should move forward with its LMR maintenance.

Examples of the various support options will be tied to our knowledge of various systems and agencies and how thee various support methods worked or did work for them.

The following table provides a summary of our project approach for Phase 4.

	GOAL: Prepare a report giving options to maintain the City two way voice radio technology for a minimum of ten years
	TASKS:
Phase 4 Summary:	• Determine the department best suited to manage and maintain the LMR system • Determine staffing levels • Determine outsourcing needs, if any. • Determine what training and/or skillsets are required to maintain the LMR system • Provide examples of other agencies and how they are able to meet similar issues when dealing with LMR system maintenance • Develop budgetary estimates for the maintenance support plan
	DELIVERABLES: • Maintenance Support Plan
	SCHEDULE: Approximately 6 weeks, following the completion of Phase 3

1.4 Project Schedule

The following pages include a project schedule, in Gantt format, that shows the order and durations for the tasks in our Proposed Approach as described above. This schedule is also based upon the Project Approach Assumptions included in Section 1.6, below.

Exhibit A
SCOPE OF SERVICES
Consultant Service Agreement between City of Fresno ("City")
and CDX Wireless Technology Consulting ("Consultant")
Radio System Needs Evaluation

		Section 2.4 - Project Schedule														
ID	Task Name	Duration	Start	Finish	4th Quarter			1st Quarter			2nd Quarter			3rd Qu	
					Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	
1	**City of Fresno Radio System Evaluation**	**142 days**	11/30/15	6/30/16											
2	**Phase 1 - Plan and Manage**	**142 days**	11/30/15	6/30/16											
3	Mobilize, Prepare PMP & Kickoff Material	10 days	11/30/15	12/11/15											
4	Conduct Project Initiation Meeting	2 days	12/14/15	12/15/15											
5	Conduct On-going Project Management	142 days	11/30/15	6/30/16											
6	**Phase 2 - System Evaluation**	**45 days**	1/5/16	3/9/16											
7	Inventory and Assess Infrastructure Equipment	10 days	1/5/16	1/19/16											
8	Inventory and Assess Subscriber Equipment	2 days	1/20/16	1/21/16											
9	Meet with Users to Discuss, Record Needs	3 days	1/22/16	1/26/16											
10	Conduct Radio Coverage Drive Testing	5 days	2/3/16	2/9/16											
11	Develop Coverage Analysis of Current Systems	10 days	2/10/16	2/24/16											
12	Perform Lifecycle Research on Infrastructure and Subscribers	5 days	1/27/16	2/2/16											
13	Develop & Submit Draft Report on System Evaluation	10 days	2/12/16	2/26/16											
14	Review Cycle	5 days	2/29/16	3/4/16											
15	Develop & Submit Final Report on System Evaluation	3 days	3/7/16	3/9/16											
16	**Phase 3 - System Upgrade/Refresh Plan**	**34 days**	3/10/16	5/3/16											
17	Prepare and Review Strategies for Microwave Upgrade/Refresh	3 days	3/10/16	3/14/16											

	Task		Inactive Task		Start-only	
	Split		Inactive Milestone		Finish-only	
CDX Wireless Inc.	Milestone		Inactive Summary		Deadline	
Contractual Contract	Summary		Manual Task		Progress	
for BID #07115	Project Summary		Duration-only		Manual Progress	
	External Tasks		Manual Summary Rollup			
	External Milestone		Manual Summary			

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Exhibit A
SCOPE OF SERVICES
Consultant Service Agreement between City of Fresno ("City")
and CDX Wireless Technology Consulting ("Consultant")
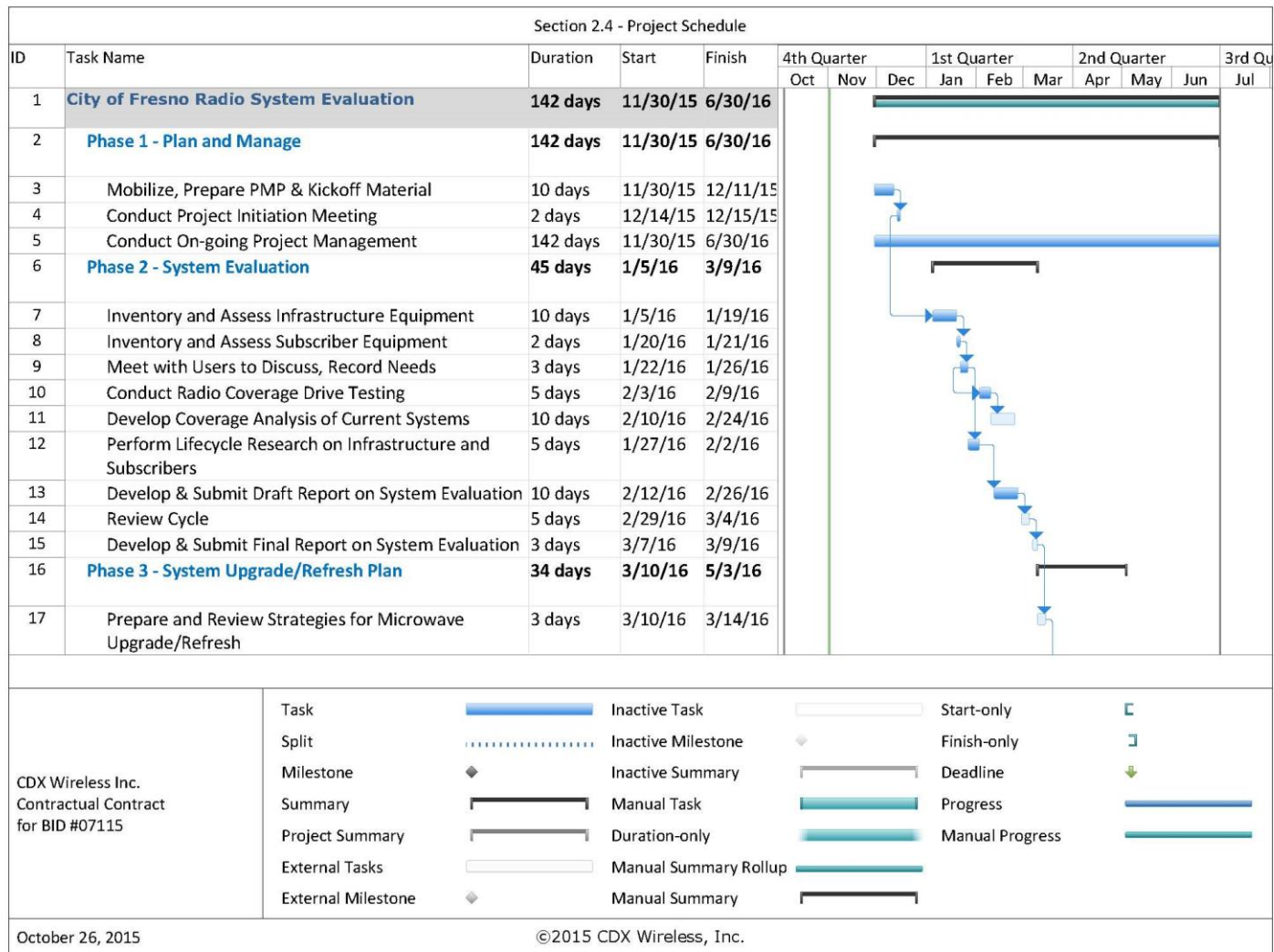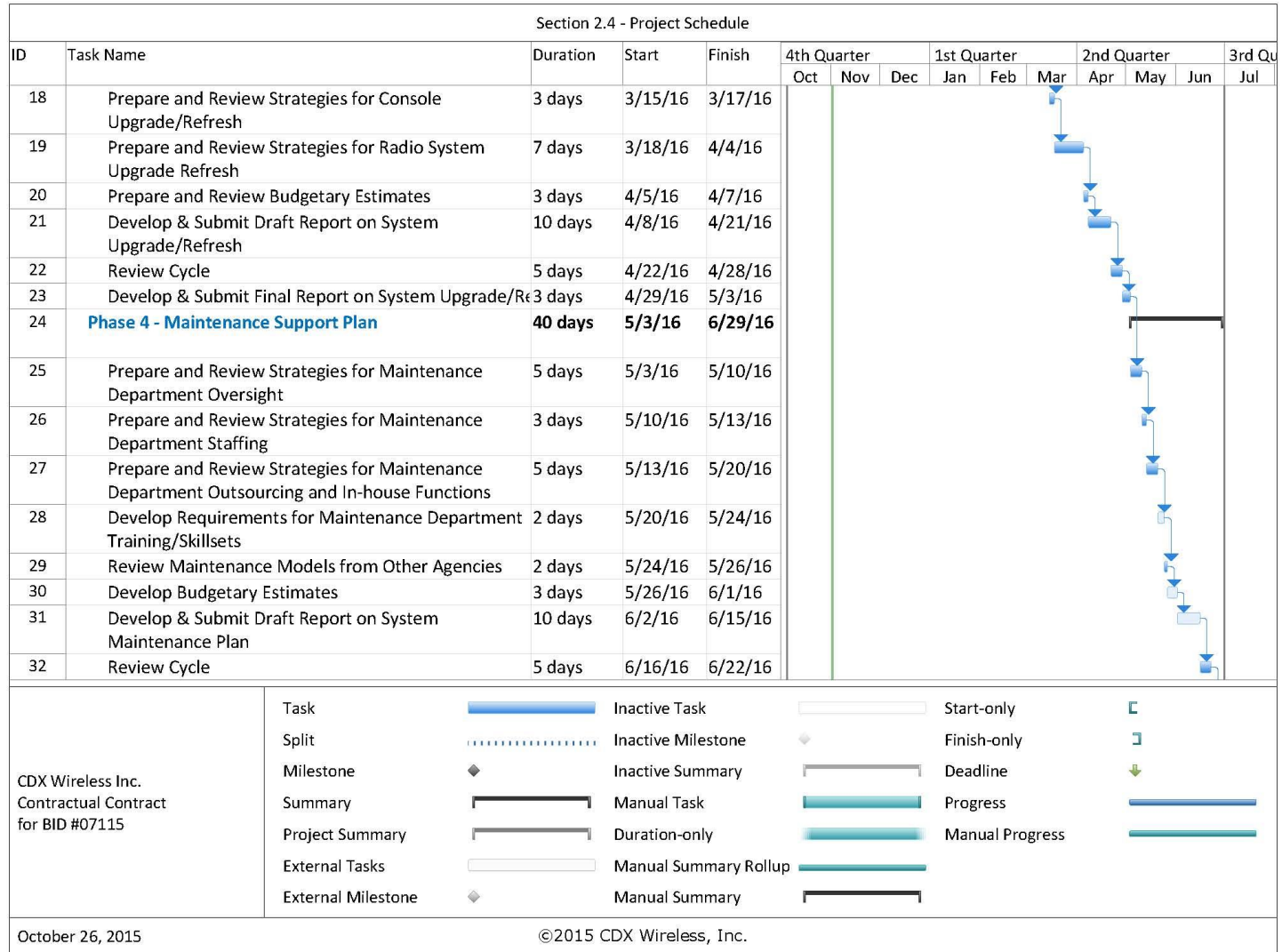Radio System Needs Evaluation

	Section 2.4 - Project Schedule														
					4th Quarter			1st Quarter			2nd Quarter			3rd Qu	
ID	Task Name	Duration	Start	Finish	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	
18	Prepare and Review Strategies for Console Upgrade/Refresh	3 days	3/15/16	3/17/16											
19	Prepare and Review Strategies for Radio System Upgrade Refresh	7 days	3/18/16	4/4/16											
20	Prepare and Review Budgetary Estimates	3 days	4/5/16	4/7/16											
21	Develop & Submit Draft Report on System Upgrade/Refresh	10 days	4/8/16	4/21/16											
22	Review Cycle	5 days	4/22/16	4/28/16											
23	Develop & Submit Final Report on System Upgrade/Re	3 days	4/29/16	5/3/16											
24	**Phase 4 - Maintenance Support Plan**	**40 days**	**5/3/16**	**6/29/16**											
25	Prepare and Review Strategies for Maintenance Department Oversight	5 days	5/3/16	5/10/16											
26	Prepare and Review Strategies for Maintenance Department Staffing	3 days	5/10/16	5/13/16											
27	Prepare and Review Strategies for Maintenance Department Outsourcing and In-house Functions	5 days	5/13/16	5/20/16											
28	Develop Requirements for Maintenance Department Training/Skillsets	2 days	5/20/16	5/24/16											
29	Review Maintenance Models from Other Agencies	2 days	5/24/16	5/26/16											
30	Develop Budgetary Estimates	3 days	5/26/16	6/1/16											
31	Develop & Submit Draft Report on System Maintenance Plan	10 days	6/2/16	6/15/16											
32	Review Cycle	5 days	6/16/16	6/22/16											

CDX Wireless Inc.
Contractual Contract
for BID #07115

Task		Inactive Task	Start-only
Split		Inactive Milestone	Finish-only
Milestone		Inactive Summary	Deadline
Summary		Manual Task	Progress
Project Summary		Duration-only	Manual Progress
External Tasks		Manual Summary Rollup	
External Milestone		Manual Summary	

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	Section 2.4 - Project Schedule															
ID	Task Name	Duration	Start	Finish	4th Quarter			1st Quarter			2nd Quarter			3rd Qu	
					Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	
33	Develop & Submit Final Report on System Maintenance Plan	5 days	6/23/16	6/29/16											
34	**Project Closure**	**1 day**	**6/30/16**	**6/30/16**											
35	Perform Project Closeout procedures	1 day	6/30/16	6/30/16											

	Task	▬▬▬	Inactive Task	Start-only	⊏
	Split	··············	Inactive Milestone	Finish-only	⊐
CDX Wireless Inc.	Milestone	◆	Inactive Summary	Deadline	↓
Contractual Contract	Summary	▭	Manual Task	Progress	▬▬▬
for BID #07115	Project Summary	▭	Duration-only	Manual Progress	▬▬▬
	External Tasks	▭	Manual Summary Rollup		
	External Milestone	◆	Manual Summary		

1.5 Project Management Processes

This section describes the Project Management Processes that our project team has used on previous projects and that we propose to implement for this project for the City. It is based on the standards of the Project Management Institute's (PMI's) Project Management Body of Knowledge (PMBOK®) Guide and it addresses project organizational structure, communications, reports, issues, risk, and changes.

1.5.1 Project Reporting Structure

CDX Wireless assumes that the City will identify and provide access to one point of contact from to serve as the authorized individual that can address issues on behalf of all involved City departments and agencies and can approve deliverables and reports. Mr. Surwillo, CDX Wireless' proposed project manager, will interface directly with this point of contact and will, in effect, report to the City Project Manager.

1.5.2 Project Stakeholders

Our project management approach also includes the identification of a Stakeholder Structure in order define the personnel that will work on this project. It is our belief that Stakeholder Structures should be based upon any existing interoperability or emergency preparedness governance structures that already may be in place. If no such structure is available or it cannot be available for work on this project, we will work to define a Stakeholder Structure that includes:

- The Core Team: Those who will actively be involved in completing the data gathering and analysis, to include at least the City PM and members of the CDX Wireless project team

- The Project Sponsors: Those that have enabled this project and that can guide its outcome through the dedication of resources such as personnel and funding

- Project Stakeholders: Key representatives from various public safety and service agencies that that currently have technical and operational details of current and future systems and user needs – Stakeholders may act as representatives of their department or discipline and may be called on to consolidate the needs and information of those they represent

In this way, our Core Team can leverage the contacts and knowledge of the Stakeholders to gather complete and accurate information and to help refine and revise our preliminary findings into our final deliverables.

1.5.3 Project Communications Process Overview

For the duration of the project, CDX Wireless will prepare and deliver bi-weekly project updates and monthly Project Status Reports to describe the project's overall status, its schedule, and any known or anticipated variances, project risks, issues and action items. These updates and reports, and their associated documents, will provide the City Project Manager with a status update giving the project team the ability to obtain the opinion, buy-in, and involvement of key stakeholders.

1.5.4 Bi-Weekly Project Updates

The bi-weekly (every other week) project updates will describe the progress made during that period, the work planned for the following period, and any new issues or risks encountered. These will be provided at the end of each bi-weekly period of the project, by the CDX Wireless Project Manager to the City Project Manager, in the form of an email.

1.5.5 Monthly Project Status Reports

The monthly Project Status Reports will include the following sections to address the following project attributes:

- Project Status Overview

- Project Milestone Schedule

- Project Issues, Changes, and Risks

- Project Financials: Invoice Status

1.5.5.1 Project Status Overview

As an Executive Summary of the project's overall condition, each Project Status Report will begin with a one paragraph Project Status Overview that will note at a high-level any changes to the project condition since the last reporting period with focus on: a) major accomplishments, b) significant risks (and assistance needed, if appropriate) and c) schedule performance. This section should quickly inform the Executive Level of the project's status and inform that Level if any intervention on their part (such as application of additional resources, etc.) is required. This Overview may include subjective statements that are derived from detailed (and referenced) facts contained in subsequent sections.

1.5.5.2 Project Milestone Schedule

Tracking project progress and the on-time completion of tasks shall be accomplished through the reporting of the completion dates of major milestones. For each identified major milestone, CDX Wireless shall report:

- The Milestone Name, which shall typically be the project deliverables as, agreed to in the Statement of Work but may also include other key project activities as mutually agreed to by both Project Managers.

- The Planned Completion Date which is the date set for completion as originally agreed-to by both parties in the Statement of Work and as represented in the initial project Detailed Schedule.

- The Revised Completion Date, which shall be an updated or revised date, set for completion as agreed-to by both parties (per issue or change management processes).

- The Actual Completion Date, which shall be the date on which the milestone was actually completed and accepted per the conditions of the Agreement.

- Notes regarding the milestone including summary descriptions for the causes of the revised completion date.

Tracking the Planned, Revised and Actual Completion Dates in this manner will allow CDX Wireless and the City Project Manager to view project progress, schedule slippages and the overviews to the reasons for such slippages. A sample of the Milestone Tracking Table that shall be included in Project Status Reports is shown in the following table.

Activity	Deliverable(s)	Planned Date of Submission	Revised Date of Submission	Actual Date of Submission	Notes
Phase 2: LMR Planning	Final Assessment Report	*Date*			

Table - Milestone Tracking Table

If necessary, sufficient narrative details regarding the cause and possible outcomes of any significant schedule delays will be included with the Milestone Progress table. Such narrative shall also include potential means by which the schedule can be improved, if such means are available. Additionally, the Notes regarding any milestone progress shall contain the linkage between any project delay and a Project Issue or Change.

1.5.5.3 Project Issues, Risks, and Changes

Project Issues, Risks, and Changes shall be managed according to the processes described included in the following section, "Issue, Risk, and Change Management". The Project Status Reports shall include the then-current Logs for Project Issues, Risks, and Project Changes as well as any necessary additional narrative to describe a significant impact any Project Issue, Risk, or Change may have to the project's scope, schedule or cost.

1.5.6 Issue, Risk, and Change Management

As with our processes for planning, monitoring, controlling, and reporting on projects, CDX Wireless uses methods consistent with Project Management Institute's (PMI) recommendations for identify, managing, and mitigating project risks. During the conduct of a project, our Project Manager, working with the City Project Manager, will use the following tools and processes to identify a potential problem as an issue, risk, or change and then apply the corresponding management process to avoid it from impacting the project's intended outcomes.

1.5.6.1 Overview of Issues, Risk and Changes

Actions, decisions or unforeseen events that impact or have the potential to impact the project's schedule shall be classified in one of the following categories:

1. Project Issue: A Project Issue is a situation, action, problem or question arising during the performance of the project which requires subsequent action before progress can continue toward the completion of a task or deliverable, to the satisfaction of both Project Managers. Left unresolved, a Project Issue will impede or prohibit project-related progress or development by delaying or suspending a task or project. All possible impacts to the completion of project tasks and deliverables shall be initially recorded as a Project Issue and tracked via an issue management process. However, Project Issues may be resolved as Project Issues or they may be escalated to become Project Risks or Project Changes and managed by the corresponding management process.

2. Project Risk: A Project Risk is a situation, action, problem or question which has the potential to arise during the performance of the project that may cause the project to deviate from the plan by critically impacting cost, scope, or schedule; and that requires management through planning and mitigation efforts.

3. Project Change: A Project Change is an alteration, desired by at least one party, to the activities or deliverables of a project that is agreed to force the project outside its original scope (and, potentially, cost). Project Changes are typically requested whereas Project Issues and Project Risks occur.

Project Issues, Risk and Changes are all managed by separate, but related processes, which are described in subsequent section of this document. The inter-relation of these processes is shown in the following figure.
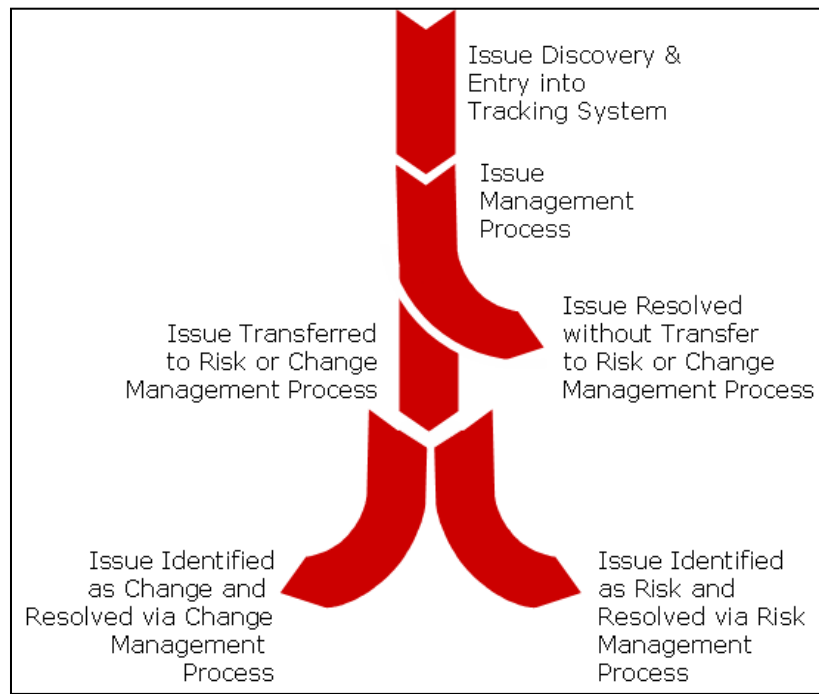
Figure - Relationship of Project Issues, Risk and Changes

The remainder of this section of this proposal describes the processes CDX Wireless shall use to manage Project Issues, Risks and Changes.

1.5.6.2 Project Issues

The procedures described in this section of this Project Management Plan are designed to facilitate the management of project-related Issues. The procedures address the following key steps:

- Document the issue

- Log and assign the issue

- Research the issue

- Resolve the issue

- Sign-off on issue resolution

- Track and Report

Document the Issue

The originator of an issue will contact the CDX Wireless Project Manager and provide a written description of the situation, action, problem or question that has arisen and which requires subsequent action before progress can continue toward the completion of a task or deliverable to the satisfaction of both CDX Wireless and the City Project Manager.

Log and Assign the Issue

Upon receipt of the Issue description, the CDX Wireless Project Manager will confirm the completeness of the written description and add it to the Issue Log. As necessary, the CDX Wireless Project Manager will request the Issue originator to correct or provide incomplete or missing information. Additionally, the CDX Wireless Project Manager will determine the priority of the Issue. The CDX Wireless Project Manager will then assign a unique, sequential tracking number to the Issue and record the description and the tracking number to the Issue Log.

Once the Issue has been recorded, the CDX Wireless Project Manager will review it with the City Project Manager, and any other affected members of the project team to determine the individual to whom the Issue should be assigned to analyze the issue. Finally, the CDX Wireless Project Manager will work with the assignee to determine an appropriate due date for the next action related to the Issue.

Research the Issue

The individual assigned to analyze the Issue will then research the Issue by discussing the situation with the originator and other relevant project team members. This may involve gathering any necessary background material not contained in the Issue Log. The assignee shall identify the scope and impact of the issue and shall discuss possible resolution options with the originator, the Project Managers, and/or other relevant project personnel. Finally, the assignee shall document potential Issue resolution options; prepare cost/benefit or other analysis summary information, and if appropriate, attach an analysis summary to the Issue Log before forwarding all information to the CDX Wireless Project Manager.

Resolve the Issue

Upon receiving the Issue Log and any summary information, the CDX Wireless Project Manager shall review the issue resolution options and analysis summary information to ensure the information is sufficient. Both Project Managers will then discuss the resolution options and agree to one option to implement. If the issue is determined to be a Risk or a Change (per the above definitions), it will be transferred to the appropriate process and tracking log where it will continue to be identified by its unique, sequential tracking number. If the Issue can be addressed without transfer to the Risk or Change processes, the Project Managers will agree to an implementation plan and document it and its effects accordingly in the Issue Log and all other relevant project documents (including, if appropriate, the Detailed Schedule).

Sign off on Issue Resolution

Upon concurrence that the issue is resolved per the approval Sign-off by the City Project Manager, the CDX Wireless Project Manager will then consider the Issue resolved and shall note it as "closed" in the Issue Log.

1.5.6.3 Project Risks

The procedure described in this section of this proposal is designed to facilitate the management of project-related Risks. The steps of the Risk Management process are as follows:

- Risk identification and documentation

- Risk analysis

- Risk mitigation and planning

- Risk tracking and reporting

Risk Identification

As part of the management of Issues, the Project Managers may agree that any specific issue poses a risk to the project and may therefore transfer that issue to the Risk Management process. Risks may include technical, political, logistical, and managerial aspects of the project. Examples of Risks to be managed include significant possibilities that the project could fail to meet its objectives in areas such as schedule, cost, and scope.

At the time that an Issue is identified as being a Risk and upon its transfer to the Risk Management Process, the CDX Wireless Project Manager shall record the Project Risk in the Risk Log where it will continue to be identified by the unique, sequential tracking number assigned it during the Issue Logging process. The format of recording a Risk is as follows: "(IF [Situation] by [Date] then [Consequence])". For example, "If all survey results are not received within two weeks, then the delivery of the Evaluation Report will be delayed." Additionally, the root cause of the Risk will be identified and recorded as will the likely impact of its occurrence. To continue the preceding example, a root cause may be listed as "Failure of survey participants to understand response process" and impact may be "Slippage in time of the Gap Analysis and all project deliverables."

Risk Analysis

All Project Risks are to be categorized based on its probability of occurrence and impact to the project, should it occur.

Probability (P) is based on a subjective assessment by the Project Managers, and is a numerical value of the ranges shown in the following table:

Consultant Service Agreement between City of Fresno ("City")
and CDX Wireless Technology Consulting ("Consultant")
Radio System Needs Evaluation

P	Probability	Guideline
1.0	100% - Problem	No longer a risk but a problem which must be dealt with.
0.9	Highly Likely	The risk has a very high likelihood of occurrence. Probability of greater than 80% and less than 100%
0.7	Likely	The risk is has better likely to become an issue. Probability of greater than 60% and less than or equal to 80%
0.5	Moderately Likely	The risk has some probability of becoming an issue. Probability of greater than 40% and less than or equal to 60%
0.3	Unlikely	The risk has a small probability of becoming an issue Probability of greater than 20% and less than or equal to 40%
0.1	Highly Unlikely	The Risk item has a very small probability of becoming an issue. Probability of greater than 0% and less than or equal to 20%
0.0	For minor issue tracking	Used to denote minor issues which are to be tracked via the template

Table– Risk Probability Guidelines

Impact (I) is based on a subjective assessment by the Project Managers, and is a numerical value of the ranges shown in the following table:

I	Impact	Guideline
80 - 100	Catastrophic	A key project objective <u>will</u> not be met. This may entail such things as a failure to be able meet a customer commitment, provide a necessary product feature, or an inability to hit required product cost or revenue targets. The ability to resolve should the risk occur is very limited.
60 - 79	High	A key project objective <u>may</u> not be met. Commitments will be affected regardless of any possible action (cost) taken. For example, this may cause a product feature to be removed from the project scope in order to reestablish a balance among the project elements of schedule, scope and cost/resources (i.e. the "Triple Constraint"). The ability to resolve should the risk occur may be limited
40 - 59	Medium	A project objective <u>may</u> not be met. If the risk becomes a problem it will require help from outside of the project team to manage. In order to resolve, some element of the triple constraint will need to be affected i.e. cost/resources, scope, or schedule. With effort, the risk could be resolved should it become a problem.
20 - 39	Low	If the risk becomes a problem it can be managed internally to the project. The project can recover without additional resources potentially through the use of project float (for non-critical path activities), available schedule reserve or minor change in strategy.
0 - 19	Negligible	If the risk becomes a problem its effect may be so minor as to be ignored. Ranking in this range is usually done to capture a risk whose impact is minor at the present time but may increase as the project proceeds.

Table - Risk Impact Guidelines

In this way, a Risk Priority Number (RPN) can be calculated by the following equation: RPN = P * I (i.e., risk priority increases with increasing probability and impact). This will allow risks to be prioritized by RPN in the Risk Log.

Risk Planning and Mitigation

The CDX Wireless Project Manager, with input from the City Project Manager, develops a mitigation strategy for each risk with an RPN of a mutually-agreeable number (typically 55) or higher. There are four mitigation strategies for managing Risks:

- Accept Risk – The project manager accepts the risk if it will not significantly impact the schedule, scope, or cost of the project.

- Reject Risk – The risk is rejected if it is not relevant or significant to the success of the project.

- Mitigate- Develop a plan to reduce or eliminate the risk, continually monitor the risk and any identified residual risk, and develop a risk contingency plan.

- Contingency – Prepare a back-up plan to address the project impacts of the risk if it arises.

The Project Managers will decide upon a Risk management approach for each Risk and shall document a Risk plan that includes an action plan (the actions to be taken, the timing of those actions and the parties responsible to take those actions); the intended outcome of the action plan and the action plan owner (if different than the party responsible to take the action). Finally, the anticipated date of resolution of the Risk shall be recorded, as will any notes regarding the Action Plan's current status.

Risk Tracking and Reporting

Identified risks are documented in the weekly Project Status Report and reviewed periodically based on their categorization.

- Risks that have an RPN above 75 shall be reviewed weekly by the Project Managers.

- Risks that have an RPN between 55 and 75 shall be reviewed bi-weekly by the Project Managers.

- Risks that have an RPN below 55 shall be reviewed monthly by the Project Managers to ensure that the conditions surrounding the Risk have not changed in ways that result it from becoming more probable or of greater impact.

Updates to the Action Plan for Risks shall be recorded in the Risk Log and the CDX Wireless Project Manager shall record the Risk as closed upon mutual agreement by both Project Managers that the underlying issue no longer poses risk to the project.

1.5.6.4 Project Changes

The intent of a process to manage Project Change is to define the mechanisms for requesting, evaluating, deciding, and tracking possible changes to the project scope and all related activities and deliverables. This procedure defines the steps by which the project team members and stakeholders can request changes and its key objectives are to:

- Identify changes in scope, or other unplanned activity, in advance of their occurrence and control them

- Protect the integrity of deliverables that have been approved as fit for purpose

- Ensure that new tasks and other requested changes are justified and cost justifiable, and that affected deliverables are identified and modified accordingly (newly baselined)

- Obtain authorization and contract modifications, if required, to proceed with the new tasks/changes and assign them to appropriate individuals to be completed

- Monitor the progress and cost of the changes.

The change control procedure will apply to any change of project scope, unplanned activity or the production of an unplanned deliverable (i.e. any task not explicitly within the scope of the current baselined work plan).

It is important to note that no project member is authorized to begin work on an activity or task that is not included in a project contract, a project agreement, or for which there has not been explicit approval of a Change Request following the exercise of this Project Change process.

The following table defines the events and responsibilities in the Project Change process. During the Project Change process, the Change will continue to be identified by the unique, sequential tracking number assigned it during the Issue Logging process.

Step	Responsibility	Action
1	Originator	Requirement for new task/enhancement identified and documented on a Change Request (CR) form. If possible, change analysis fields should also be completed. Pass to Project Manager for review. If Project Manager agrees with CR, it will be assigned to a Project Team Member.
2	CDX Wireless Project Manager	Assign a unique number to CR, log the request.
3	Project Team Member	Analyze impact to project of change including cost, scope, outcomes, and schedule.
4	Project Managers	Regularly review new CRs and allocate for further analysis. The Project Manager approves change (if analysis is complete), rejects, or puts in a hold status. Where estimated cost (or impact on timescales) exceeds pre-defined limit, the Project Manager refers the request to Client for review.
5	City Project Manager	If deemed necessary by the Fresno project team, issue a Task Order to execute the Change.

Table - Project Change Management Process

1.6 Project Approach Assumptions

The following assumptions have been used in the development of this proposal.

- The City of Fresno will designate one individual to serve as the Project Manager that will represent the City. The City Project Manager will be authorized to provide direction to the CDX Wireless Project Manager as needed. This level of authority is needed to help ensure that the project can be completed within the desired time frame.
- The City Project Manager shall facilitate access to sites as needed to allow CDX Wireless to complete their review as described in the Project Approach, above.
- Any reports developed by CDX Wireless will be completed in Microsoft Office or PDF formats and submitted to the City Project Manager in electronic format.
- Completing the project in a timely manner will require a rigorous deliverable and review process. We assume that the following process shall be employed:
  o The CDX Wireless Project Manager shall submit the specified deliverables to the City Project Manager for dissemination and review.
  o Comments on a deliverable will be submitted to the City Project Manager who shall develop one set of comments for presentation to the CDX Wireless Project Manager.
  o The comments for each deliverable shall be submitted to the CDX Wireless Project Manager within five (5) business days of receipt of the draft deliverable.
  o CDX Wireless shall have five (5) business days to address the comments on the deliverable and submit the final document unless otherwise identified in the schedule.
  o The City Project Manager shall have five additional business days to review the revised final draft to ensure that all of the comments were properly addressed. This review will be limited to comments made on the initial draft. Additional or new comments made on the revised draft may be subject to change control.
  o An acceptance certificate shall be submitted with each final deliverable for the City Project Manager's signature.
- Our work on this project will include a combination of on-site and off-site activities, the latter occurring at the offices of CDX Wireless. When it makes practical sense, meetings will be conducted via phone conference or WebEx telepresence.

The scope of CDX Wireless's efforts on this project excludes certain tasks. These excluded tasks include, but are not limited to the following:

1. Civil engineering work including Tower Loading studies or any structural analysis.
2. Site preparation, installation or civil/construction work.
3. Securing permits, or other items necessary to implement the system design.

It is important to note that while CDX Wireless has the capabilities listed above, they are not included in our pricing or scope of work. Any requests to perform the above excluded tasks will require a quote and change order.