New York City Department of Transportation
Engineering Services Agreement
Contract No.: TF01-ESA3
PIN No.: 84104MBTR712

Proposal
Assignment No. 00D-31: Project ID 841TF01___

Deployment of Radio Frequency Identification (RFID) Readers for Midtown Manhattan Travel Time Study

SCOPE OF SERVICES

Introduction:

The New York City Department of Transportation (NYCDOT) is seeking to identify and observe t rends in travel time congested areas of the City. Vehicle speeds and link travel times convey a broader picture of how traffic moves and identifies congestion problems. As part of this study the NYCDOT is planning to install Radio Frequency Identification (RFID) tag readers and associated equipment at 18 intersections in Midtown Manhattan. The RFID tag readers will read electronic toll collection (ETC) system tags mounted on vehicles as they pass through an intersection. Data will be collected and transmitted to the Traffic Management Center (TMC) where they will be processed and used to calculate average travels and speeds between a series of intersections equipped with the tag readers. The average travel speeds will be used to determine the "real time" impact of adjustments to signal timings in the Midtown Core.

Communications between the tag readers and the TMC will be via the existing Citywide wireless communication system (NYCWiN) utilizing the new Class 4B wireless router.

Scope of Work:

This scope of work is for the JHK - Urbitran Joint Venture (Consultant) to provide engineering design services, installation and integration support, and procurement support.

The Consultant shall develop installation schematic drawings that NYCDOT in-house forces will use for the installation of tag readers and antennas at each of the 18 Intersections. The Consultant will also procure the tag readers antennas that NYCDOT will install. The Consultant will provide on-site installation and integration support to NYCDOT personnel.

The Consultant will install the Application and Database Servers at the TMC. The Consultant will assist the NYCDOT personnel in establishing a communications link between the Servers and Readers located in the field.
The Consultant will develop software to parse the raw data received from each reader site and populate a database with Tag ID matches including the intersections where each Tag ID read took place and the time stamp for each Tag ID read. The Consultant will provide support to the NYCDOT in developing the algorithm to calculate the average travel speed and average travel time for each link.

Below is a summary of the various pieces of equipment that will be procured and installed for this project:

Equipment	Estimated Quantity	Procured by	Installed by	Integration by
Tag Reader	38 (36 + 2 spares)	Consultant	NYCDOT	Consultant
Tag Reader Power Supply	38 (36 + 2 spares)	Consultant	NYCDOT	Consultant
Antenna	36	Consultant	NYCDOT	Consultant
Coaxial Cable	As required	NYCDOT	NYCDOT	Consultant
Serial Cable	750 ft.	Consultant	NYCDOT	Consultant
Coaxial Cable Connectors	36	NYCDOT	NYCDOT	Consultant
Coax Lightning Suppressor	36	Consultant	NYCDOT	Consultant
Auxiliary Cabinet	As required	NYCDOT	NYCDOT	Consultant
NYCWiN Modem and Antenna	36	NYCDOT	NYCDOT	NYCDOT/Consultant
Server	2	Consultant	Consultant	NYCDOT/Consultant
Note: The Consultant to provide on-site support during installation				

The following tasks describe the work to be performed, along with our assumptions and the anticipated deliverables.

Task 1 – Project Familiarization

NYCDOT will identify the 18 intersections where the readers will be installed. The Consultant will review the information and meet with the City to discuss any potential issues of the intersections selected. The

City and Consultant will define the project requirements that includes identifying the links or sections where travel time will be required.

It is assumed that the City will be responsible for development of the algorithm for processing the parsed data. The Consultant will provide support in development of the algorithm to the NYCDOT. The Consultant will work with the NYCDOT to determine the format of the parsed data the NYCDOT will use to develop the Travel Time algorithm.

Deliverables:

- **Upon completion of the review of the aforementioned materials, the Consultant will prepare a memorandum identifying potential issues that may impact the project.**
- **The Consultant will attend one project kick-off meeting with NYCDOT.**

Task 2 – Field Survey

The Consultant will perform a joint site survey with the City of all the 18 locations to take field measurements and identify the location where reader(s) need to be mounted in order to meet the requirements identified from the previous task. It should be noted that an intersection may require 2 reader and antennas depending on the number of traffic movements that needs to be read based on the travel time link required.

Photographs of all proposed equipment locations will also be taken for future reference.

Assumptions:

- **NYCDOT representative will be present during the site survey.**
- **Permits will not be required for the Consultant to perform the field work.**
- **Structural analysis will not be performed for the poles and mast arms where the readers and antennas will be installed.**
- **City will confirm availability of electrical power at the base of each pole where the reader will be installed.**
- Each intersection will require two readers and two antennas.

Deliverables:

- **The Consultant will prepare a memorandum documenting the data collected during the field surveys and identify any issues that need to be addressed.**

Task 3 – Installation Diagrams

The Consultant will develop installation diagrams and schematics that NYCDOT in-house forces will use for the installation of all pieces of equipment. The installation diagrams will include:

- Location Plans to indicate the corner where the equipment will be installed, the required offset of the antenna with respect to the corner, orientation and the approximate tilt of each antenna.
- Typical interconnect wiring diagram
- Typical auxiliary cabinet layout

Assumptions:

- **The Consultant assumes that the following sheets will be developed:**
  - **Location Plans (18 sheets)**
  - **Interconnect wiring diagram (1 sheet)**
  - **Auxiliary cabinet layout (1 sheet)**
- **NYCDOT will be responsible for installing the antennas on existing traffic signal mast arms using commercially-off-the-shelf (COTS) mounting hardware. The Consultant will not develop any mounting details.**

Deliverable:

- **The Consultant will submit soft and hard copies of the installation diagrams. The hard copies will be submitted on 11" X 17" prints.**

Task 4 – Procurement Support

As stated above, construction will be performed by in-house forces and the Consultant will procure most of the electronic equipment that will be installed as part of Phase 1. This includes:

Equipment	Estimated Quantity
Tag Reader	38 (36+ 2 spares)
Tag Reader Power Supply	38 (36 + 2 spares)
Antenna	36
Serial Cable	750 ft.
Coax Lightning Suppressor	36
Server	2

The costs associated with the procurement of these different pieces of equipment are included as direct non-salary cost of this proposal. If different equipment than that offered in the BOM is chosen during

the design process or if quantities change from what is indicated, budget modifications shall be made as appropriate.

Task 5 –Installation and Integration Support

The Consultant will provide installation and integration support to NYCDOT in-house forces. During installation, the Consultant will provide on-site and off-site support to provide guidance and technical recommendations. If necessary, the Consultant will develop an alternate engineering solution to mitigate unforeseen conditions. The Consultant will also respond to questions and request for clarifications from NYCDOT.

During integration, the Consultant will provide on-site personnel to assist City personnel in the integration of the electronic devices. This includes reader set-up and configuration, antenna tuning and troubleshooting of problems and testing. The Consultant will confirm that data collected by the reader is being received at the TMC.

The Consultant will provide an external interface such that the City or another consultant can select the timing plan to be run. It is expected that the City or another consultant will use this capability to select one of the plans in the ASTC's local database which has been configured for CIC operation and then use the existing interface to modify the cycle, splits, and offset as necessary. It shall be the City's or the other consultant's responsibility to research, test, and follow the rules imposed by the ASTC to ensure that the new plan is accepted and that the City's or other consultant's parameters are accepted to modify the pattern invoked.

Deliverable:

- **The Consultant will provide field and central installation and integration support**

Assumptions:

- **NYCDOT staff will be available to accompany the Consultant personnel in the field.**
- **NYCDOT will provide City electricians with bucket truck to assist in the integration activities.**
- **NYCDOT will be responsible for all lane closure work and Maintenance and Protection of Traffic.**
- **NYCDOT will take the lead role in the integration of the devices to NYCWIN with support from the Consultant. NYCDOT will be responsible for the configuration of the NYCWIN modems.**

Task 6– Project Management/Quality Assurance & Quality Control

Project management is a crucial and essential element of this task order. This task includes all management activities necessary for the successful completion of the various tasks defined herein. Project management is a continuous task and shall be active for the duration of this work order. Included in this task is Quality Control and Quality Assurance.

A. Management Plan

The Consultant will develop the project schedule utilizing Critical Path Method for schedule control of the assignment's design effort using Microsoft Project unless otherwise specified by NYCDOT. The overall assignment effort will be segregated into logical detailed work items, each with a measurable end product. Once these project activities have been defined, their relationships will be identified, start and end dates set, and budget controls established. The assignment schedule will show the relationships of these work items and the point in the assignment where they become critical.

The Consultant will notify NYCDOT when the work order expenditures have reached 75% of the agreed upon estimated budget.

The Consultant will provide Quality Assurance/Quality Control (QA/QC) as part of this task. The Consultant is committed in providing NYCDOT with the highest level of quality on all deliverables. As such, the Consultant will institute a QA/QC procedure that includes thorough internal reviews of all deliverables.

B. Meetings

To keep NYCDOT informed of the assignment's status and to gain NYCDOT input into the project, the Consultant will assist in organizing, preparing an agenda and conducting regular coordination meetings. Following each meeting, the Consultant will prepare minutes along with a list of action items. The purpose of these meetings would be to discuss the progress of the design effort, technical issues, and any comments on submittals. For estimating purposes, the number of project meetings to be scheduled between the Consultant and NYCDOT is limited to 5 meetings of 2 hours each.

C. Progress Reports

The Consultant will submit to NYCDOT on monthly basis a Cost Control Report, a Progress Report, and a Project Schedule in accordance with NYCDOT invoicing format. The beginning and ending dates defining the reporting period would correspond to the beginning and ending dates for billing periods, so that the reporting process can also serve to explain billing charges.

D. Project Records and Files

The Consultant will maintain project records and files. Project records will include status reports, meeting minutes (as required), field notes, other condition data, and plans for progress and final submissions.

Deliverables:

- **Progress and cost control reports**
- **Progress schedule**
- **Meeting agendas and minutes**

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Proposal
Assignment No. 00D-38: Project ID 841TF01___

Deployment of Radio Frequency Identification (RFID) Readers and License Plate Recognition (LPR) Cameras for Midtown Manhattan Travel Time Study

SCOPE OF SERVICES

Introduction:

The New York City Department of Transportation (NYCDOT) is seeking to identify and observe trends in travel time congested areas of the City. Vehicle speeds and link travel times convey a broader picture of how traffic moves and identifies congestion problems. As part of this study the NYCDOT is planning to install Radio Frequency Identification (RFID) tag readers and License Plate Recognition (LPR) cameras and associated equipment at intersections in Midtown Manhattan. The RFID tag readers will read electronic toll collection (ETC) system tags mounted on vehicles as they pass through an intersection and the LPR cameras will process license plate readings as the vehicles pass through the field of view of the camera. Data will be collected and transmitted to the Traffic Management Center (TMC) where they will be processed and used to calculate average travels and speeds between a series of intersections. The average travel speeds will be used to determine the "real time" impact of adjustments to signal timings in the Midtown Core.

Communications between the tag readers and the LPR cameras and the TMC will be via the existing Citywide wireless communication system (NYCWiN) utilizing the new Class 4B wireless router.

Scope of Work:

This scope of work is for the JHK - Urbitran Joint Venture (Consultant) to provide engineering design services, procurement support, installation and integration support.

The Consultant shall develop installation schematic drawings that NYCDOT in-house forces will use for the installation of the cameras, tag readers and antennas, and LPR equipment at each of the intersections. The Consultant will also procure the tag readers, antennas, LPR equipment, and any

necessary central hardware for the processing of LPR data. The Consultant will provide on-site installation and integration support to NYCDOT personnel.

The Consultant will assist the NYCDOT personnel in establishing a communications link between the central servers and the readers and LPR cameras located in the field.

The Consultant will develop software to parse the raw data received from each LPR site and populate a database with license plate matches including the intersections where each license plate read took place and the time stamp for each license plate read.

The Consultant will integrate the tag readers into the existing travel time software located at the TMC.

Below is a summary of the various pieces of equipment that will be procured and installed for this project:

Equipment	Estimated Quantity	Procured by	Installed by	Integration by
Tag Reader	18	Consultant	NYCDOT	Consultant
Tag Reader Power Supply	18	Consultant	NYCDOT	Consultant
Antenna	18	Consultant	NYCDOT	Consultant
Coaxial Cable	As required	NYCDOT	NYCDOT	Consultant
Serial Cable	18	Consultant	NYCDOT	Consultant
Wireless Serial Modems	27	Consultant	NYCDOT	Consultant
Coaxial Cable Connectors	36	NYCDOT	NYCDOT	Consultant
Coax Lightning Suppressor	18	NYCDOT	NYCDOT	Consultant
Auxiliary Cabinet	As required	NYCDOT	NYCDOT	Consultant
NYCWiN Modem and Antenna	18	NYCDOT	NYCDOT	NYCDOT/Consultant
LPR Camera	9	Consultant	NYCDOT	Consultant
LPR Processor	9	Consultant	NYCDOT	Consultant
Mounting Brackets	27	NYCDOT	NYCDOT	NYCDOT
Server	1	Consultant	Consultant	NYCDOT/Consultant
Note: The Consultant to provide on-site support during installation				

The following tasks describe the work to be performed, along with our assumptions and the anticipated deliverables.

Task 1 – Project Familiarization

NYCDOT will identify the intersections where the tag readers and LPR cameras will be installed. The Consultant will review the information and meet with the City to discuss any potential issues of the intersections selected. The City and Consultant will define the project requirements that includes identifying the links or sections where travel time will be required.

Deliverables:

- **Upon completion of the review of the aforementioned materials, the Consultant will prepare a memorandum identifying potential issues that may impact the project.**
- **The Consultant will attend one project kick-off meeting with NYCDOT.**

Task 2 – Field Survey

The Consultant will perform a joint site survey with the City of all the locations to take field measurements and identify the location where reader(s) and camera(s) need to be mounted in order to meet the requirements identified from the previous task. It should be noted that an intersection may require 2 reader and antennas depending on the number of traffic movements that needs to be read based on the travel time link required.

Photographs of all proposed equipment locations will also be taken for future reference.

Assumptions:

- **Permits will not be required for the Consultant to perform the field work.**
- **Structural analysis will not be performed for the poles and mast arms where the cameras, readers and antennas will be installed.**
- **City will confirm availability of electrical power at the base of each pole where the reader will be installed.**

Deliverables:

- **The Consultant will prepare a memorandum documenting the data collected during the field surveys and identify any issues that need to be addressed.**

Task 3 – Installation Diagrams

The Consultant will develop installation diagrams and schematics that NYCDOT in-house forces will use for the installation of all pieces of equipment. The installation diagrams will include:

- Location Plans to indicate the corner where the equipment will be installed.
- Typical interconnect wiring diagram

- Typical auxiliary cabinet layout

Assumptions:

- **The Consultant assumes that the following sheets will be developed:**
  - **Location Plans (18 sheets)**
  - **Interconnect wiring diagram (1 sheet)**
  - **Auxiliary cabinet layout (1 sheet)**
- **NYCDOT will be responsible for installing the antennas on existing traffic signal mast arms using commercially-off-the-shelf (COTS) mounting hardware. The Consultant will not develop any mounting details.**

Deliverable:

- **The Consultant will submit soft and hard copies of the installation diagrams. The hard copies will be submitted on 11" X 17" prints.**

Task 4 – Procurement Support

As stated above, construction will be performed by in-house forces and the Consultant will procure most of the electronic equipment that will be installed as part of this Phase. This includes:

Equipment	Estimated Quantity
Tag Reader	18
Tag Reader Power Supply	18
Antenna	18
Serial Cable	18
LPR cameras	9
LPR processor	9
Server	1

The costs associated with the procurement of these different pieces of equipment are included as direct non-salary cost of this proposal. If different equipment than that offered in the BOM is chosen during the design process or if quantities change from what is indicated, budget modifications shall be made as appropriate.

Task 5 –Installation, Integration Support and Before After Study

The Consultant will provide installation and integration support to NYCDOT in-house forces. During installation, the Consultant will provide on-site and off-site support to provide guidance and technical recommendations. If necessary, the Consultant will develop an alternate engineering solution to mitigate unforeseen conditions. The Consultant will also respond to questions and request for clarifications from NYCDOT.

During integration, the Consultant will provide on-site personnel to assist City personnel in the integration of the electronic devices. This includes reader set-up and configuration, antenna tuning, LPR processor set-up and configuration, camera positioning and troubleshooting of problems and testing. The Consultant will confirm that data collected by the reader and the LPR processors is being received at the TMC.

The Consultant will collect before and after travel time readings to measure the effect of adaptive traffic control strategies implemented by NYCDOT on the midtown Manhattan corridors of interest. The Consultant prepare a report documenting travel times, prior to and after implementation of adaptive traffic control, and conclusions of the analysis of the readings.

Deliverable:

- **The Consultant will provide field and central installation and integration support**
- **The Consultant will prepare a before and after study report of the effect of adaptive traffic signal control on travel times**

Assumptions:

- **NYCDOT staff will be available to accompany the Consultant personnel in the field.**
- **NYCDOT will provide City electricians with bucket truck to assist in the integration activities.**
- **NYCDOT will be responsible for all lane closure work and Maintenance and Protection of Traffic.**
- **NYCDOT will take the lead role in the integration of the devices to NYCWIN with support from the Consultant. NYCDOT will be responsible for the configuration of the NYCWIN modems.**

Task 6– Project Management/Quality Assurance & Quality Control

Project management is a crucial and essential element of this task order. This task includes all management activities necessary for the successful completion of the various tasks defined herein. Project management is a continuous task and shall be active for the duration of this work order.

A. Meetings

To keep NYCDOT informed of the assignment's status and to gain NYCDOT input into the project, the Consultant will assist in organizing, preparing an agenda and conducting regular coordination meetings. Following each meeting, the Consultant will prepare minutes along with a list of action items. The purpose of these meetings would be to discuss the progress of the design effort, technical issues, and any comments on submittals. For estimating purposes, the number of project meetings to be scheduled between the Consultant and NYCDOT is limited to 5 meetings of 2 hours each.

B. Progress Reports

The Consultant will submit to NYCDOT on monthly basis a Cost Control Report, a Progress Report, and a Project Schedule in accordance with NYCDOT invoicing format. The beginning and ending dates defining the reporting period would correspond to the beginning and ending dates for billing periods, so that the reporting process can also serve to explain billing charges.

C. Project Records and Files

The Consultant will maintain project records and files. Project records will include status reports, meeting minutes (as required), field notes, other condition data, and plans for progress and final submissions.

Deliverables:

- Progress and cost control reports
- Progress schedule
- Meeting agendas and minutes

Table 1 Detailed Itemization for Materials

Item #	Description	Quantity	Unit Price	Extended Price
1	Tag Reader	18	$ 2,700.00	$ 48,600.00
	Tag Reader Power	18		
2	Supply		$ 150.00	$ 2,700.00
3	Antenna	18	$ 900.00	$ 16,200.00
	Coaxial Cable	0		
			$ 7.00	$ -
4	Serial Cable	18	$ 115.00	$ 2,070.00
	Coaxial Cable Connectors	0		
			$ 50.00	$ -
	Wireless Serial	27		
5	Modem		$ 300.00	$ 8,100.00
	Auxiliary	0		
6	Cabinet		$ 700.00	$ -
	NYCWin	0		
	Modem and			
7	Antenna		$ 2,300.00	$ -
	LPR Camera	9		
8	Assembly		$ 10,000.00	$ 90,000.00
9	Server	1	$ 7,000.00	$ 7,000.00
			Total:	$ 174,670.00

JHK Engineering, P.C.

Eng Services Agreement - Assignment No. 00D-38
Contract No. TF01 ESA 3, PIN No.: 84104MBTR712
Deployment of Radio Frequency Identification (RFID) Readers and License Plate Recognition (LPR) Cameras for Midtown Manhattan Travel Time Study

Job Title	ASCE (A) NICET (N)	Overtime Category	Estimated Total Hours	Average Rate ($/Hour)	Cost 2.9 Mult
Project Manager	IX (A)	A	112	$ 75.50	$ 8,456.00
Technical Expert	IX (A)	A	0	$ 89.66	$ -
Project Engineer	VII (A)	B	240	$ 62.64	$ 15,033.60
Senior Engineer I	VII (A)	B	424	$ 44.04	$ 18,672.96
Senior Engineer II	VII (A)	B	0	$ 47.85	$ -
Traffic/Transp Engr III	VII(A)	B	496	$ 40.97	$ 20,321.12
CADD Operator	III(A)	B	0	$ 27.12	$ -
Secretary/Office Manager I	N/A	B	32	$ 30.37	$ 971.84
Subtotal Hours			3142	$ -	$ 63,455.52
		Subtotal			$ 63,455.52
		Multiplier 2.90			
		Subtotal x Multiplier			$ 184,021.01
		Direct Non-Salary Costs			$ 175,695.00
		JHK TOTAL			**$ 359,716.01**

Estimated Direct Expenses	Rate	Qty	Cost
Airfare - Round trips (NYC - All)	$ 400	0	$ -
Per Diem	$ 300	0	$ -
Misc Travel Exp	$ 100	0	$ -
Local Travel	$ 25	41	$ 1,025
Materials	$ 174,670	1	$ 174,670
Misc. Courier & Supplies	$ 200	0	$ -
	Total		$ 175,695

(Note: See Table on Page 6 of 7 for detailed itemization)

Assignment No. 00D-38
Deployment of Radio Frequency Identification (RFID) Readers and License Plate Recognition (LPR) Cameras for Midtown Manhattan Travel Time Study

Agreed to:

Raymundo Martinez, P.E.
President, JHK-Urbitran JV

Approved:

Mohamad Talas, P.E., P.T.O.E.
Deputy Director Systems Engineering, NYCDOT
Traffic Operations Division

Approved:

Steven J. Galgano, P.E.
Executive Director, Engineering, NYCDOT
Traffic Operations Division

Approved:

Office of Management & Budget