Statement of Work (SOW)

General Provisions

ABB Tropos (the term Tropos is defined as Tropos Networks and its approved subcontractors) will provide equipment, software licenses, a site Support Agreement, and professional services for a technology refresh of the City of Corpus Christi, Texas (CCTexas) broadband wireless mesh network in three specified areas. The network is used by CCTexas and other entities for multiple applications, to include: mobile broadband for the City, mobile connectivity for buses, and other municipal functions (e.g. AMR, SCADA, Public Safety, Video Monitoring, Libraries, Public Internet, etc.).

The technology refresh equipment shall be comprised of one hundred and fifty (150) of the latest generation ABB Tropos model number 73203130XA wireless mesh routers. The 150 new 7320XA routers shall be used to replace previous generation ABB Tropos 5210 wireless mesh routers. Previous generation ABB Tropos 5210 and 5320 wireless mesh routers may also be relocated for continued use to alternate areas of the network.

Professional Services: Seven (7) weeks of on-site professional services, including travel expenses. The following general provisions apply to this project:

Mounting Assets:
- CCTexas will secure mounting rights for street lights with photo cells, towers, buildings and other electrical distribution assets for the purpose of mounting and powering all Tropos routers and other wireless devices required to complete the project. Lack of access to mounting assets will limit the coverage and effectiveness of the wireless network.
- CCTexas will provide locations, power and mounting assets in order to install Gateway routers connected to the City's fiber, point-to-point microwave, or point-to-multipoint microwave systems (Tier 1 backhaul and capacity injection network demarcation points). The City should consider providing as many Tier 1 demarcation connections as possible in order to increase the performance of the mesh. The City will be responsible for providing Ethernet connectivity, including network configurations, security or firewalls at these ABB Tropos mesh Gateway router installation locations (Tier 1 network demarcation points).
- CCTexas will provide additional mounting assets where required if not currently available.

Responsibilities

ABB Tropos Responsibilities
- Delivery of Professional Services: Design, engineering, implementation support and optimization support of the ABB Tropos broadband wireless mesh network infrastructure as defined in this document.

CCTEXAS Responsibilities
- Provide street light mounting assets with photo cell power capabilities.
- Provide 90V to 277V power in photo cell compatible receptacle at Tropos Node and Gateway wireless mesh router locations.
- Provide warehouse space for equipment receipt and staging.
- Provide configuration of the Tropos routers.
- Provide electrical grounding of Tropos Routers.

- Provide suitable mounting locations and Fiber/Ethernet/PTP/PTMP network staff to perform Tier 1 network configuration and testing for network implementation at Tier 1 network demarcation points based on a mutually agreed design.
- Provide Ethernet interface or Ethernet Switch at Tropos Gateway wireless mesh router locations.
- Provide IT assistance to install and configure Tropos Control management software.
- Provide Internet access / connectivity, firewalls, security configurations, VPN, DNS, and DHCP network services via existing network infrastructure as required for network and application testing.
- Provide router installation on street lights with photo cells.
- Provide roof chase on roof mounted installation and/or provide wall penetration core drilling where required.

Table 1 – Responsibility Matrix

#	Corpus Christi ACTIVITY / RESPONSIBLE [P=Primary Responsibility S=Secondary]	City of Corpus Christi (CCTexas)	ABB Tropos
1	Project prime contractor	P	
2	Wireless mesh network project management	P	S
3	Manage union relations (if applicable)	P	
4	Provide GIS data sets of mounting assets, and existing network elements	P	
5	Wireless mesh network detailed design	S	P
6	Identify any exceptional mounting assets or coverage/non-coverage areas	P	S
7	IP network design	P	S
8	Wireless mesh network system engineering (on-site and remote)	S	P
9	Site survey of mounting assets and facilities	P	S
10	Approve proposed mounting asset / facility locations	P	
11	Provide storage and staging space	P	
12	Provide power, access, equipment space for all mounting assets	P	
13	Provide wireless mesh network equipment and software licenses		P
14	Provide and install server hardware or VM for Tropos Control management server software	P	S
15	Install and configure Tropos Control management server software.	S	P

16	Provide fiber and/or wired or wireless Tier 1 network transport from mutually agreed locations to production/office facilities.	P	
17	Provide 100 Mbps full-duplex wired Ethernet 802.1q VLAN trunk port at Tier 1/ demarcation points for the wireless network at mutually agreed locations.	P	
18	Provide secure remote access for Tropos engineering, support, and professional services staff to support wireless mesh network deployment, optimization, testing, commissioning, and delivery of ongoing Support services.	P	
19	Create database of selected and approved mounting asset locations, perform installation planning, and create service work orders for all network installation activity.	S	P
20	Provide and install if necessary horizontal mast arms to facilitate installation of wireless network equipment at mutually agreed locations.	P	
21	Manage Tropos Control router database during implementation	S	P
22	Provide Internet connectivity and gateway	P	
23	Provide installation crews for installation of the ABB Tropos wireless mesh routers on poles	P	
24	Provide electrical and wired Ethernet conduit and cabling installation within buildings and other required structures	P	
25	Provide individually powered photocell adapters on existing street lights or power poles where needed	P	
26	Configure Tier 1 network elements and connections.	P	S
27	Create Tropos router Deployment configurations (temporary)	P	S
28	Create Tropos router Production configurations (final)	P	S
29	Configure Tropos routers	P	
30	Create network test plan and scripts	P	S
31	Cutover network from deployment configuration to production configuration	P	S

32	Perform network optimization	P	S
33	Conduct network performance testing	P	S
34	Correct network deficiencies (test plan failures), coordinate re-testing as applicable.	P	S
35	Document final network performance testing results	P	S
36	Provide "as-built" documentation including internal test results	P	S
37	Authorize network commissioning for production operational use	P	

Service Area

The installation areas of this SOW will be focused on Island, Flour Bluff, and Ocean Drive.

Site Survey / Design

- Required site surveys will be performed jointly by CCTexas and ABB Tropos for the Mesh Layer installed on street lights and other designated mounting assets for the network implementation.
- Individual virtual wireless networks will be defined and configured for each CCTexas user community (up to 16), with assigned ESSID, VLAN, IP subnet, and data traffic routing.

Professional Services

Tropos and its subcontractors will provide the following services:

- Asset validation and data reconciliation to ensure Tropos Control, Tropos router, and GIS data is accurate for the as built network and transferred to designated CCTexas data owner for ongoing accuracy maintenance using established internal CCTexas business process. The asset validation deliverable is a reconciled data set, including location information, and a punch list of network move, add, change activity needed to manage the deployed infrastructure in the focused areas.
- Identify and prioritize Gateway reactivation in the CCTexas focus areas.
- Support transition to VM environment for Tropos Control.
- Support transition of all ABB Tropos mesh infrastructure routers from DHCP to static IP addressing.
- Upgrade Tropos Control and all operational routers to most current GA software release.
- Support golden (standardized) configuration reconciliation for all router models following upgrade. Ensure configuration backup is activated for the mesh network.
- Confirm discovery and manageability of all operational fixed infrastructure mesh routers by Tropos Control.
- Support configuration of all Tropos Control network optimization thresholds on the Tropos Control Network Optimization page.
- Support prioritization of Tier 1 network demarcation points (fiber, PTP microwave, and PTMP microwave) implementation to meet specified network performance requirements for department applications in the designated focus areas.
- Support development of ongoing operational best practices.
- Project management of Tropos-provided functions.

- Install Tropos Control software on a temporary server hardware (not VM) platform to be supplied by CCTexas. The temporary Tropos Control server is required to be installed to configure the Tropos mesh routers.
- During the period while ABB is providing onsite support, ABB will facilitate, in coordination with CCTexas, a weekly change control meeting to review and prioritize network move, add, change activity.
- Following each weekly change control meeting, while ABB is providing onsite support, ABB will make written recommendations to CCTexas regarding methods to implement and document approved network changes to the ABB Tropos mesh network that require the use of the Tropos Control network management system.

Professional Services Billing Schedule

- 25% upon receipt of purchase order

- 25% - upon completion of Planning Phase (Google Earth .KMZ showing locations for all routers to be installed. Some routers may be held back as spares at the discretion of CCTexas)

- 50% upon deliverable of the final report of network inventory and asset reconciliation.

All pricing and the billing schedule is subject to the Terms and Conditions of Tropos Quote HR-CCTX111914PS. To the extent that there are conflicting terms between the quote and other documentation, the terms in the Tropos Quote shall prevail.

Staging / Deployment

CCTexas will provide a facility (warehouse or office space) for receiving and storing the network equipment during the deployment and testing periods.

CCTexas will stage the equipment (code installation and configuration), configure all Tropos network equipment, other wireless equipment and accessories. Tropos will install Tropos Control on a server at a CCTexas location and configure it for remote access. The Tropos Control management server also supports the staging / deployment activity.

CCTexas will perform necessary configuration modifications and testing of the existing wired Enterprise network infrastructure in accordance with the mutually agreed network design and in accordance with CCTexas MIS Change Management policy and procedures. These configuration changes include:

- Defining and administering network security policy which the network project implementation shall adhere to.
- Enabling Ethernet VLAN trunk ports (802.1q) for Tropos Gateway connections.
- Allocating required IP Address subnets.
- Implementing wired router configuration changes as needed.
- Configuring DHCP server to provide reservations for designated IP device interfaces.
- Implementing Firewall configuration changes as needed to facilitate application testing.

Upon completion of deployment, ABB Tropos shall ensure the network is configured for production operation according to the mutually agreed design and prior to the start of optimization.

TROPOS NETWORKS

By: _____   **By:** _____

Printed Name: _____   **Printed Name:**_____

Title: _____   **Title:** _____

Date: _____   **Date:** _____
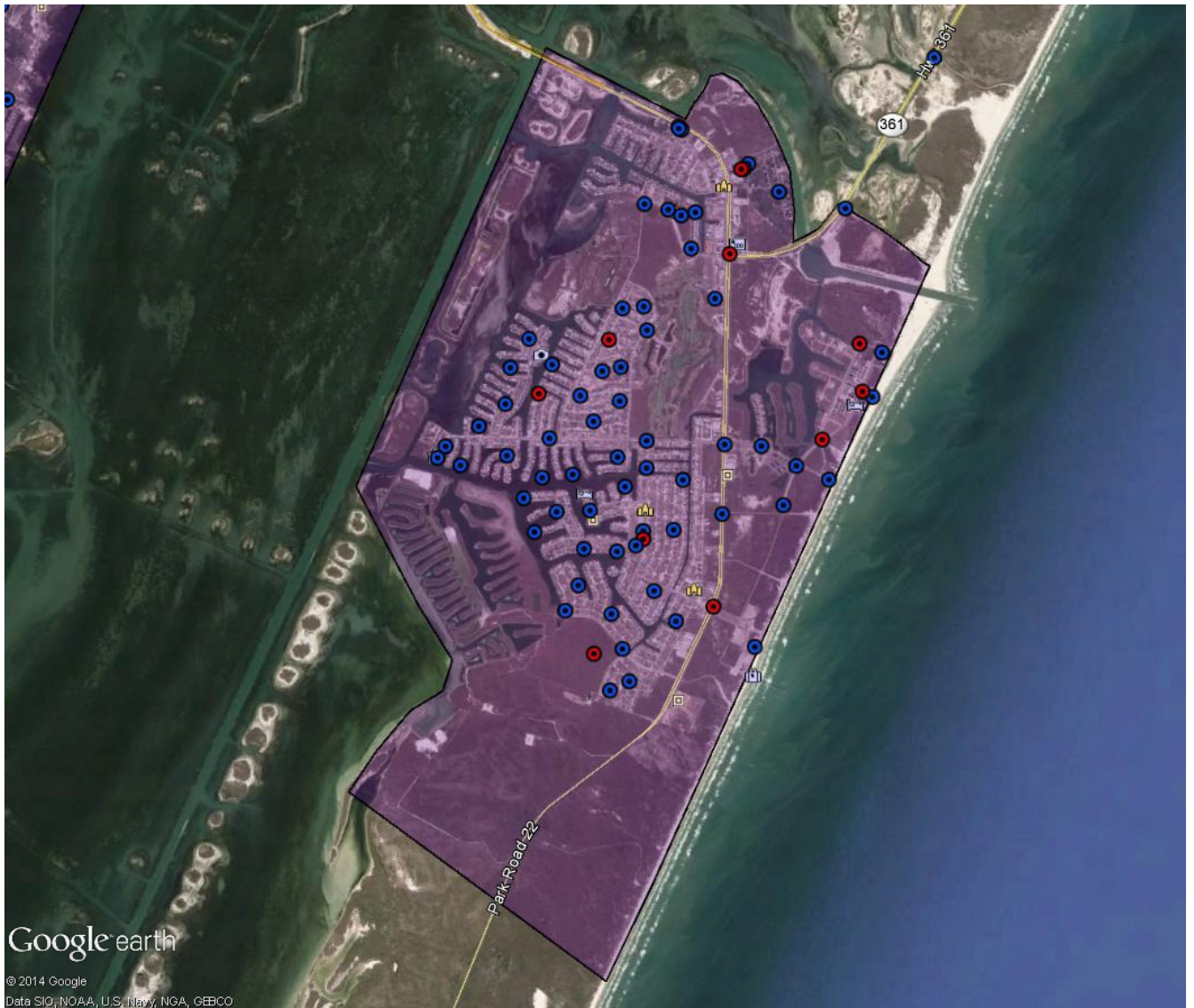
Appendix A: CCTexas Focus Areas

Flour Bluff

The ABB Tropos mesh routers located along the eastern edge of Flour Bluff (see purple shaded area on aerial photograph below) are to be replaced with 73203130XA units. Currently there are a mix of 5210 and 5320 routers in this area. These units are subject to constant wind with corrosive salt air content. This is also a specific CCTexas Police Department (PD) area of interest for video camera placement.

City of Corpus Christi

Island (Padre Island/Mustang Island)

The ABB Tropos mesh routers located on Padre and Mustang Island (see purple shaded area on aerial photograph below) are to be replaced with 73203130XA units. Currently there are a mix of 5210 and 5320 routers in this area. These units are subject to constant wind with corrosive salt air content.

City of Corpus Christi

Ocean Drive

The ABB Tropos mesh routers located along Ocean Drive from the Texas A&M Campus to Coal Park (see purple shaded area on aerial photograph below) are to be replaced with 73203130XA units. Currently there are a mix of 5210 and 5320 routers in this area. These units are subject to constant wind with corrosive salt air content.