
Montego Bay City, Jamaica
THE EXPORT-IMPORT BANK OF KOREA
2013 KSP-IDB Joint Consulting for Designing
the Integrated Operation and Control Center
in Montego Bay - Jamaica
SANE
KRIHS
Korea Research Institute for Human Settlements
DAEYEONG UBITEC

1

Introduction
of Project

2

What is
Smart City

3

Status of the
Montego Bay
City

4

Comprehensive
Design and
Implementation
Plan

1

Introduction of Project

2

What is
Smart City

3

Status of the
Montego Bay
City

4

Comprehensive
Design

Sustainable Emerging Cities Platform by IDB

Environmental Sustainability/Climate Change

- Control Air/Water Pollution
- Reduce, Reuse, and Recycle
- Increase Energy Efficiency
- Prevent/Respond to Disasters

Comprehensive And Sustainable Urban Development

- Reduce Traffic
- Improve Public Safety
- Promote Competitiveness/ Economic Development
- Improve Connectivity

Fiscal Sustainability And Governance

- Modernize Fiscal and Financial Management
- Organize Public Utilities and Services
- Incentivize Management by Results
- Promote Participation

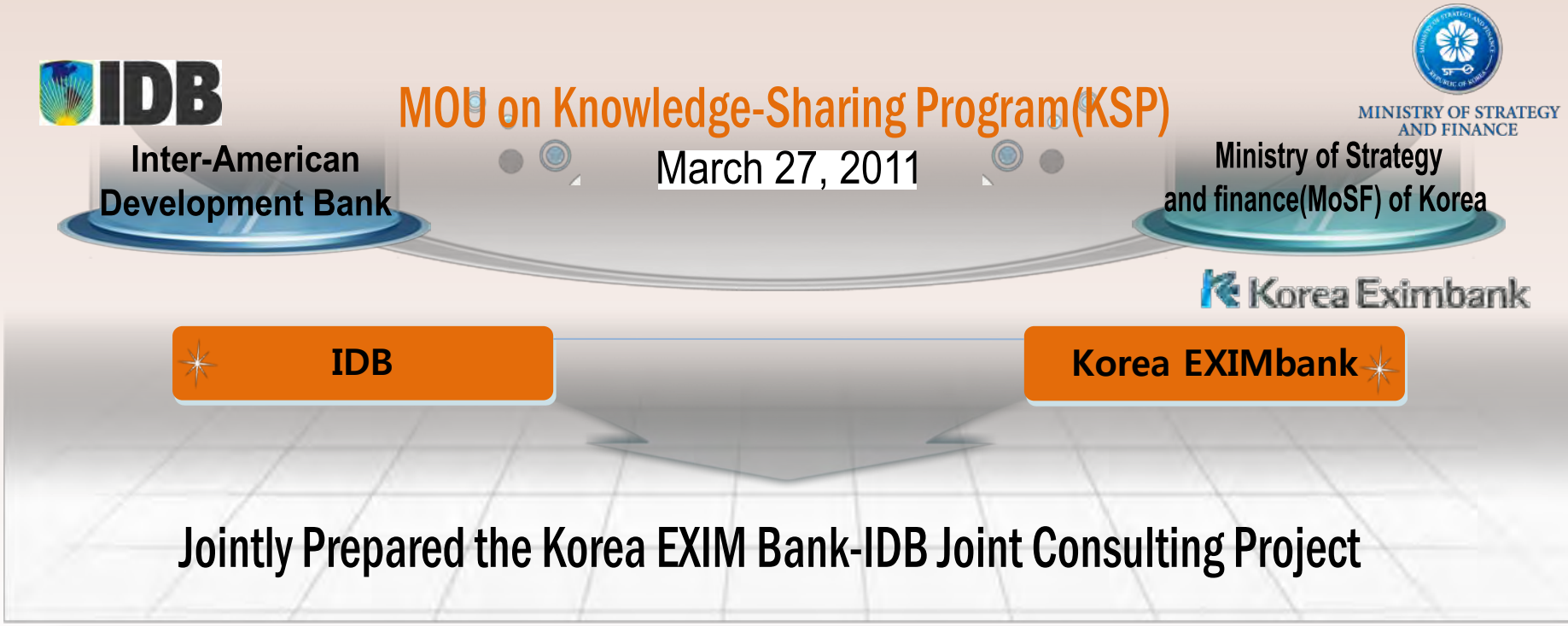
Integrated Operation and Control Center

Knowledge Sharing Program by MoSF of Korea

In 2004, the Ministry of Strategy and Finance of Korea launched the Knowledge Sharing Program (KSP), a demand-driven bilateral policy consultation program to share Korea's development experience with developing countries. From 2004 to 2011, KSP provided tailored solutions to 34 developing countries for over 300 projects.

- Launched in 2011
- Supports TA/TC projects of MDBs
- Formed a partnership with five major MDBs

MoU on Knowledge Sharing Program(KSP)



- The MoSF agreed to support the 2013 KSP consultancy for Montego Bay, Jamaica with detailed Technical Project Design and Implementation Plan for the IOCC

Objectives

Comprehensive design for Montego Bay IOCC

- Support the Montego Bay municipality to make more informed planning decision and take immediate actions towards smart and sustainable urban development
- Impart IOCC solution to relieve Traffic Congestion, curb incident of Crime and Natural Disaster

IOCC

- Traffic Improvement
- Crime Prevention
- Disaster Prevention

Project Flow Chart

On-site Meetings and Site Survey

Jamaica Constabulary Force

Meeting at SJPC

National Works Agency

Meeting with Minister Noel Arscott

Training Course

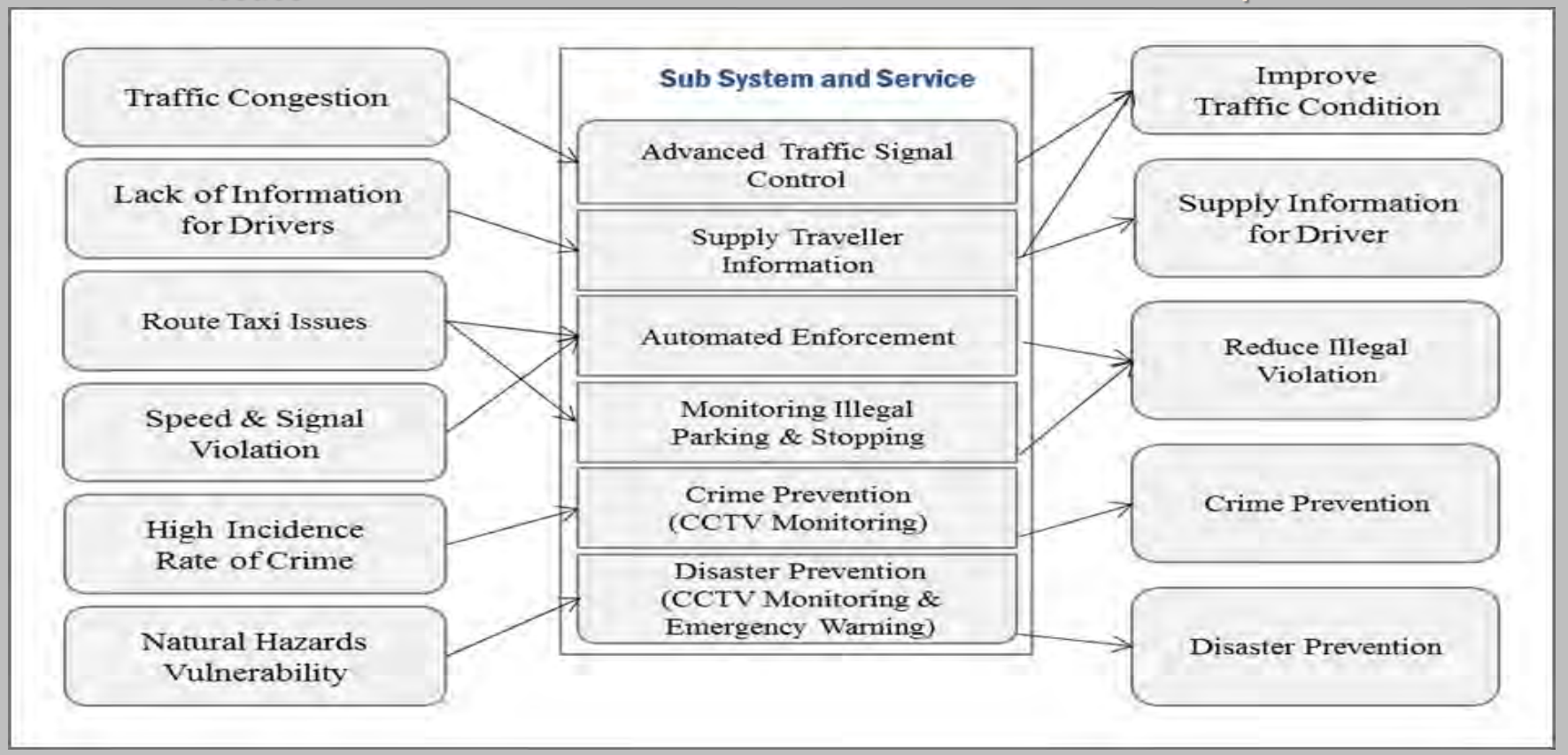
Songdo IOCC

KBS Disaster Broadcasting Center

Anyang City Hall U-Center

Korea Internet Security Agency

Expected Results



1

Introduction of Project

2

What is Smart City

3

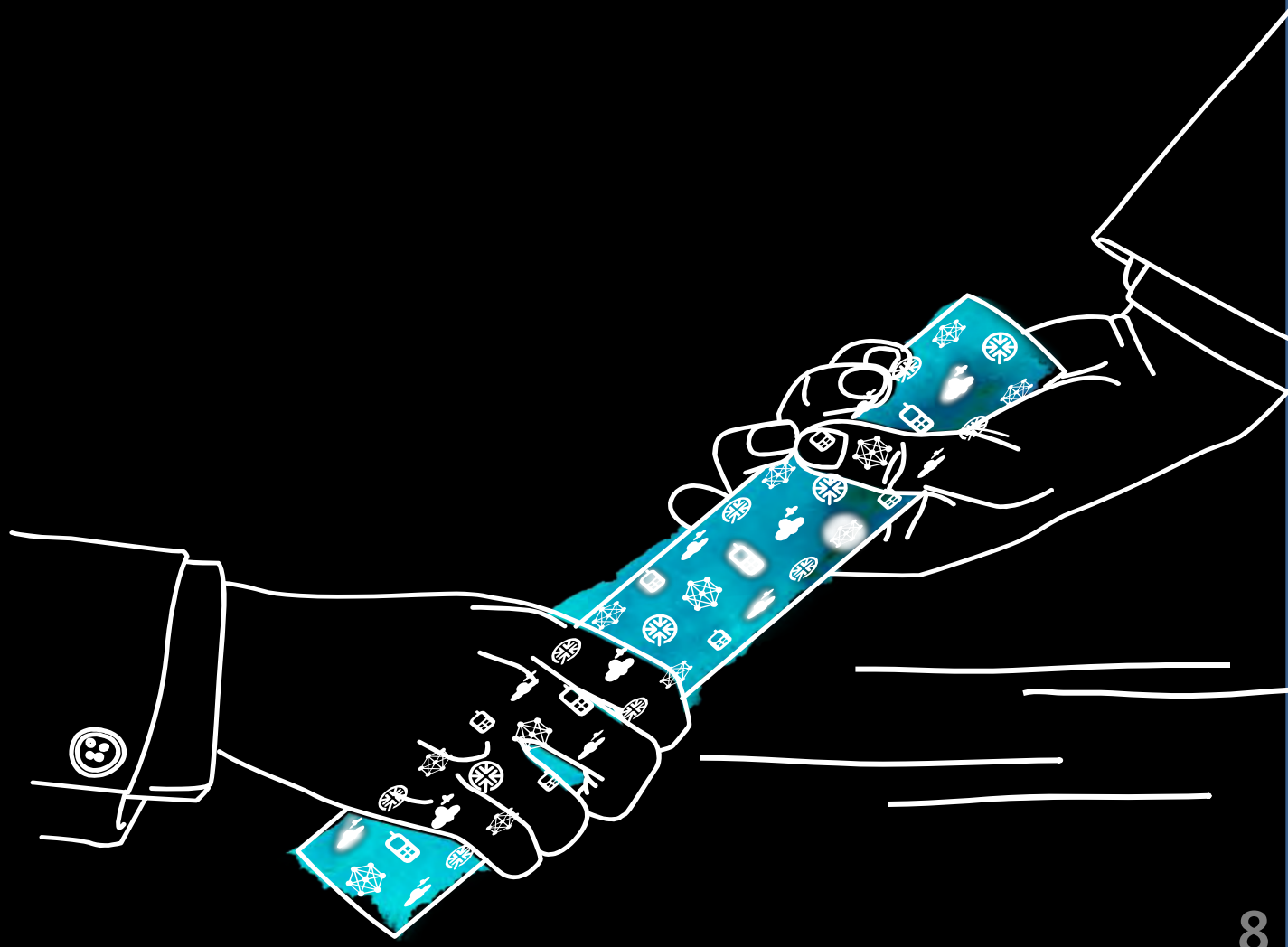
Status of the Montego Bay City

4

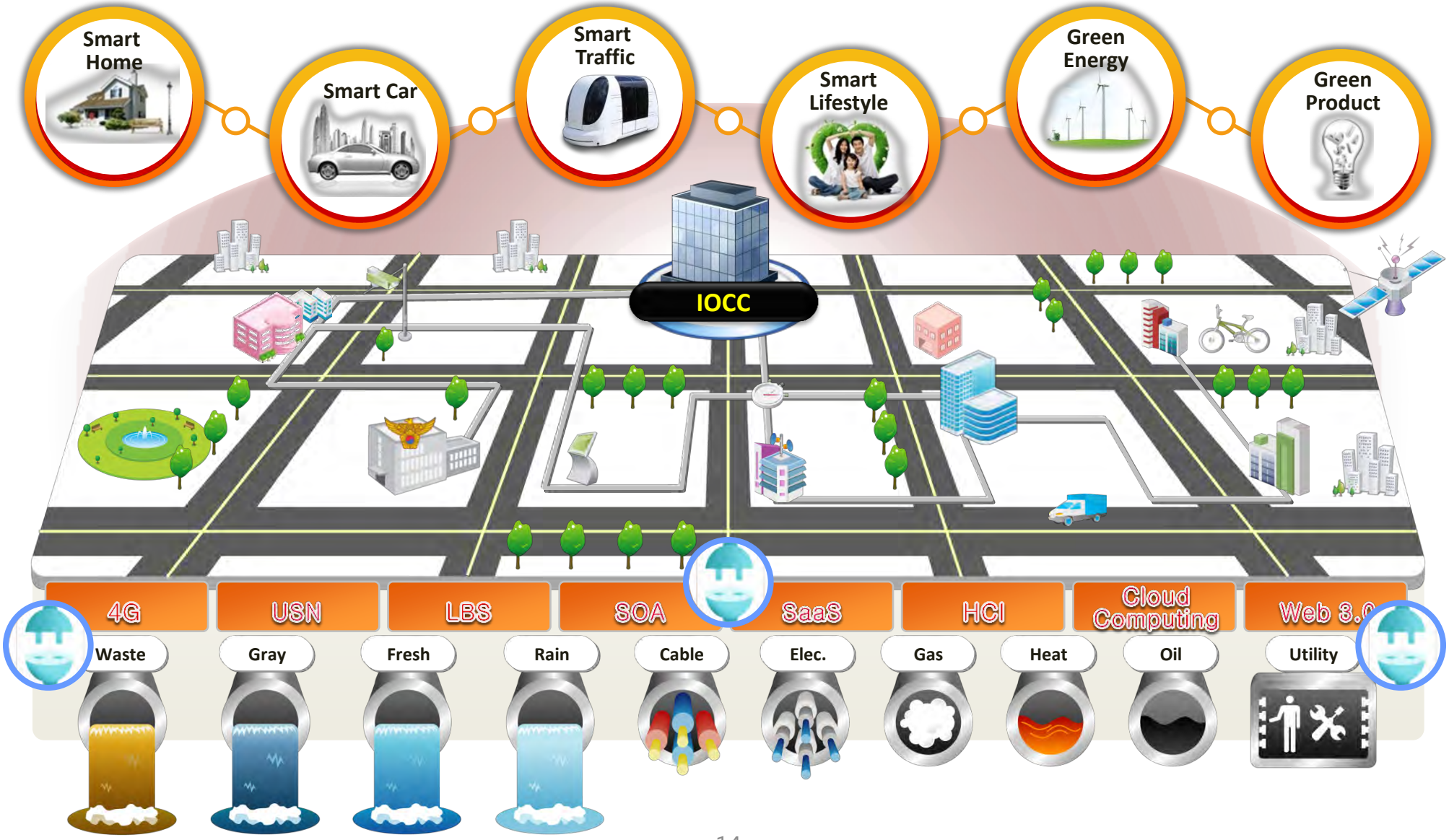
Comprehensive Design and Implementation Plan

TOWARD SMART CITY

Smart City contains information and communication technology in every city element that enables citizens to access and utilize them at anytime, anywhere and from any devices.



Smart City Components

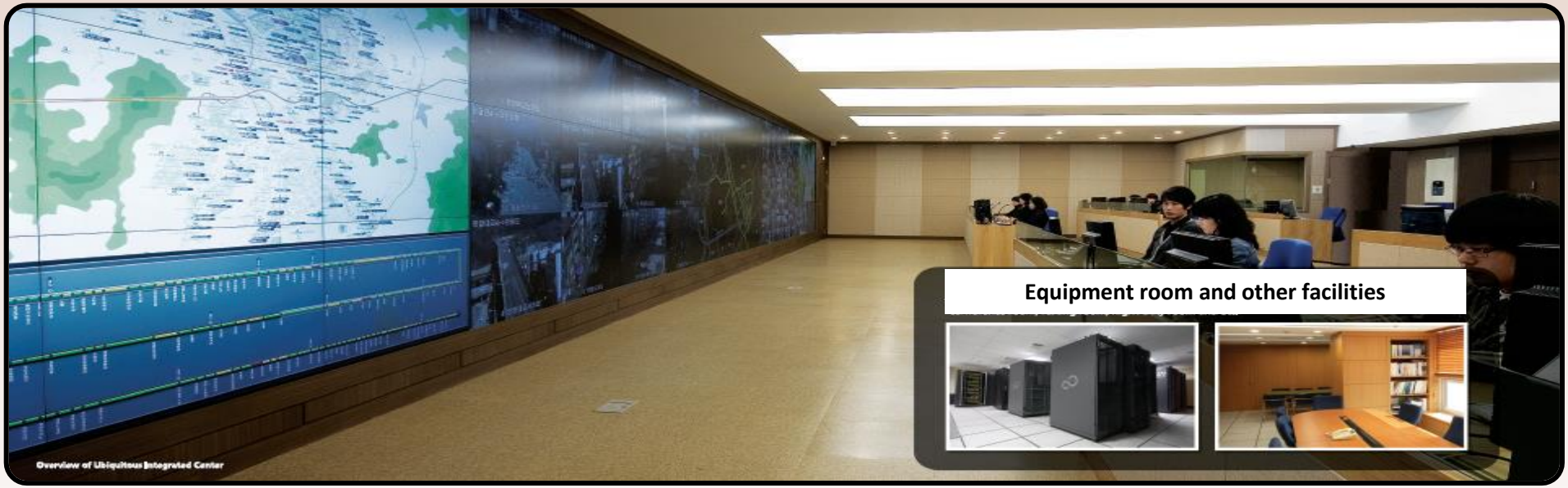


How ICT can impact on Smart City Development

ICT

Function	Target	Effect
24-hour Monitoring	Environment : Air, Energy, Water, Disaster …	Increasing : Efficiency, Productivity, Transparency, Competitiveness, Monitoring, Land Management
Sharing Real-Time Information with Citizen & other agencies	City : Transportation, Security, Waste …	Decreasing : Crime, Pollution, Accident, Vulnerability
Analysis Based upon Real-time Field Data	Governance : Tax, Procurement, Custom ..	
Ubiquitous Controlling		
Prompt Feedback and Improvement		

Integrated Monitoring System - Anyang City in Korea.



The situation room is equipped with 45 units of 50-inch situation board

Response to any situation

1

Introduction
of Project

2

What is
Smart City

3

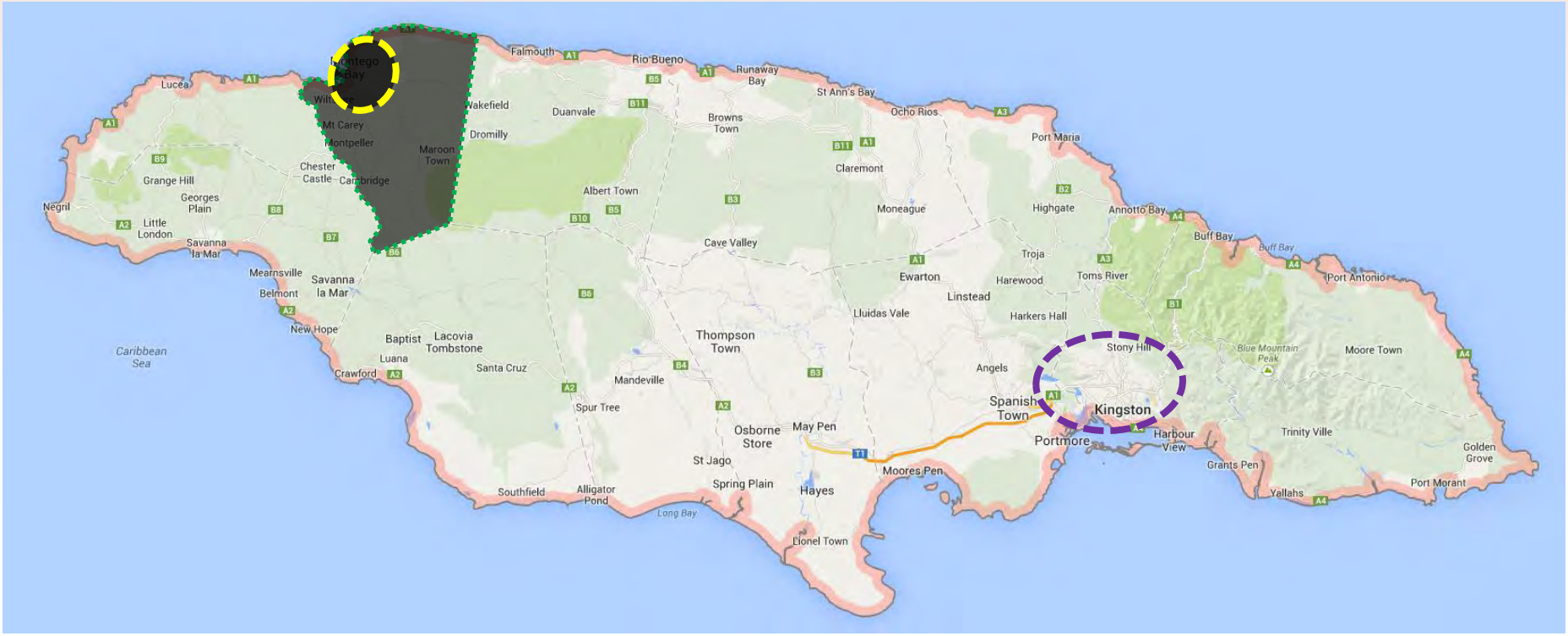
Status of the Montego Bay City

4

Comprehensive
Design and
Implementation
Plan

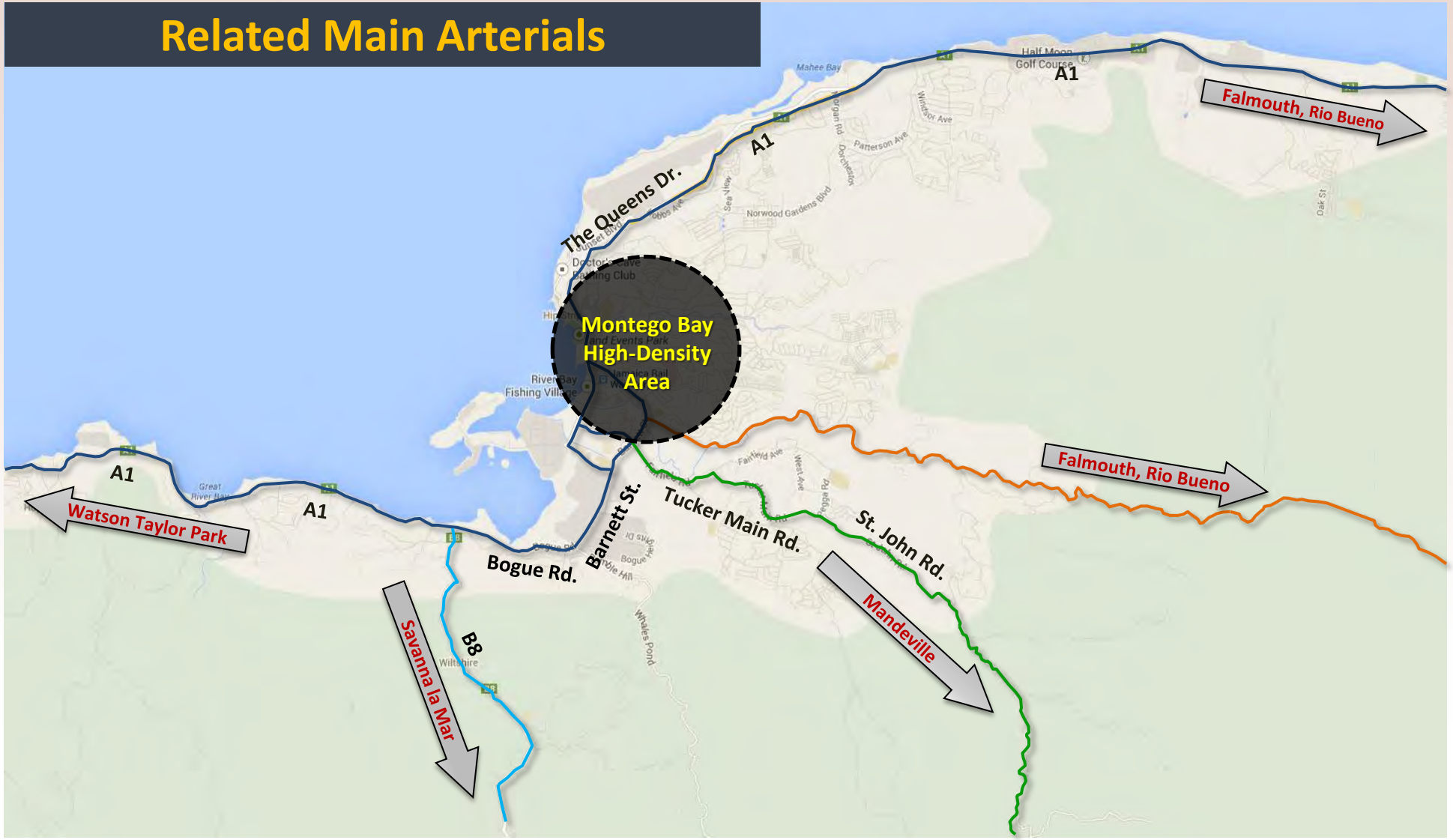
City Status

	Area	Population
Jamaica	10,991km^2	2,890,000
Kingston	480km^2	579,100
St. James Parish	595km^2	200,000
Montego Bay	56km^2	110,000



Road Status

Related Main Arterials



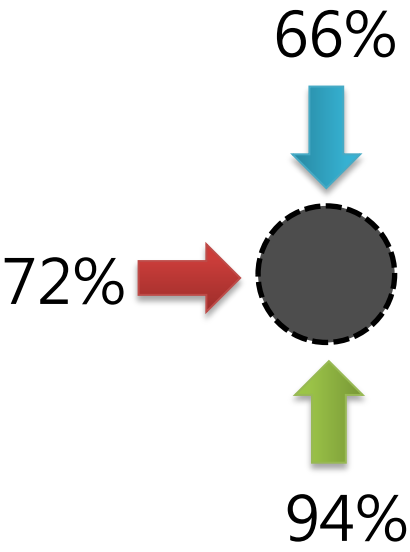
Road Status

Downtown

One-Way in operation

- St James St, Union St, Creek St, Church St, etc

Concentrated Traffic



- Significant portion of traffic from Bogue Rd and Rose hall is destined for the Downtown Montego Bay

Montego Bay Redevelopment Challenges

Montego Bay's Redevelopment Challenges *

ISSUES

- **Traffic Congestion**
- **Transportation** crisis
- **Crime**
- **Flood, Landslide, Hurricane**
- Inadequate **Parking**
- **Illegal Vending** in non-designated area
- **Drainage** – Blocked and unable to carry required capacity
- **Lack of green & recreational spaces**
- **Negative Image**
- **Squatter settlements**
- **Roads & sidewalks** in poor conditions
- **Unsightly** small business **commercial** areas
- **Garbage Disposal**
- Shortage of **eating & seating** areas
- **Poor architecture**
- **Declining interest** in Downtown

Resulting In

Alternate commercial developments on the outskirts of downtown

*** Source: Montego Bay Redevelopment Plan**

Attempt to Solve about...

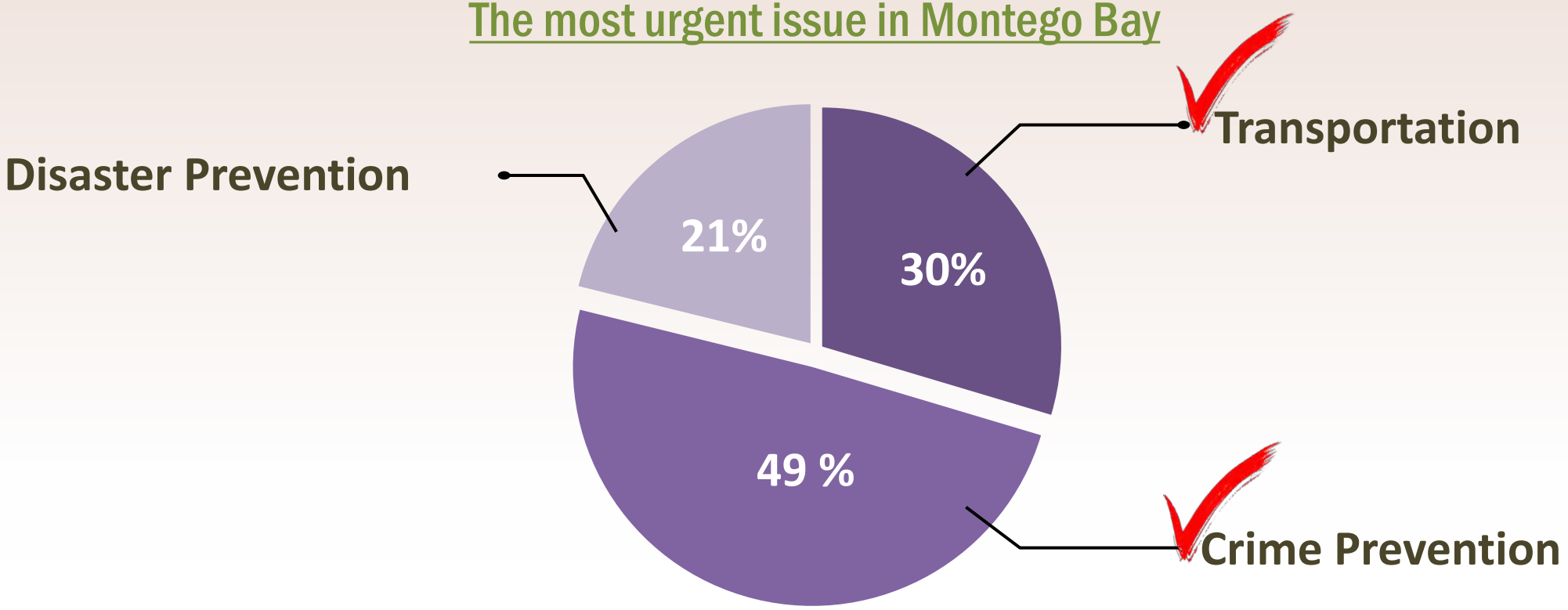
- Traffic
- Crime
- Disaster
- City Environment
- Economy

Current Issues of Montego Bay: Needs Survey Result

- To comprehend the basic demand and preference for IOCC

Overall Evaluation

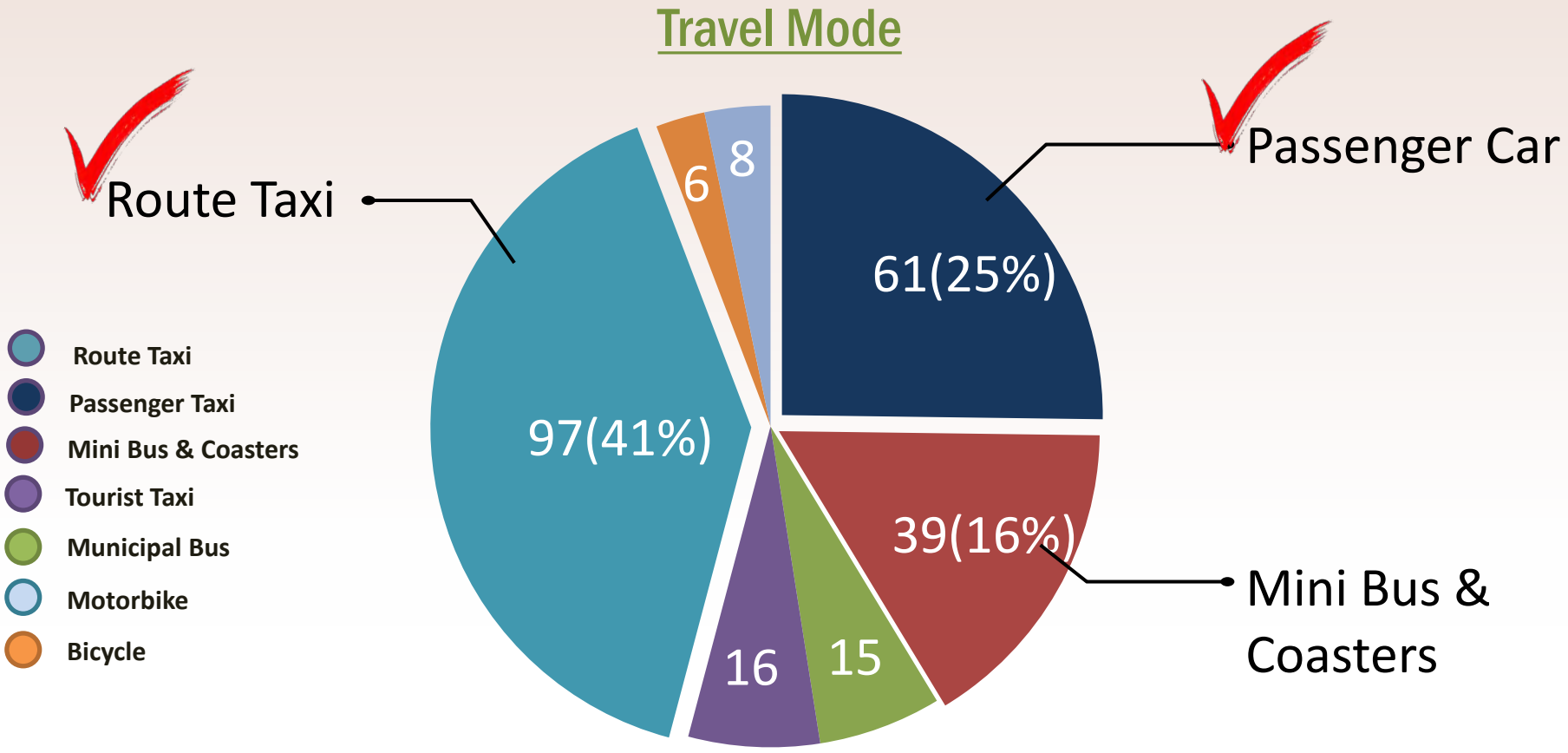
The most urgent issue in Montego Bay



Current Issues of Montego Bay: Needs Survey Result

- To comprehend the basic demand and preference for IOCC

Transportation

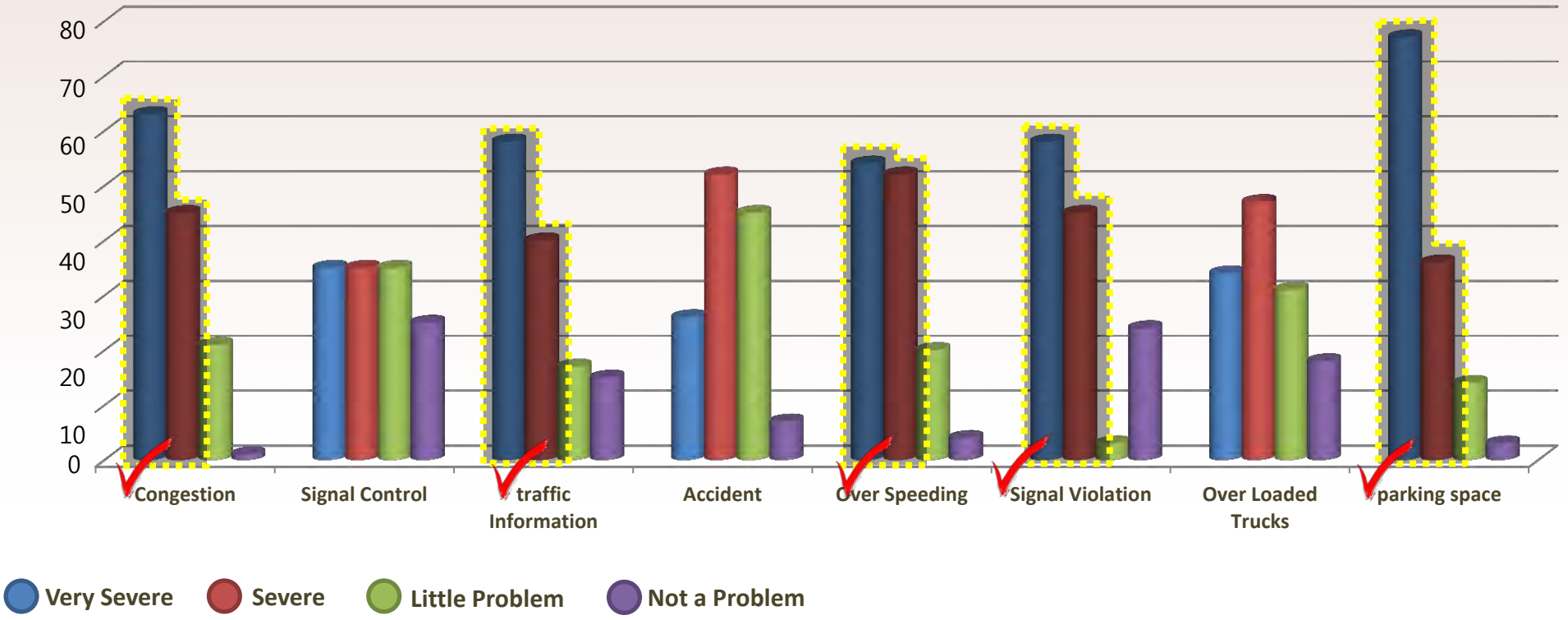


Current Issues of Montego Bay: Needs Survey Result

- **To comprehend the basic demand and preference for IOCC**

Transportation

General Transportation Problems

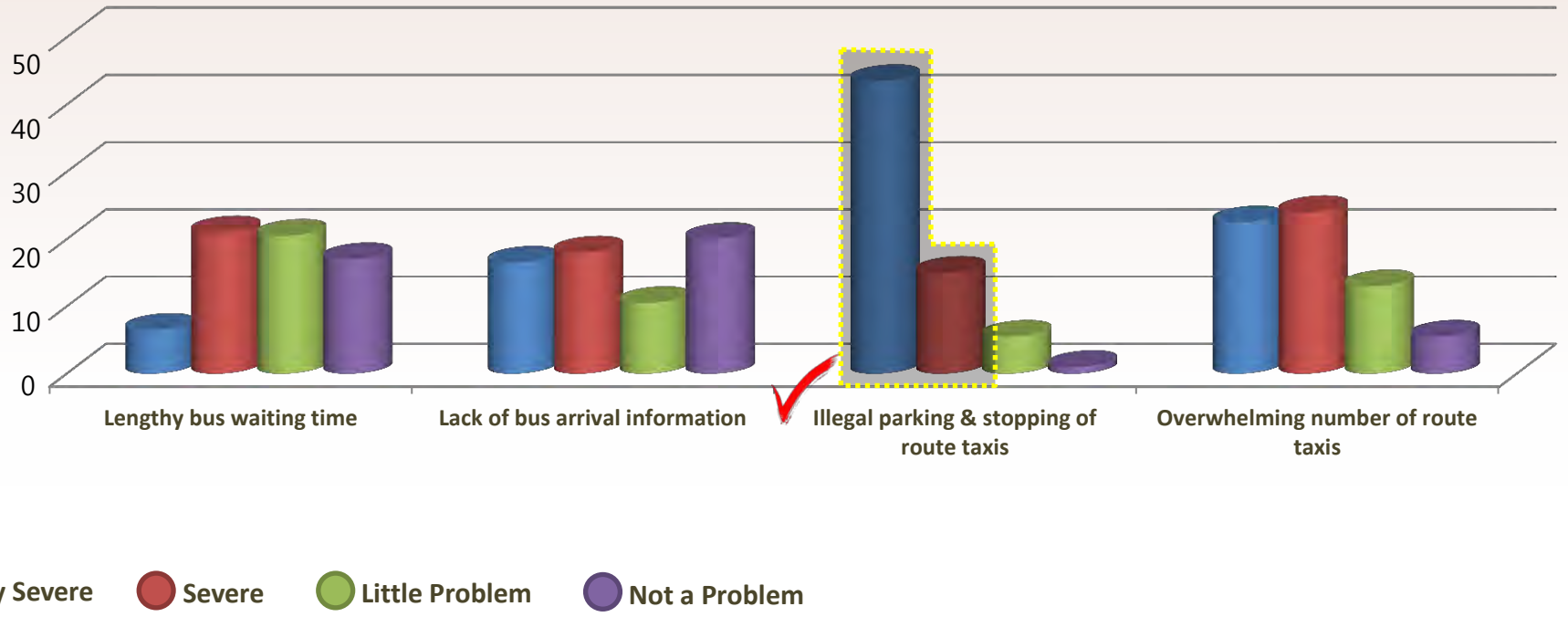


Current Issues of Montego Bay: Needs Survey Result

- **To comprehend the basic demand and preference for IOCC**

Transportation

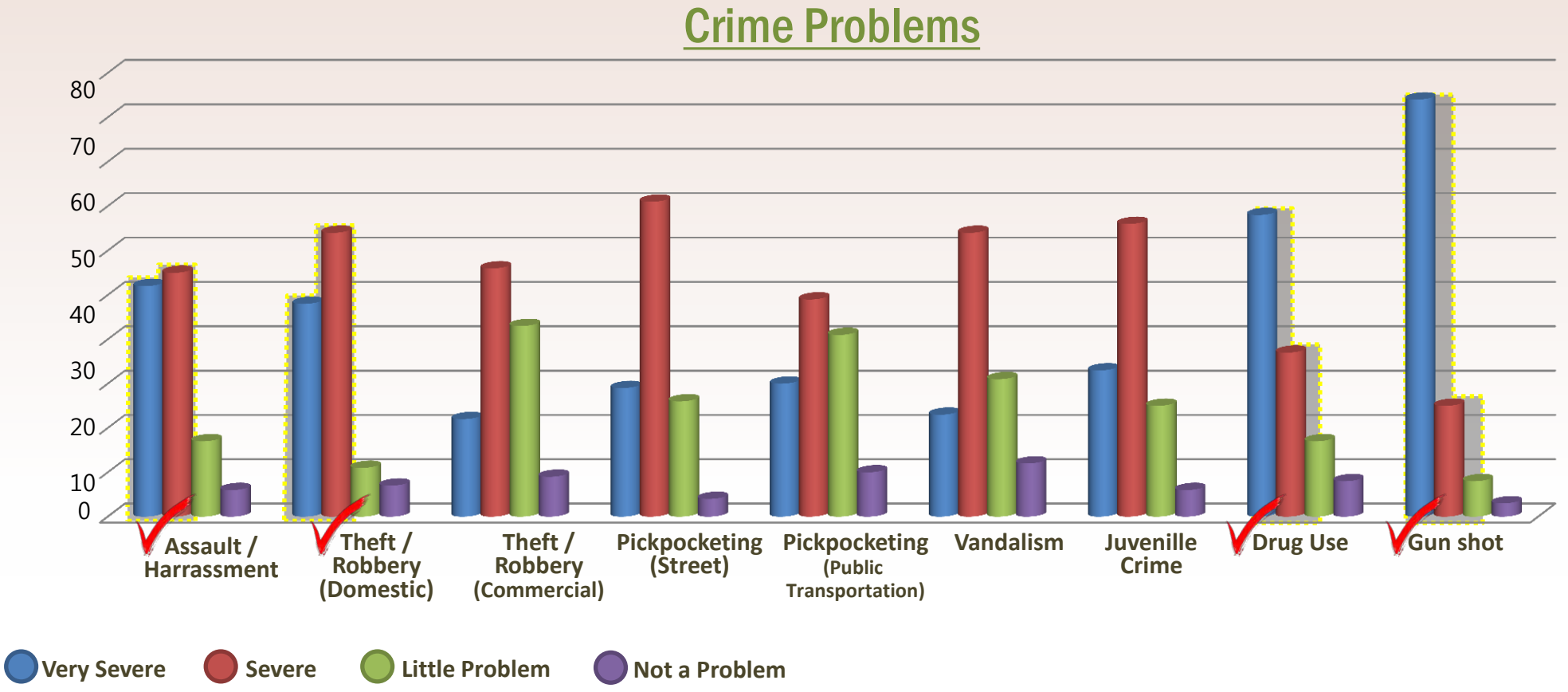
Public Transportation Problems



Current Issues of Montego Bay: Needs Survey Result

- **To comprehend the basic demand and preference for IOCC**

Crime

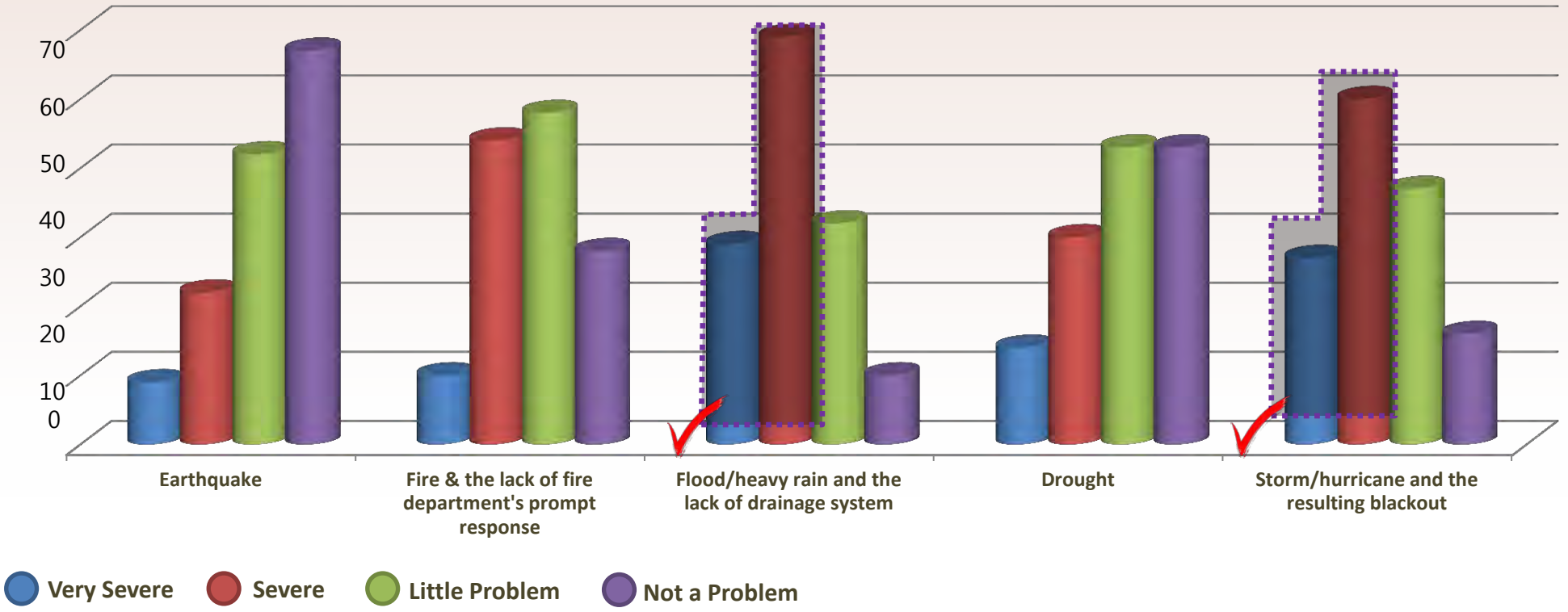


Current Issues of Montego Bay: Needs Survey Result

- **To comprehend the basic demand and preference for IOCC**

Disaster

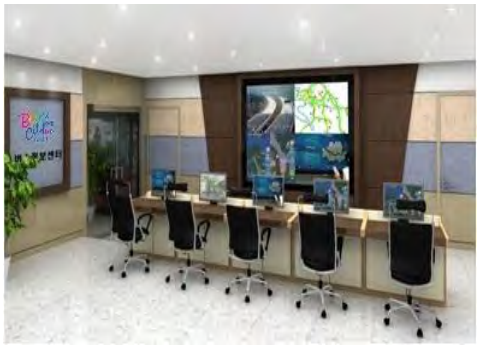
Disaster Issues



Selection of Sub System

- Traffic Signal Control System
- Traveler Information System
- Traffic Violation Enforcement System
- Route Taxi & Metro Bus Management System

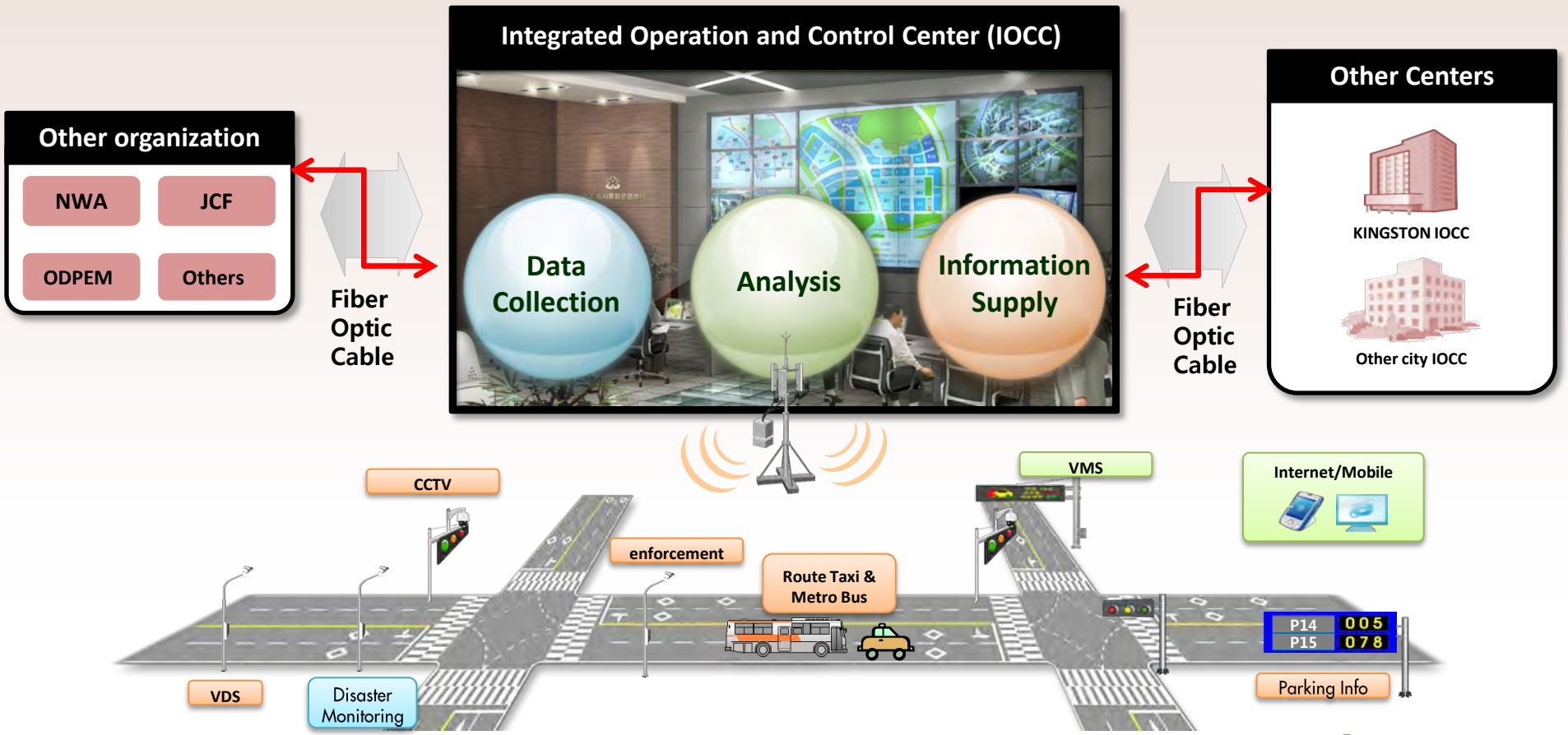
IOCC



- Crime Prevention System
- Disaster Prevention System
- Parking Information System

Modeling of IOCC Subsystems

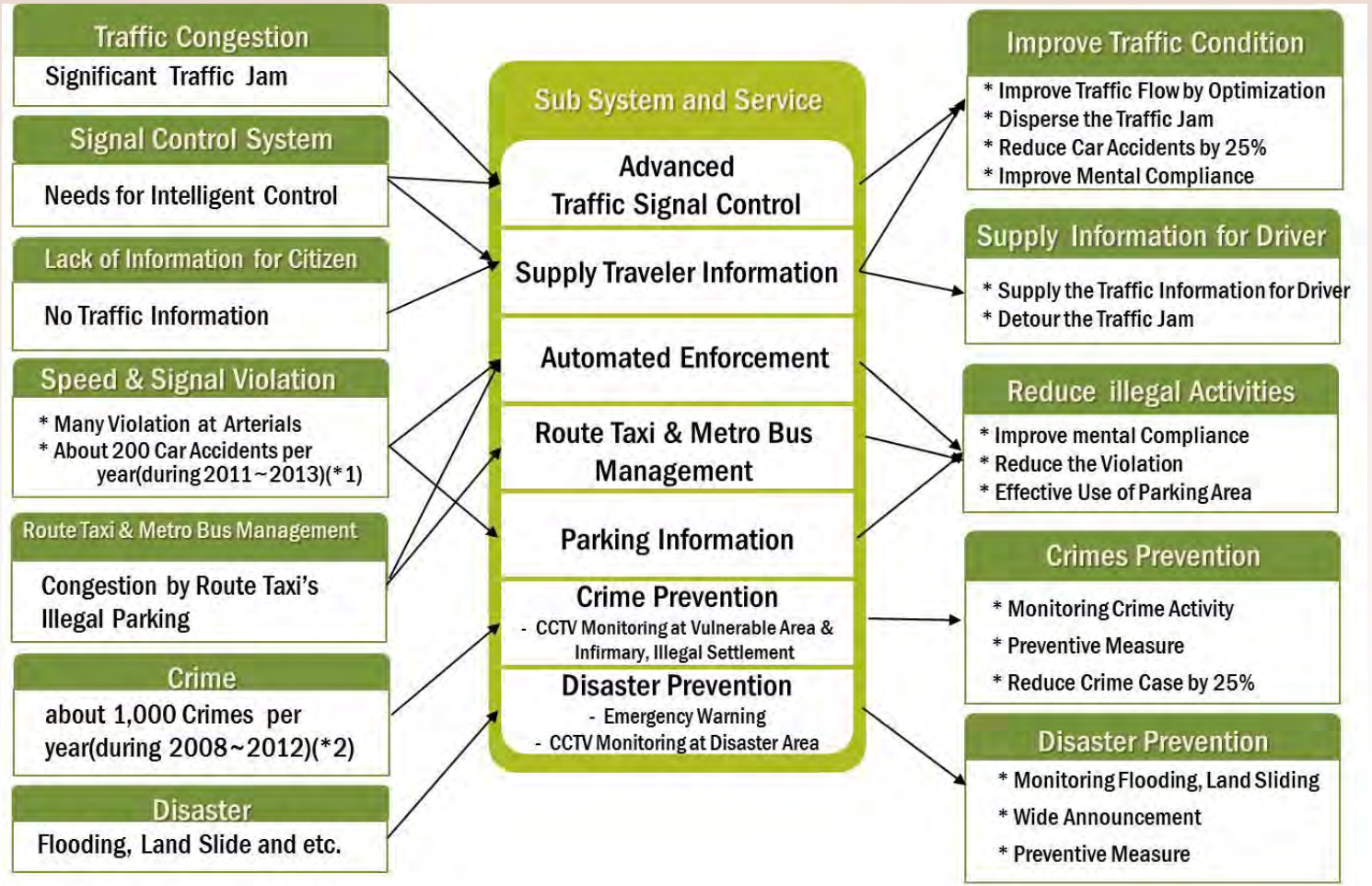
1. Advanced Traffic Signal Control
2. Advanced Traveller Information
3. Automated Enforcement
4. Crime Prevention
5. Disaster Prevention
6. Route Taxi & Metro Bus Management
7. Parking Information System



Fundamental Design Concept

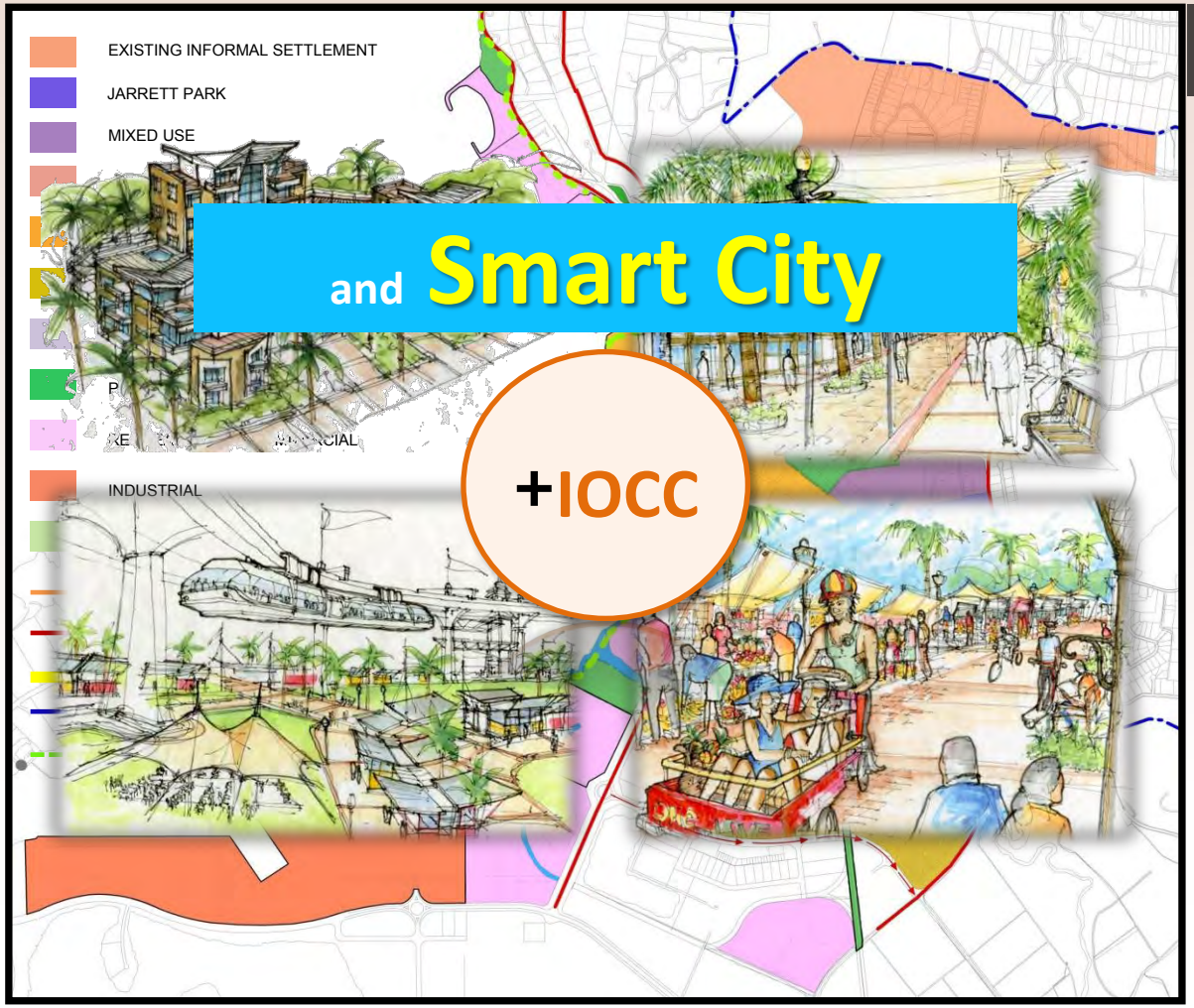
Goal	Core elements	Proposed strategy and planning
System Optimization	**System** System considering the step-by-step scalability	Strategy 1 | IOCC systems optimize the expected effects Take 1. Protective effect against incident, accident, disaster Take 2. Establishment of policy alternatives according to the FEED-BACK
Operator centric	**Operator-centric** Operator-centric system to reflect the requirements	Strategy 2 | Maximize linkage of operating system Strategy to establish Take 1. IOCC for conjunction the design, analysis, and understanding Take 2. Secure infrastructure to build Private Network Infinite
Standard architecture	**organic structure** Physical Integration organic integration	Strategy 3 | Optimal system architecture for improving the configuration Take 1. Measures proposed for Unprecedented control Take 2. Establish a plan for system expansion
Expandable infrastructure	**KNOW-HOW** Minimize the risk by applying a prior business experience	Strategy 4 | Know-how applying equipment qualified Take 1. Take advantage of the prior business experience and business management Take 2. Perform management professional process applies
Risk Analysis		

Expected Results of IOCC Operation



(*1) source: Montego Bay Municipality
(*2) source: JCF, Statistic and Information Management Unit

Downtown & Urban Study Area



* from Montego Bay Redevelopment Plan

Downtown Redevelopment

- Green Space
- Pedestrian Movement
- Transportation
- Multimodal Transportation
- Econimic Apportunities
- Market Revolution

To reposition **Montego Bay** as being the "**Friendly City**"

1

Introduction
of Project

2

What is
Smart City

3

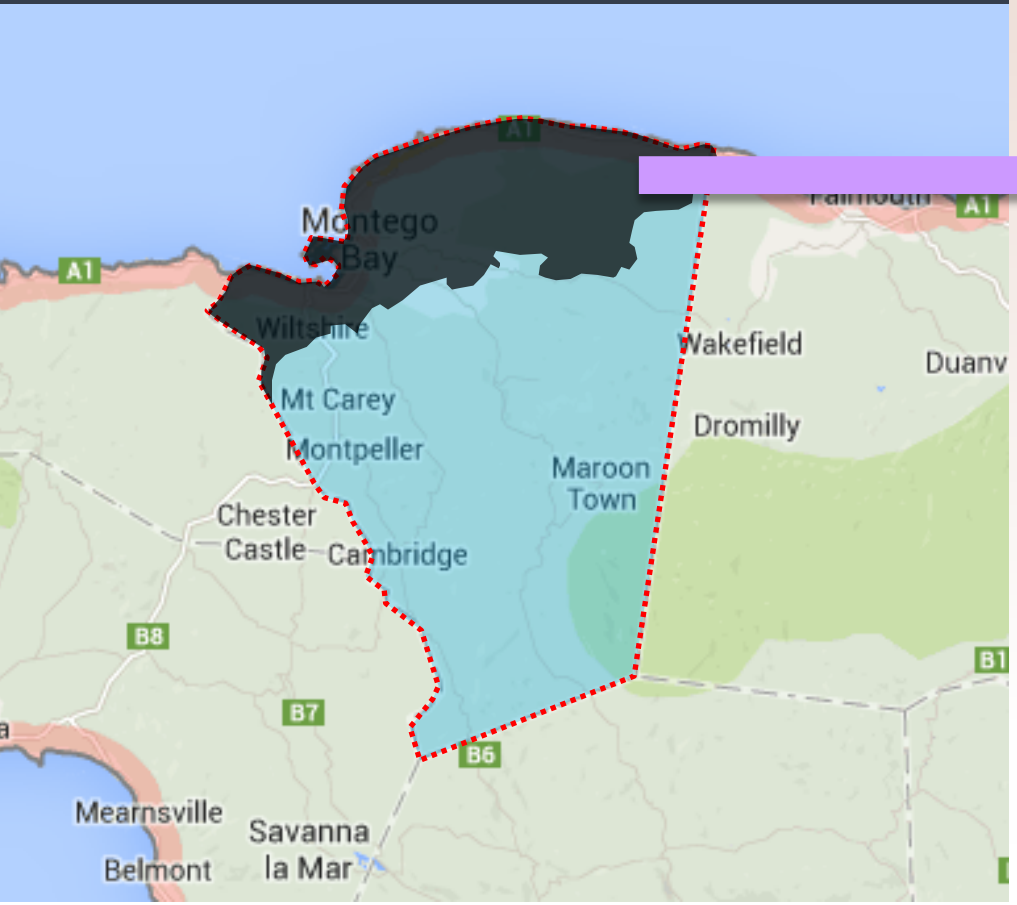
Status of the
Montego Bay
City

4

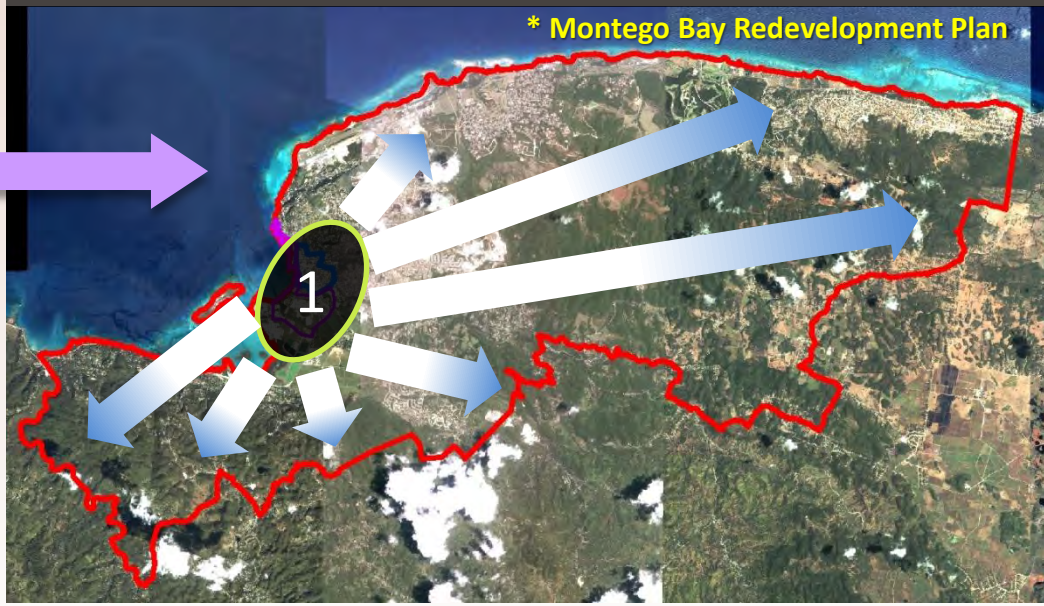
Comprehensive Design and Implementation Plan

Implementation Plan per Phase

ST. James Parish



The Greater Montego Bay



Phase 1 Downtown Area

Phase2 Greater Montego Bay City

Expansion St. James Parish / Other Cities

4.2 Comprehensive Design
Advanced Traffic Signal Control System

Design Directions

- Downtown : Centered group control & Traffic flow coordination optimization
- Major arterial & connecting road : Real-time control with detectors & Traffic coordination optimization

Design Principles

- Selection of signal group in consideration of road level, passage pattern and intersection intervals
- Installation of control system in consideration with geometric & passage characteristics
- Establishment of the signal control strategy for improvements

Installation Plan per Phase

Phase 1

- Introduction of group and independent control on major intersections
- Improvement of roads thru pilot sector selection

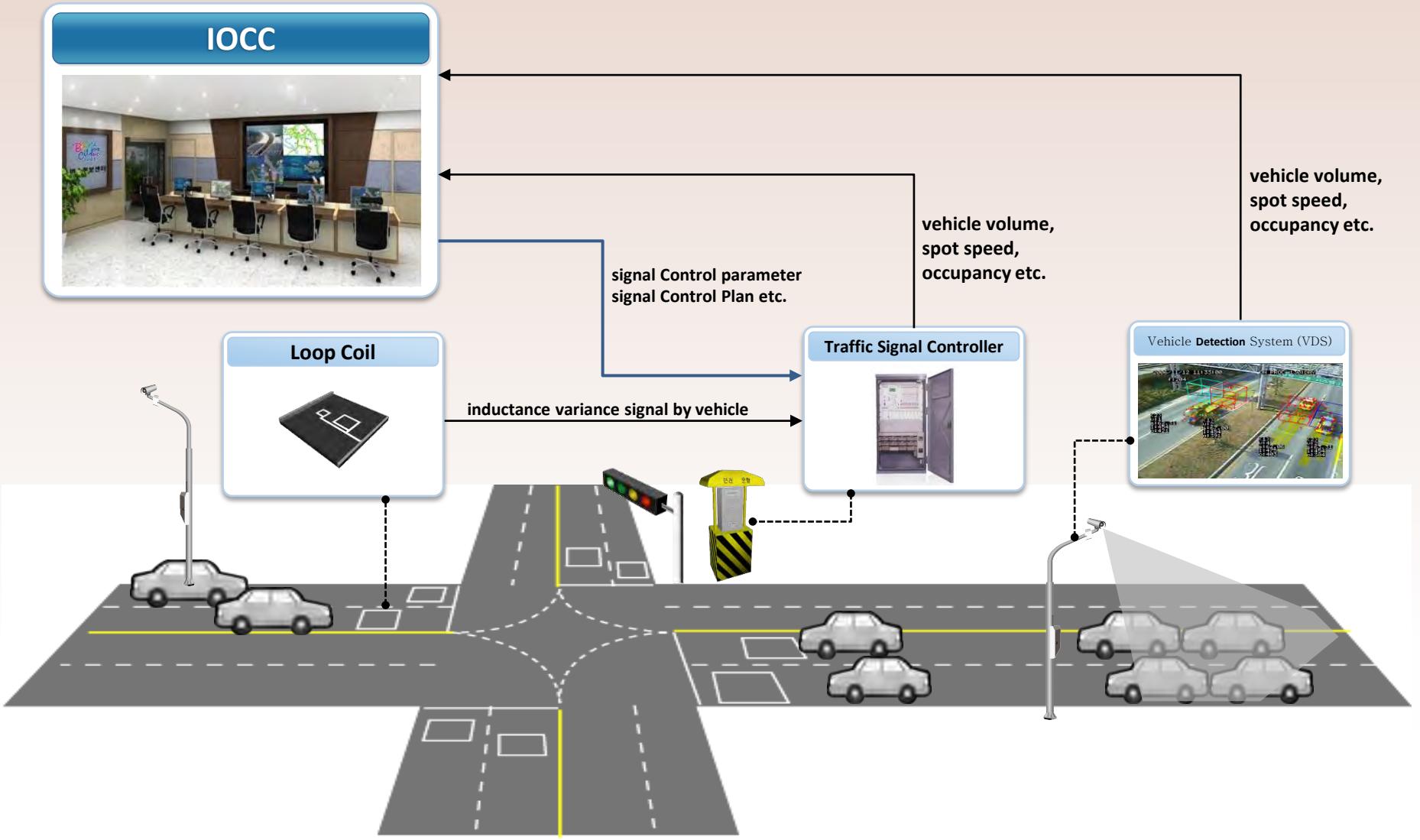
Phase 2

- System expansion on major roads at downtown
- Traffic axis based control with the linkage to Phase 1 system
- Installation for entire city

Expansion

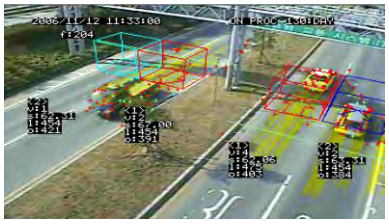
- National Level Standard establish
- Expansion of system to other cities

Traffic Signal Control System



Traffic Signal Control System – Example

Vehicle Detection System (VDS)



IOCC

Data Processing

Traffic Signal Optimization

Data Management

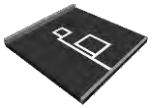
Real-time Based Control

Vehicle Detection Information

Traffic Signal Controller

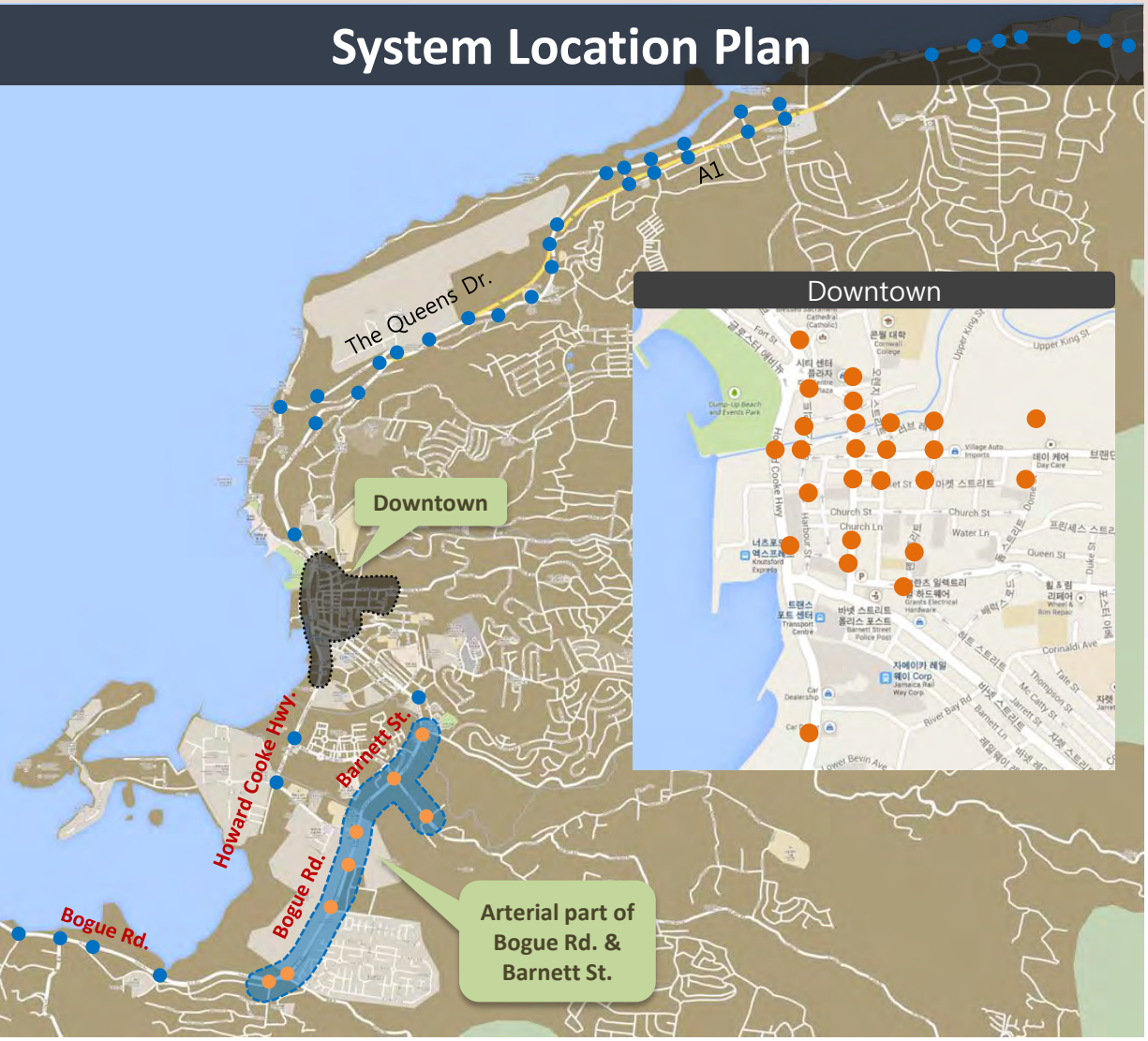
Vehicle Detection Signal

Loop Coil



4.5 Comprehensive Design
Traffic Signal Control System

System Location Plan



Phase 1

33 Systems at One Way Roads

- Recommend the replacement of old systems
- Center monitors the on-line traffic flow
- Down town, **Bogue Rd. & Barnett St.**
- Traffic Flow **Coordination Optimization**

Phase 2

41 Systems at One Way Roads

- **A1, Queens Dr., Howard Cook Hwy., etc.**
- **Actuated Control** by Detectors
- Traffic Flow **Coordination Optimization**
- **System Expansion to other Intersections**

4.6 Comprehensive Design
Advanced Traveler Information System

Design Directions

- Collects & processes traffic information from related bodies, incident management system, signal control system and traffic info system
- A system that provides users by drawing linkage information with other systems with a purpose of traffic control

Design Principles

- Real-time traffic flow control by providing traffic information
- Promotion of safety and efficient road traffic operation
- Enhancement of convenience to citizens and users
- Alternate junctions and points expected of traffic dispersions

Installation Plan per Phase

Phase 1

- AVI, VDS installation for real-time collecting traffic information
- VMS installation on major arterial roads

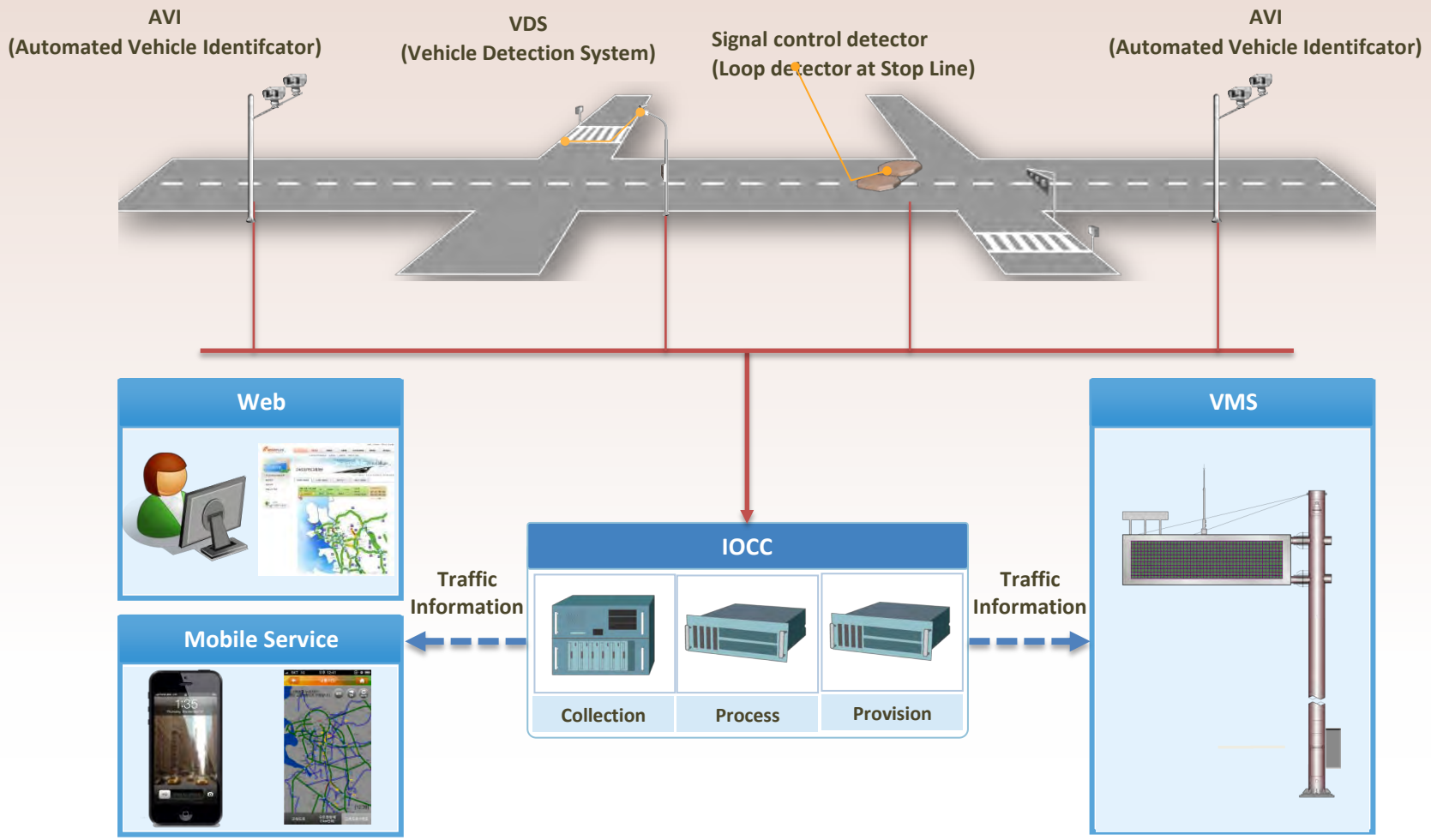
Phase 2

- Expansion to surrounding areas of downtown in a linkage with Ph1

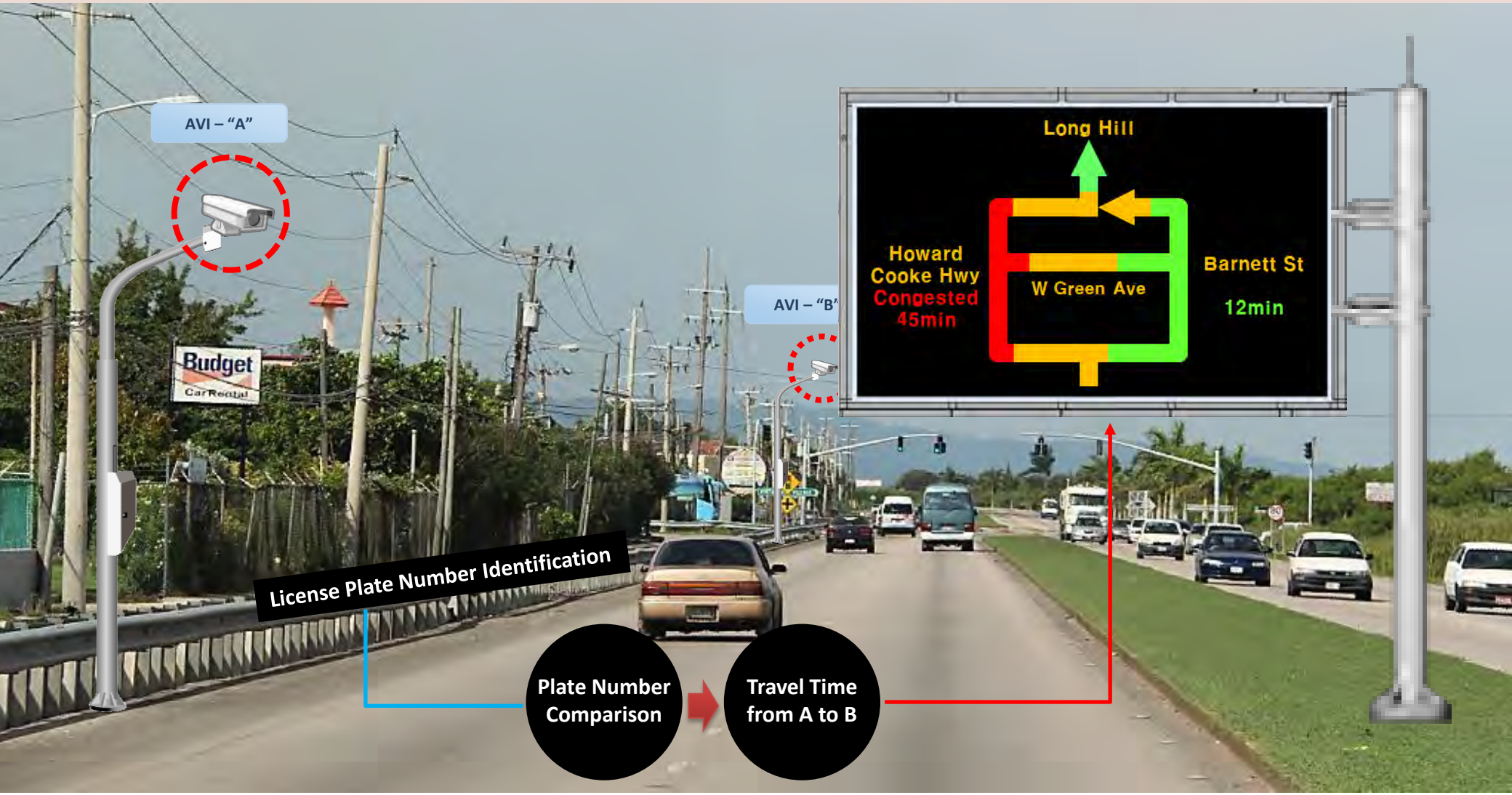
Expansion

- National Level Standard establish
- Expansion of system to other cities

4.7 Comprehensive Design
Advanced Traveler Information System



Advanced Traveler Information System - Example



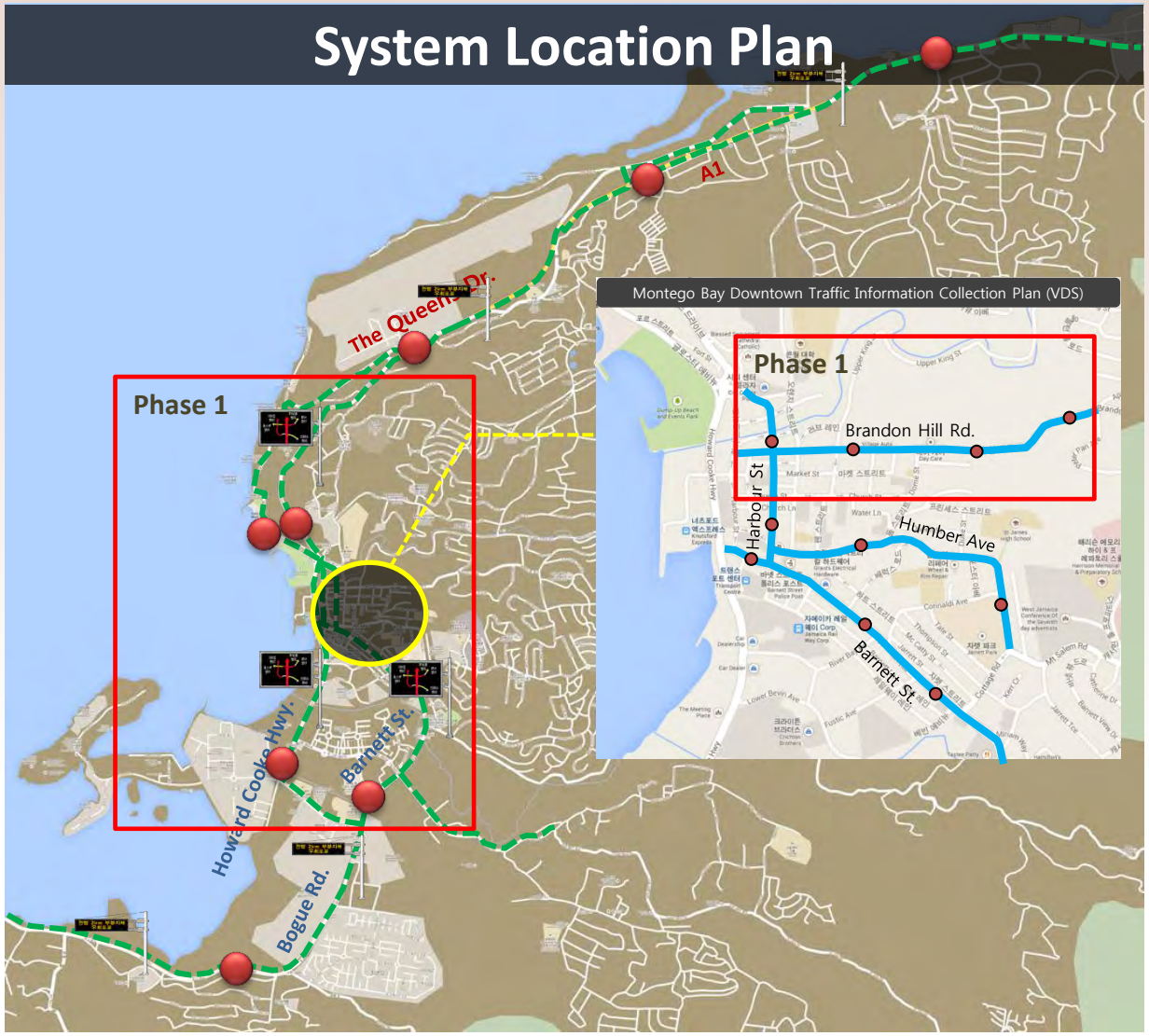
Advanced Traveler System

Top 10 Locations for VMS

1. Rose Hall / Greenwood Ave intersection
2. Rose Hall / Lilliput intersection
3. Barret Town / Rose Hall intersection
4. Queens Dr / Airport – Bus stop
5. City Centre / St James Street
6. Sam sharpe Square
7. Transportation Centre
8. St Clavers Ave Satellite Transportation Centre
9. Fustic Rd and Barnett Street intersection
10. Howard Cooke / West Green Ave Intersection
11. Bogue Road / Ramble Hill intersection

4.10 Comprehensive Design
Advanced Traveler System

System Location Plan



Supply Information for Traffic Monitoring and Disaster Prevention

Phase 1

Traffic Information Collection

- 4 sets of AVI (Automated Vehicle Identification)
- 4 sets of VDS (Vehicle Detection System)
- Center monitors the on-line traffic flow

Traffic Information Provision

- 3 sets of Graphic VMS
- Internet & Mobile

Phase 2

- 4 sets of AVI (Automated Vehicle Identification
- 6 sets of VDS (Vehicle Detection System)
- 4 sets of Text VMS (Variable Message Sign)
- More VMS & Information Service

4.11 Comprehensive Design
Automated Traffic Enforcement System

Design Directions	• Automatic enforcement for the vehicles which violate the signal, speed, parking regulation • After capturing the vehicle's license plate, sends/processes/analyzes in the center and then, issues tickets
Design Principles	• Secures road safety by reducing accident risks by enforcing vehicles • Guidance of safe speed and signal observation to the vehicles • Maximization of effects on enforcement and reduction of operation costs through automatic enforcement

Installation Plan per Phase

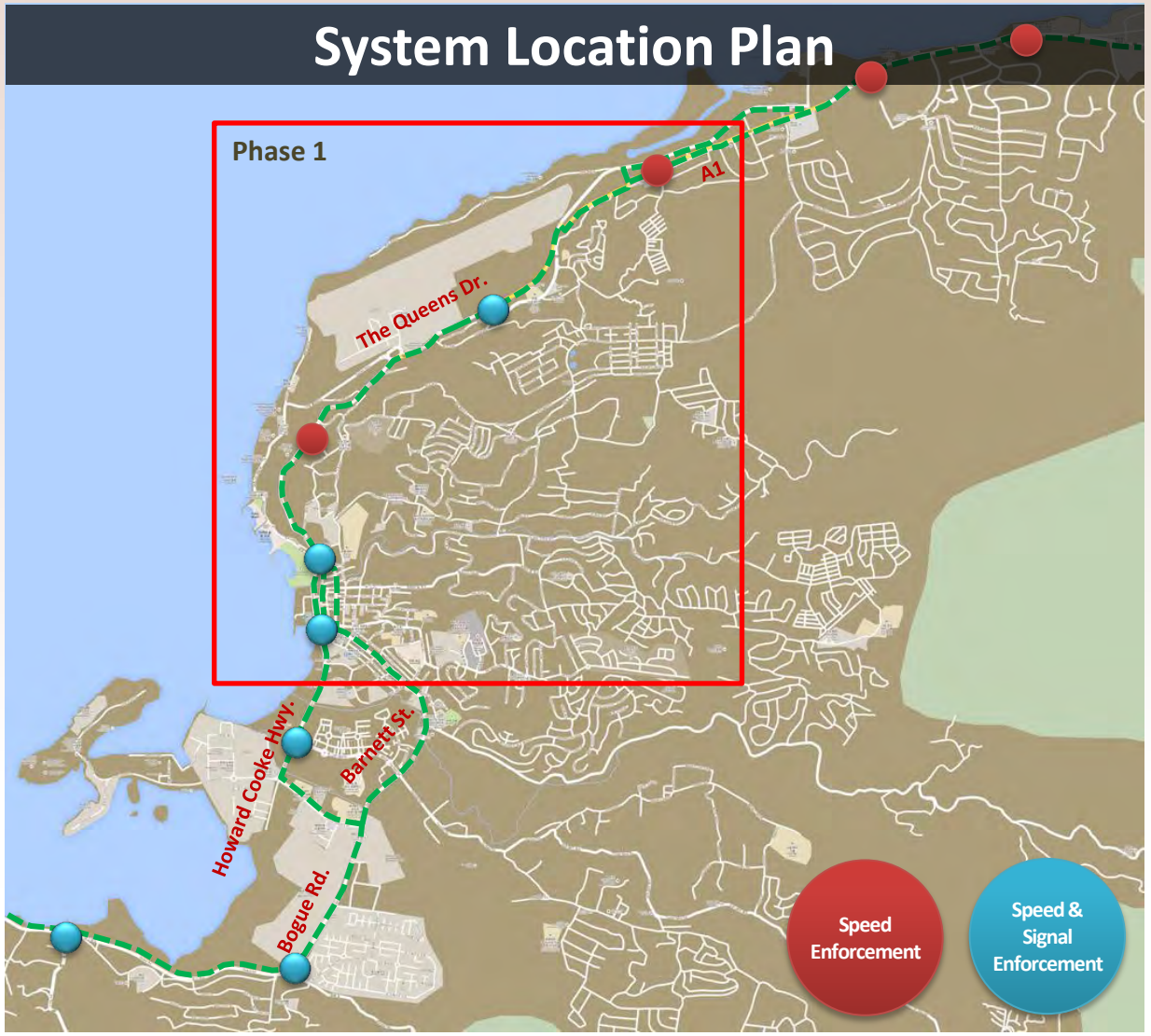
Phase 1
- Priority installation on frequently violation occurring areas
- Installations other than the existing installation points

Phase 2
- Congested intersections & other areas in need after Phase 1

Expansion
- Points needed for the enforcement to the entire city in linkage with Phase 2

Automated Enforcement System

System Location Plan



Enforcement Camera Only

Phase 1

Speed Violation Enforcement

- 2 sets

Speed & Signal Violation Enforcement

- 3 sets
- Main Arterials of Montego Bay

Speed Violation Enforcement

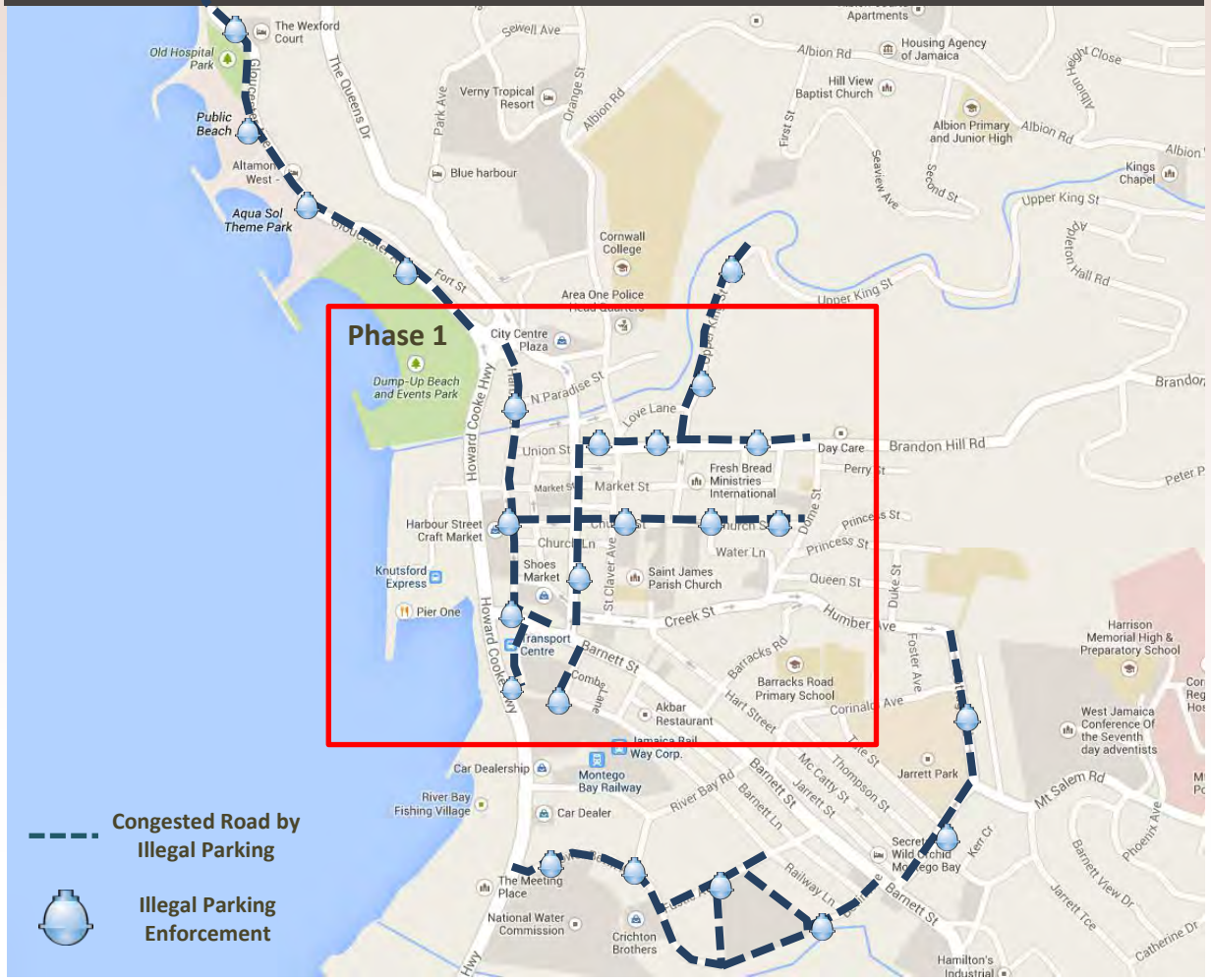
- 2 sets

Speed & Signal Violation Enforcement

- 3 sets
- Arterials of Intersections that has frequently happens accidents or violation activities

Automated Traffic Enforcement System

System Location Plan



Multi-purpose for Enforcement, Traffic monitoring and Crime Prevention Camera

Phase 1

Illegal Parking Enforcement

- 13 sets
- Downtown of Montego Bay City

Phase 2

Illegal Parking Enforcement

- 11 sets
- Other roads or Intersections that has frequently happens parking violation activities

4.14 Comprehensive Design
Crime Prevention System

Design Principles

- Installation of integrated control and crime surveillance system
- When a crime breaks out, CCTV camera controls the site and flexibly responds to accidents/incidents
- When an accident breaks out, possible to judge and respond rapidly with a small number of police forces

Design Directions

- CCTV is installed for multi-purpose for the crime prevention and for the traffic monitoring.
- The pole type system is installed with IP CCTV camera capable of 360° rotation
- Harmonization with surrounding environments

Installation Plan per Phase

Phase 1

- Reflects downtown & major arterial roads as priority
- Reflects vulnerable areas such as illegal settlement & infirmary facilities

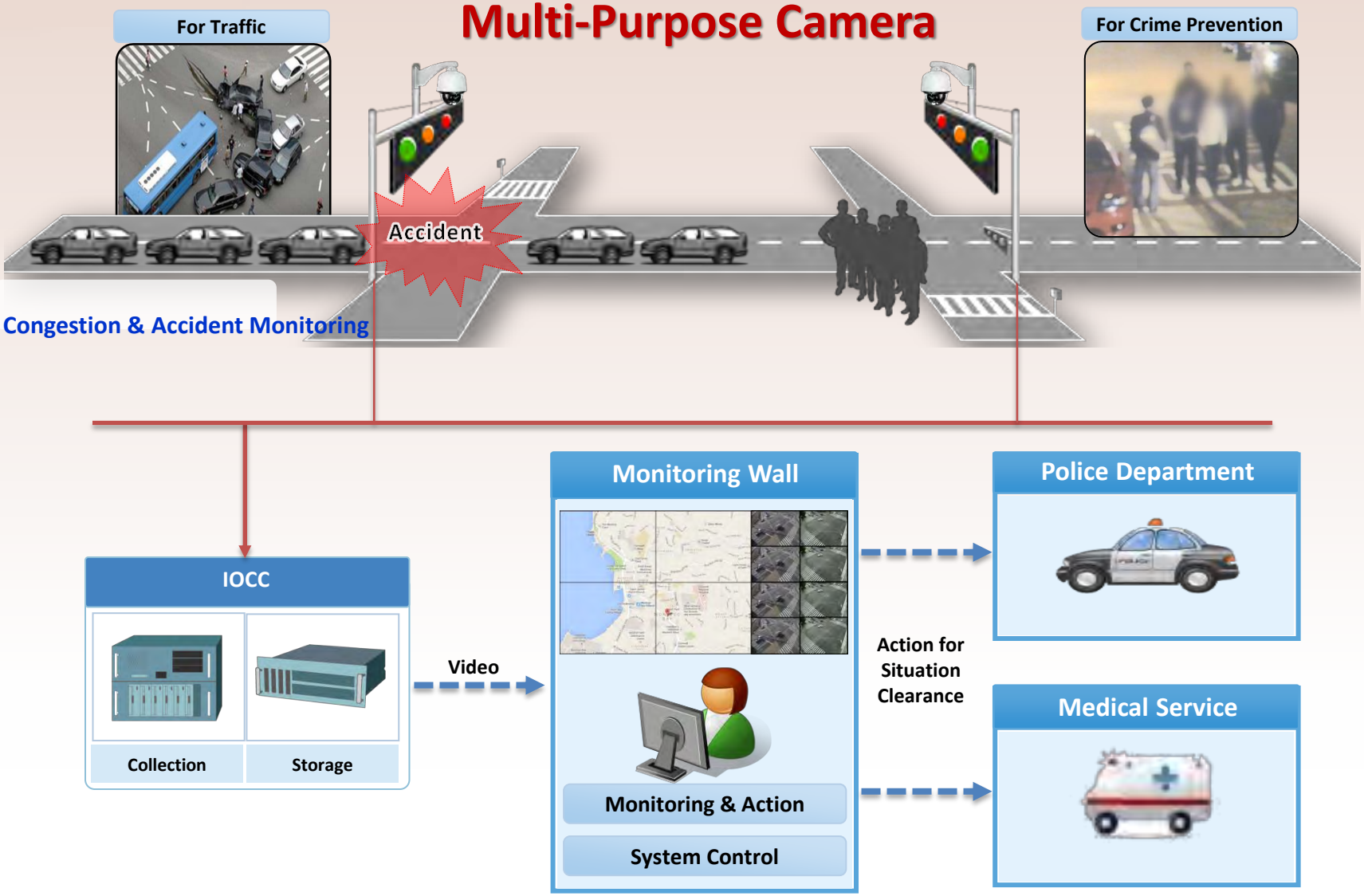
Phase 2

- Expansions to the points such as accident prone areas/intersections
- Additional expansion on area that crimes are frequently happen

Expansion

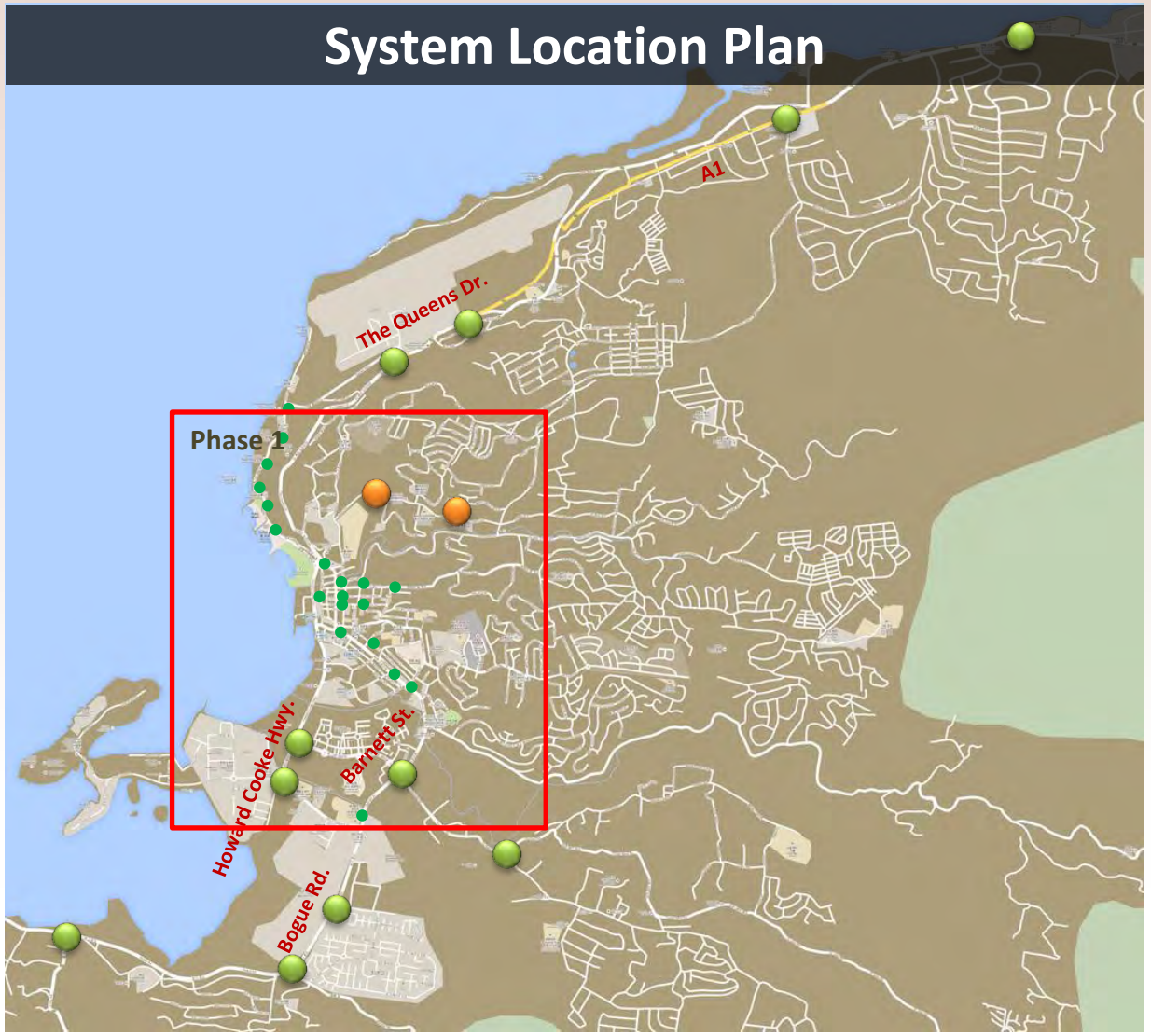
- Installed at major management points of the city outskirts & crime prone areas

Crime Prevention System



Crime Prevention System

System Location Plan



Multi-Purpose for Crime and Traffic Monitoring Camera

Phase 1

Current CCTV Integration to IOCC

- Exiting 19 sets of CCTV

Crime +Traffic Information Provision

- 3 sets of CCTV

CCTV for Vulnerable Areas

- 2 sets of CCTV
- St. James Infirmary & Illegal Settlement

Phase 2

New CCTV

- 8 sets of CCTV
- Expansions to the needed points

4.17 Comprehensive Design
Disaster Prevention System

Design Principles

- Monitoring all events occurring in Montego Bay and carry out measure with situation room
- Using fixed megapixel camera and speed dome camera, could monitor flood at urban gully and tidal wave at seaside, landslide for 24hours
- Displays & Warning information through VMS and alerts through speakers

Design Principles

- Focal installation on accident prone points
- Priority installations on disaster happend frequently
- Focal management on troubled areas considering traffic environment
- Geometrically vulnerable points & points with frequent climate change

Installation Plan per Phase

Phase 1

- Installed with utmost priority towards risk areas centered on Pilot sectors

Phase 2

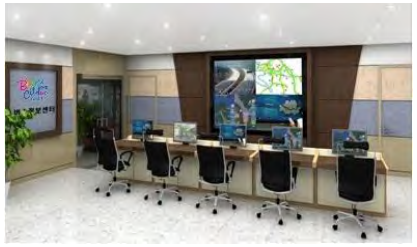
- **Major management points**
- **Whole City**

Expansion

- System Expansion & Upgrade to intelligent System

Disaster Prevention System - Dataflow

IOCC



Broadcasting, Data transmission

Data transmission or hot-Line

Disaster situation monitoring, detection & prediction

Emergency Warning

- Siren & Voice
- VMS (Detour)
- Internet & Mobile
- Mass Media

Data sharing with related agencies

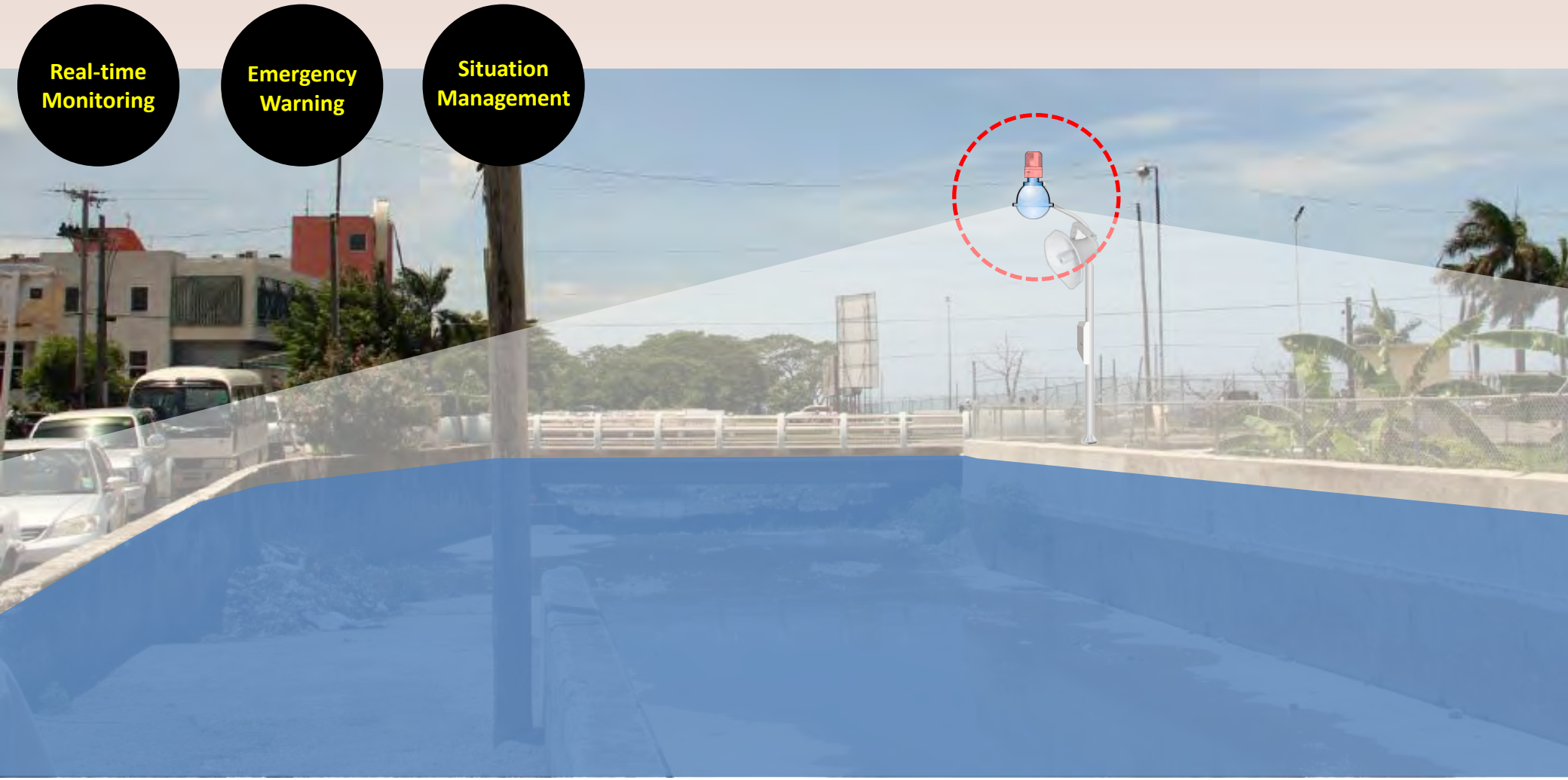
- OPDEM
- St. James Parish Headquarters
- Police Command Officers
- Emergency Medical Service
- Fire Bridge
- NWA (National Works Agency)

Related Disaster with Montego Bay

Flood in Urban Area	Tidal wave at harbour	Landslide	Hurricane	Earthquake
				

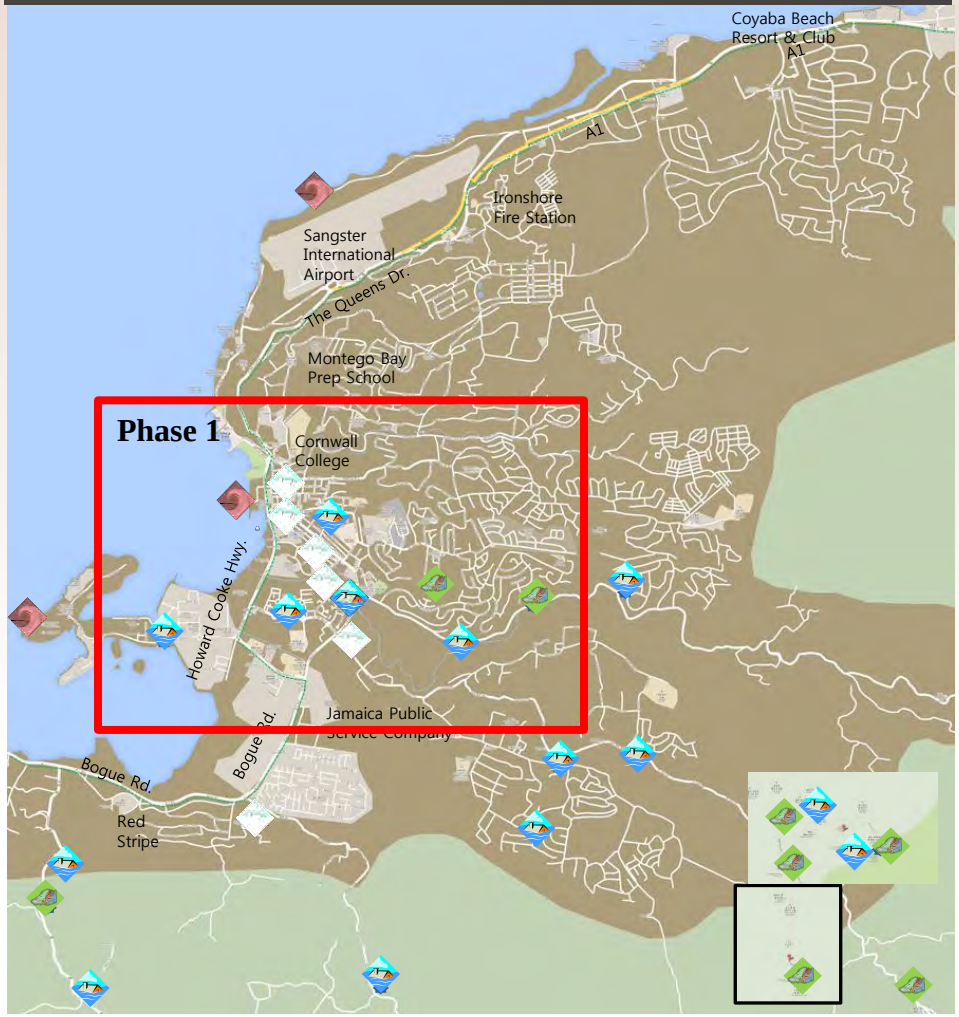
4.19 Comprehensive Design

Disaster Prevention System - Example



Disaster Prevention System

System Location Plan



Multi-Purpose for Disaster, Traffic Monitoring Camera

Phase 1

- Tidal Wave Observation
  - 1 sets
- Urban Flood Observation
  - 5 sets
- Landslide Observation
  - 2 sets

Phase 2

- Tidal Wave Observation
  - 2 sets
- Urban Flood Observation
  - 9 sets
- Landslide Observation
  - 6 sets

4.21 Comprehensive Design
Route Taxi & Metro Bus Management System

Design Directions

- Real-time Tracking of Route Taxies & Metro Buses for schedule management, illegal operation or activity warning etc.
- Installation On Board Equipment (OBE) based on GPS & wireless communication with Display

Design Principles

- Public Transportation management by Monitoring real-time locations for selected vehicles at IOCC
- Prevent illegal activities thru Drivers Warning Message
- Expand to Public Transportation Information System

Installation Plan per Phase

Phase 1

- Priority installation of OBE on selected Route Taxi & Metro Bus

Phase 2

- Whole Route Taxi & Metro Bus installation of OBE

Expansion

- Expand to Information System
- Information Device installation at Bus Stops & Route Taxi Stops

4.22 Comprehensive Design
Route Taxi & Metro Bus Management System

IOCC

H/W

comm. Server

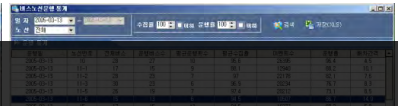
DB Server

N/W

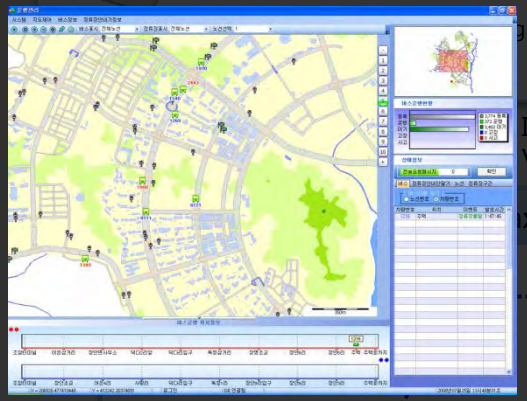
Monitoring Wall

S/W

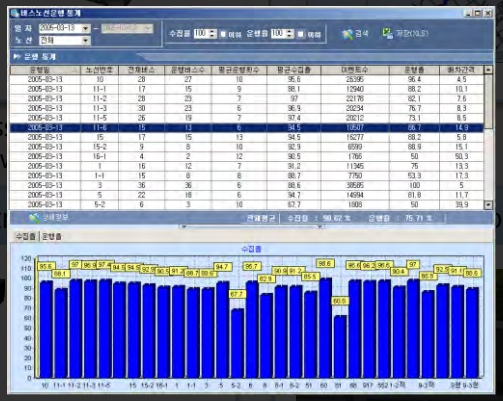
- GIS Based Operation Software
- Statistic Data monitoring, Data Editing etc.



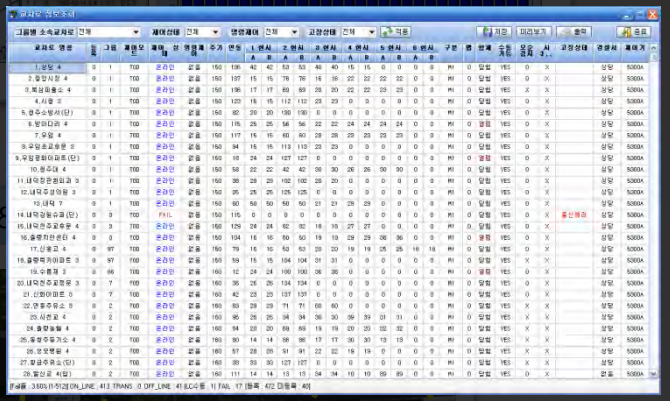
Location Monitoring



Statistics by Graph



Data Management



Backup Server

IOCC Mes

Violation

axi & Met

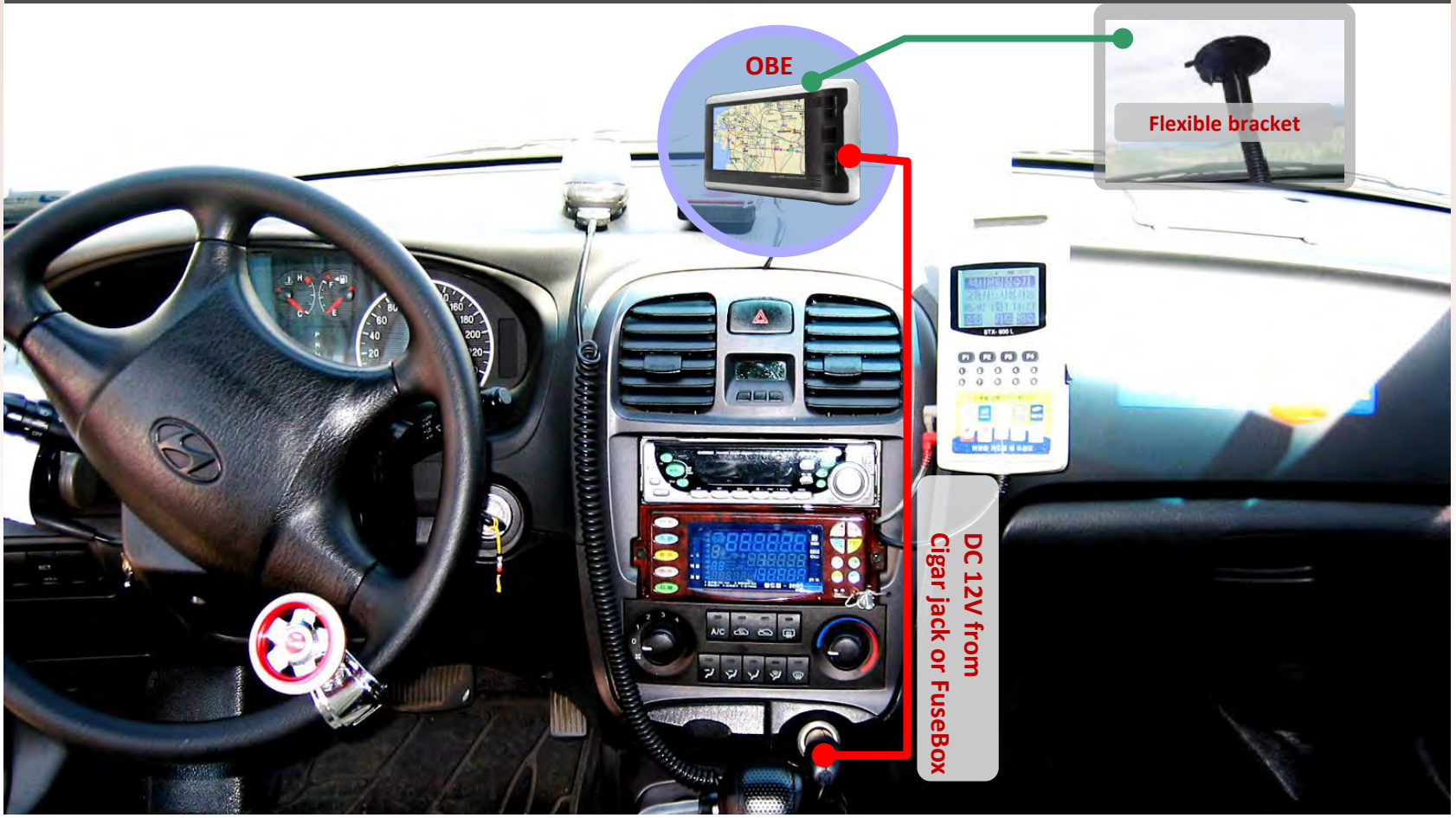
Bus &

RF Antenna

- Driver Assistance Display
- IOCC message
- real-time location data processing & Sending

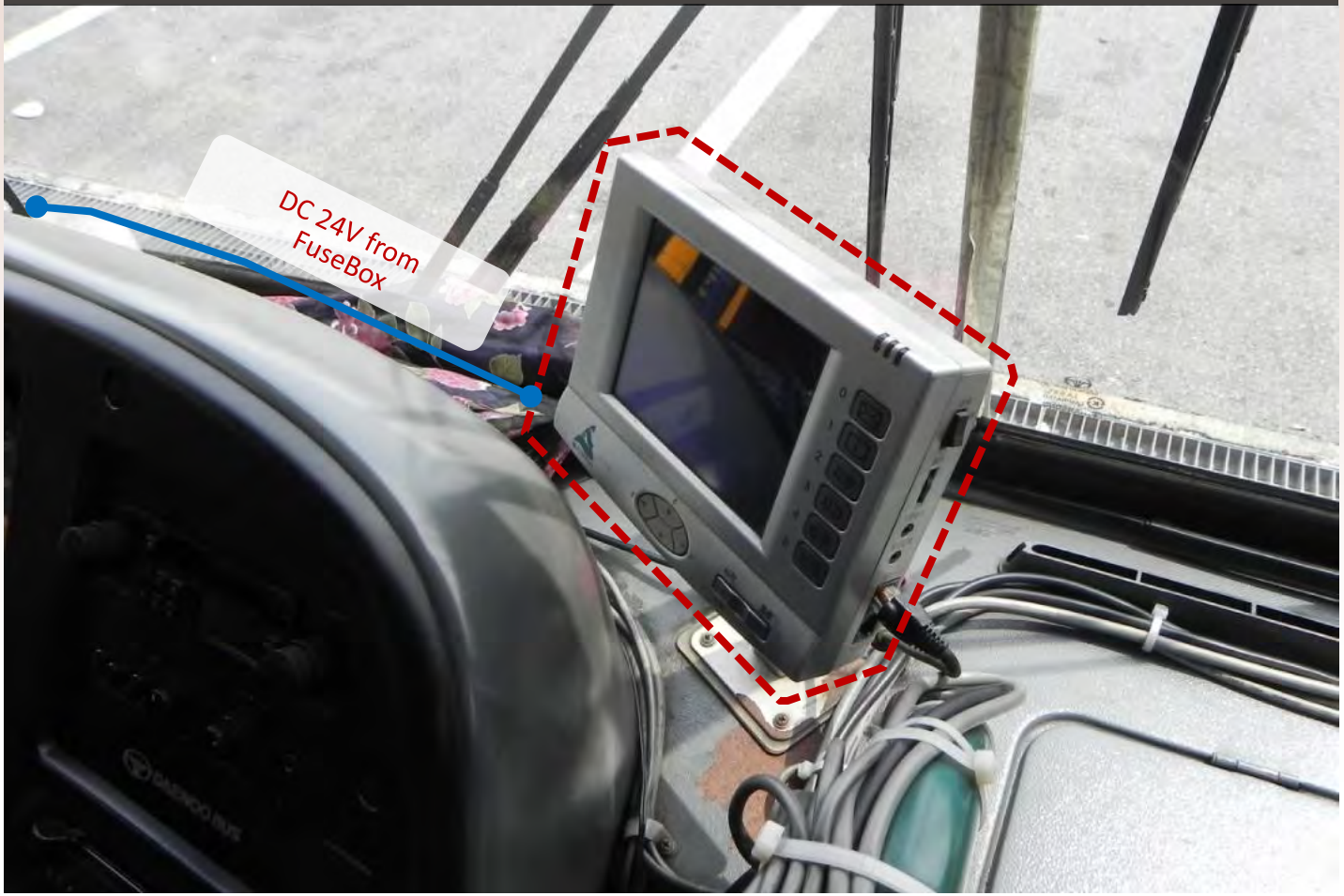
Route Taxi & Metro Bus Management System – Example

On a Route Taxi



Route Taxi & Metro Bus Management System – Example

On a Metro Bus

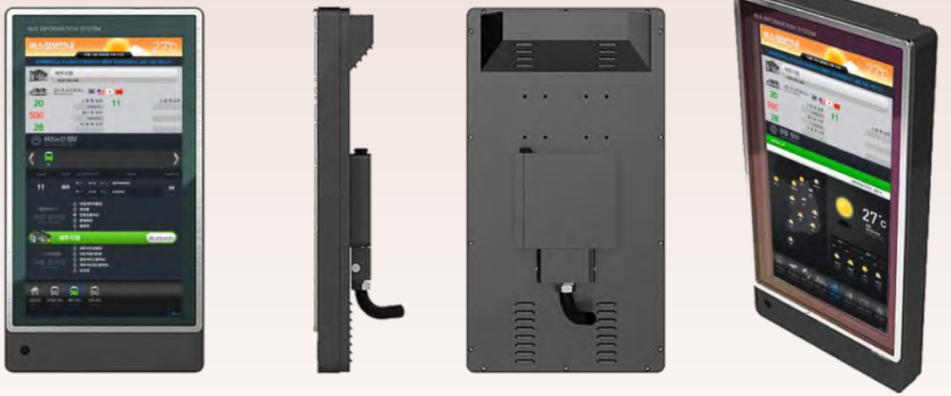


4.25 Comprehensive Design
Route Taxi & Metro Bus Management System

Improvement to....

Information Service

At Route Taxi & Metro Bus Stops



On Hands

4.26 Comprehensive Design
Parking Information System

Design Directions

- Supply information of public parking area and public parking facilities

Design Principles

- Real-time parking space information to drivers through VMS, Internet, etc.
- Promote drivers to use public parking lot nearby
- Effect to prevent illegal parking activities and help to ensure maximum road capacity

Installation Plan per Phase

Phase 1

- Priority installation on Downtown Parking lots

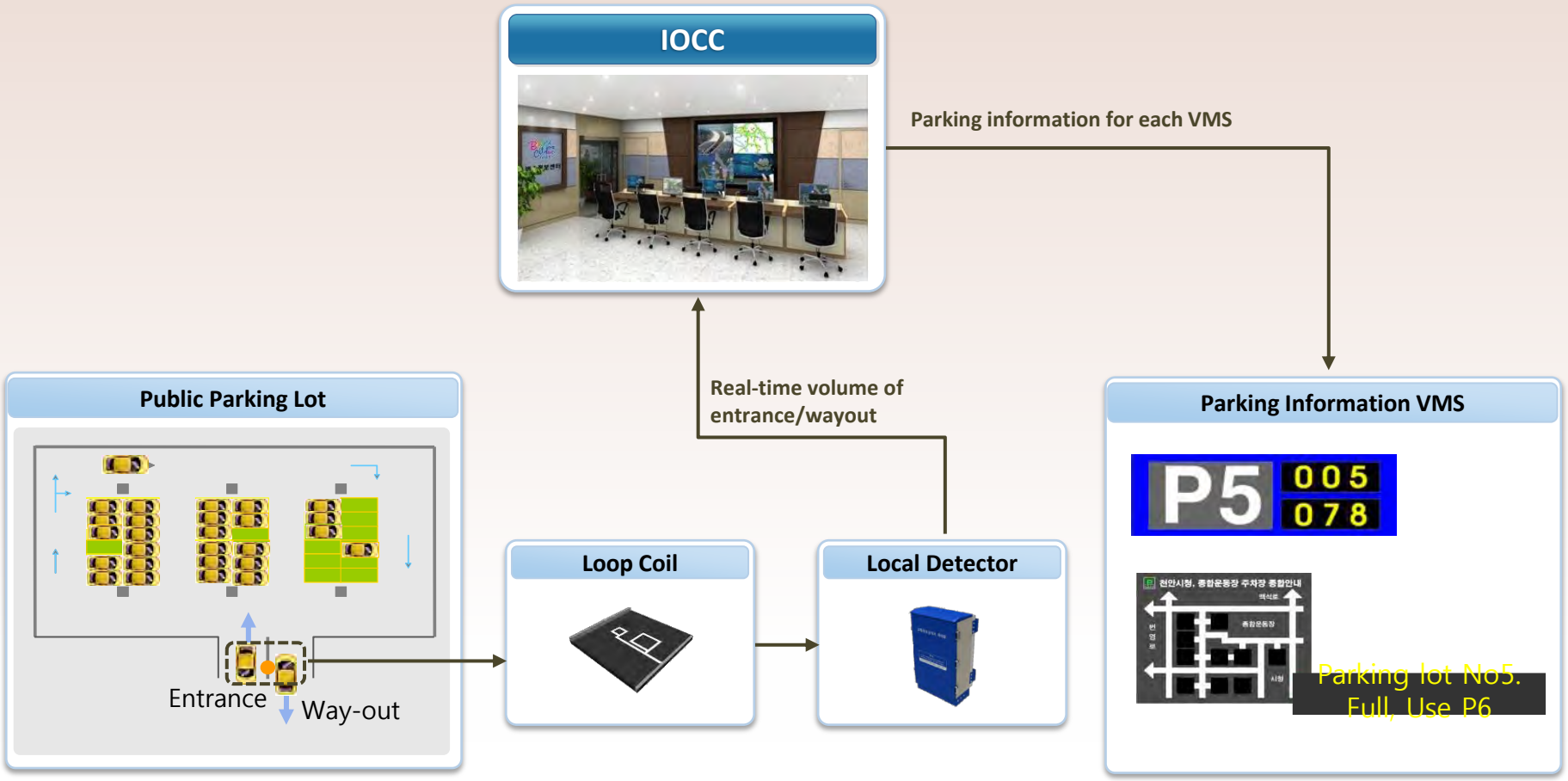
Phase 2

- Whole installation on Montego Bay City Public Parking Lots

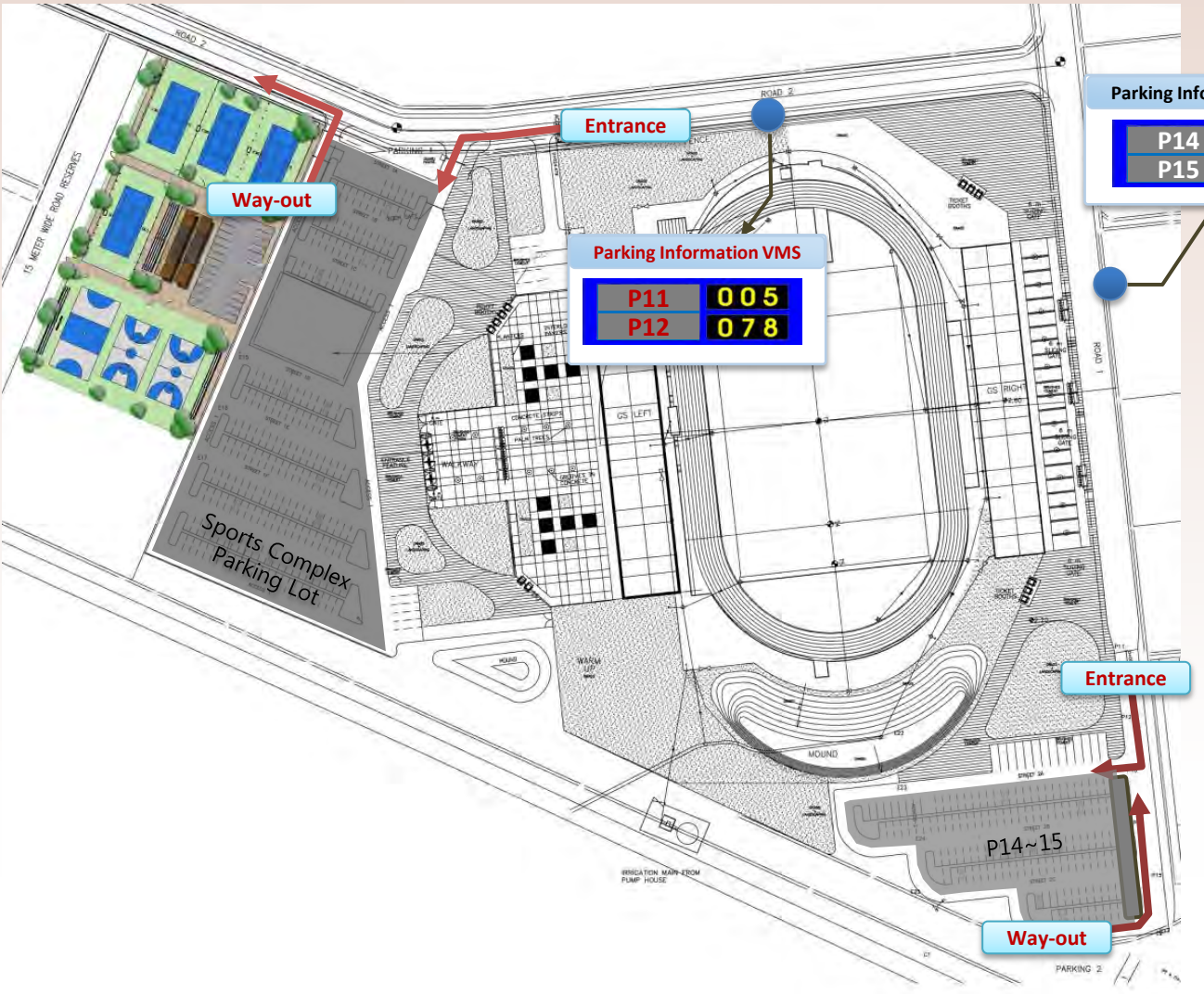
Expansion

- System Upgrade to intelligent Parking Information System
- Each parking space vacancy detection & lead each vehicle to parking space

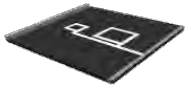
Parking Information System



Parking Information System - Example

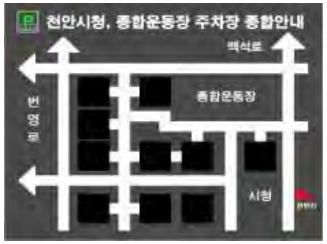


Vehicle Detection for Space count



Information Service

P14 005
P15 078



4.29 Comprehensive Design
Parking Information System

Parking Lots in Montego Bay

Stand Alone System

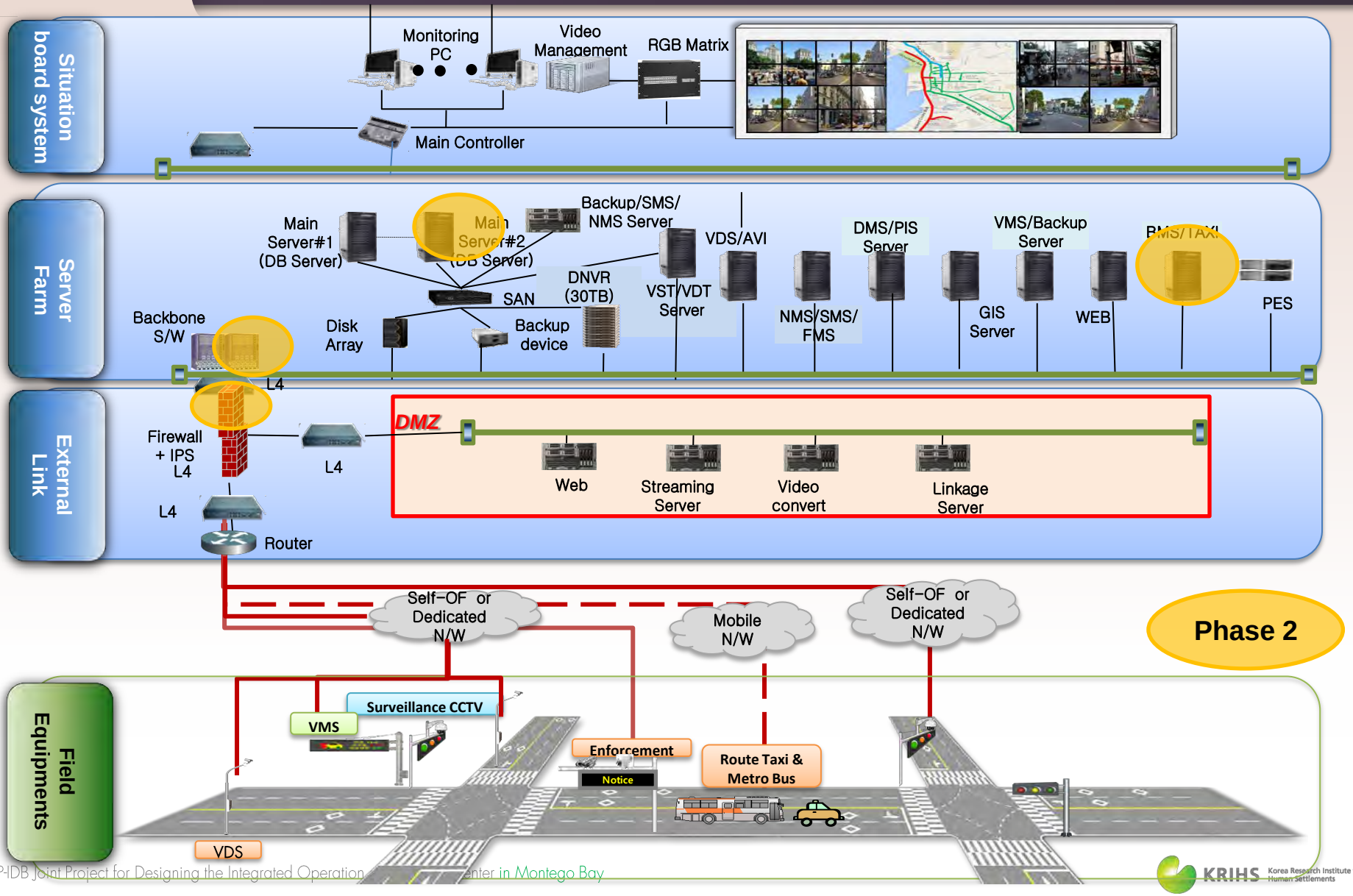
Phase 1

- 1 set
- Pilot Case of Montego Bay City
- Recommend the Stand Alone Operation

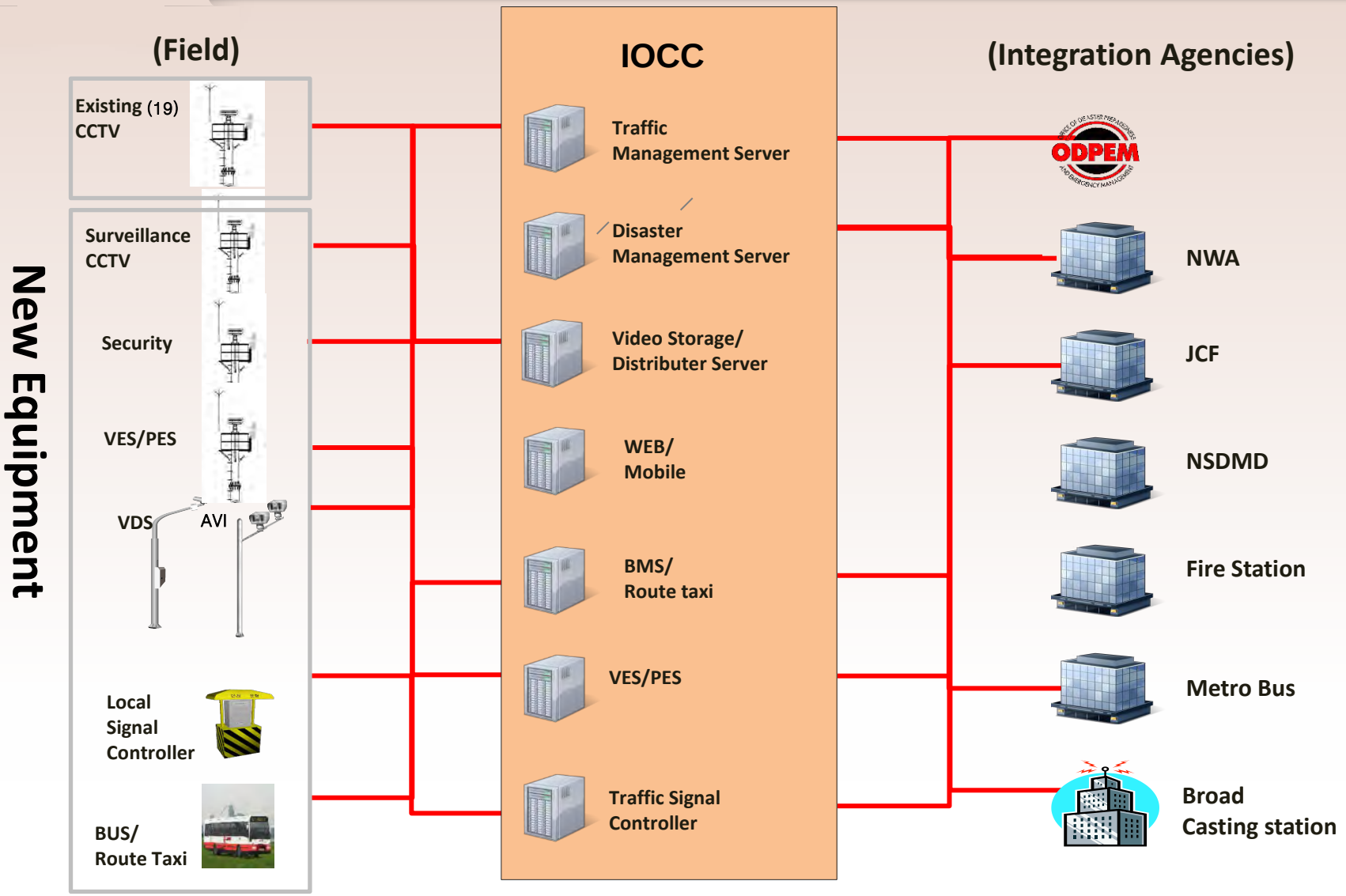
Phase 2

- 4 sets
- Downtown of Montego Bay City

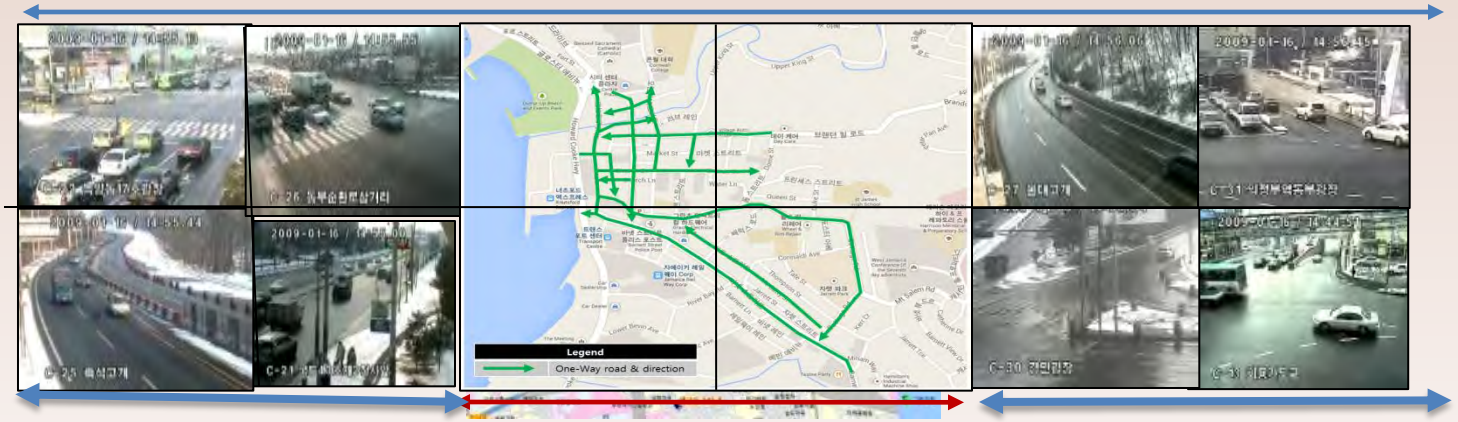
IOCC – Center System



IOCC – Integration between IOCC and related agencies



IOCC – Situation Board System Design



Structure	50"
Width	1,016mm
Height	762mm
Depth	788mm
Weight	60kg

• Width size (6 row)

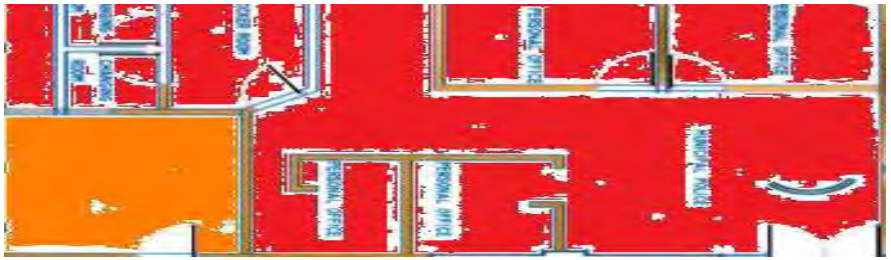
1. LED cube : 1,016mm X 6ea = 6,096mm
2. vessel(edge) Gap : 5mm X 5ea = 25mm
3. Total Sum : 6,096mm+ 25mm = 6,121mm

• Height size (2row)

1. LED cube : 762mm X 2ea = 1,524mm
2. vessel(edge) Gap : 5mm X 1ea = 5mm
3. Base Flate : 1,000mm X 1ea = 1,000mm
4. Total Sum : 1,524mm+5mm+1,000mm=2,529mm

Comprehensive Design

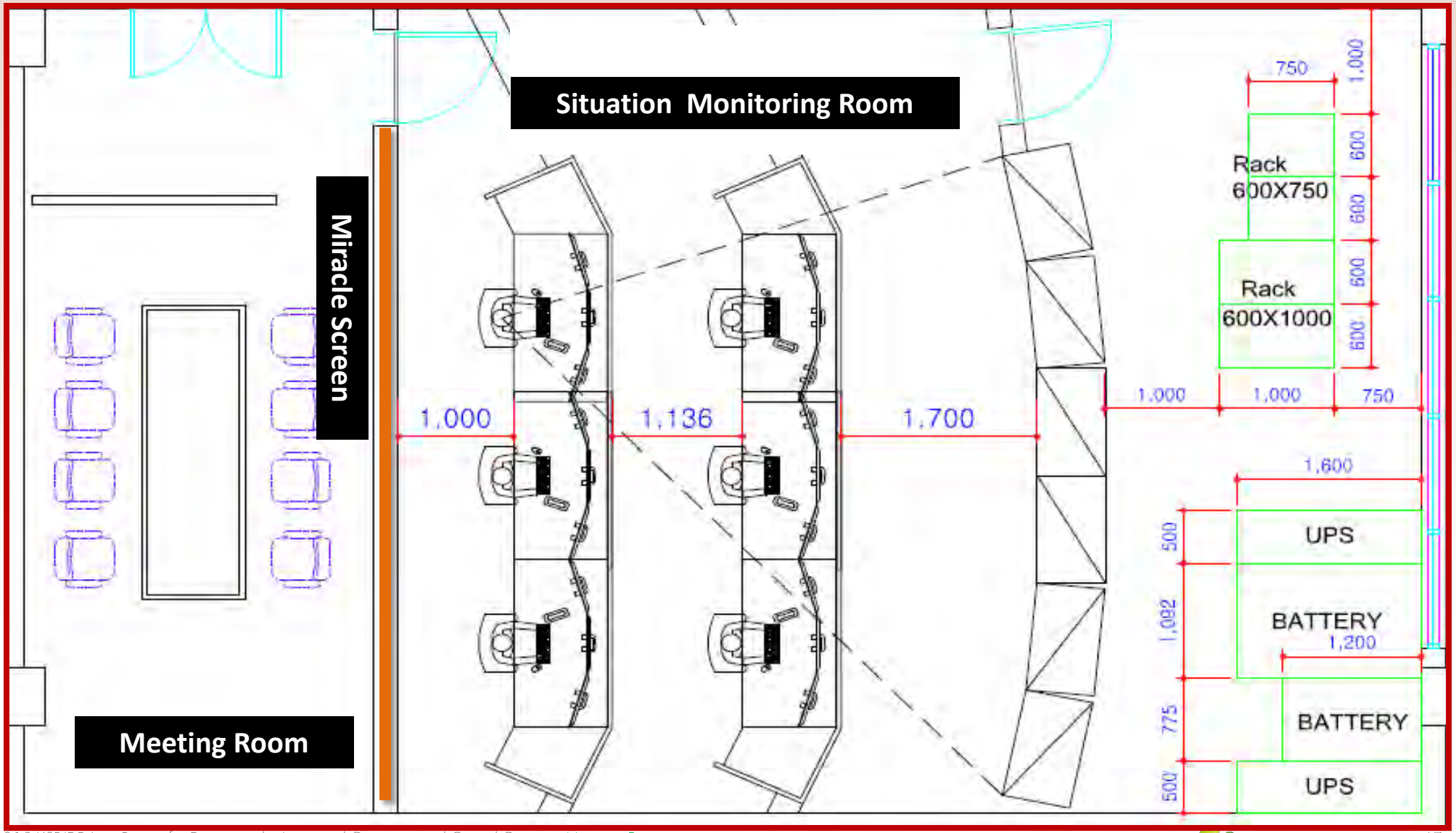
IOCC Interior – allocated IOCC Site



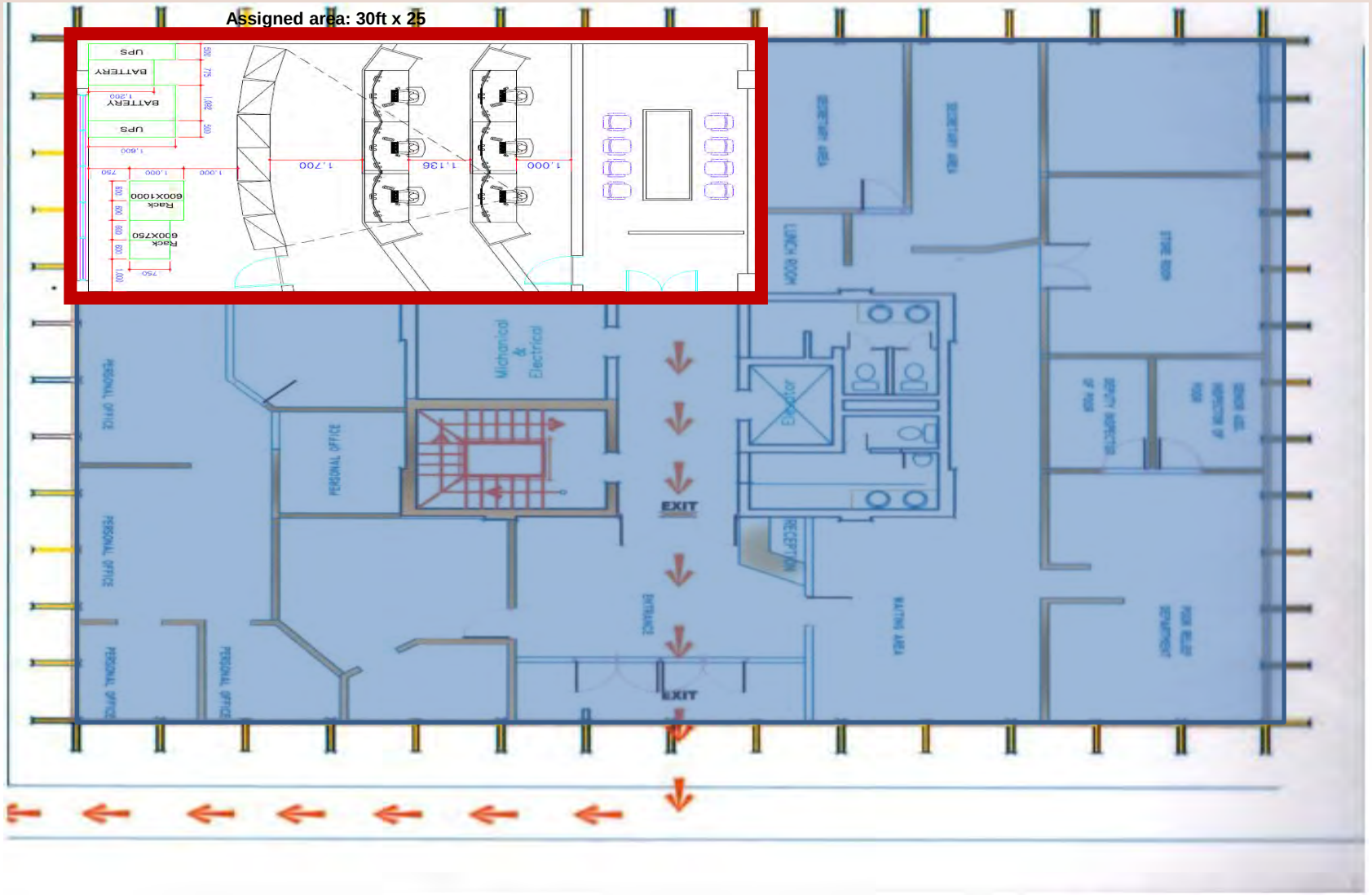
Assigned IOCC area

Default area:30ft x 52 ft
(9.14m x 7.62m)
Additional area : 11ft x 14ft
(3.35m x 4.27m)

IOCC Interior – Floor Plans



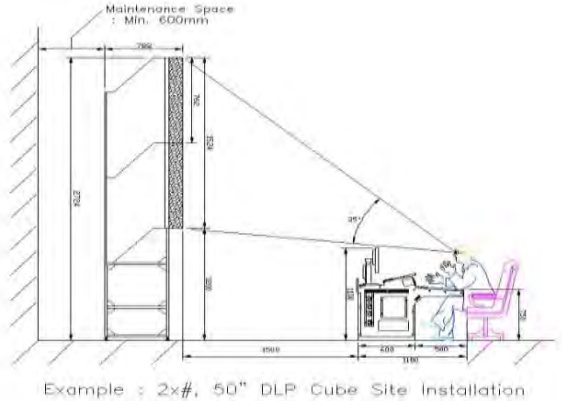
IOCC Interior – overlapped Floor Plans



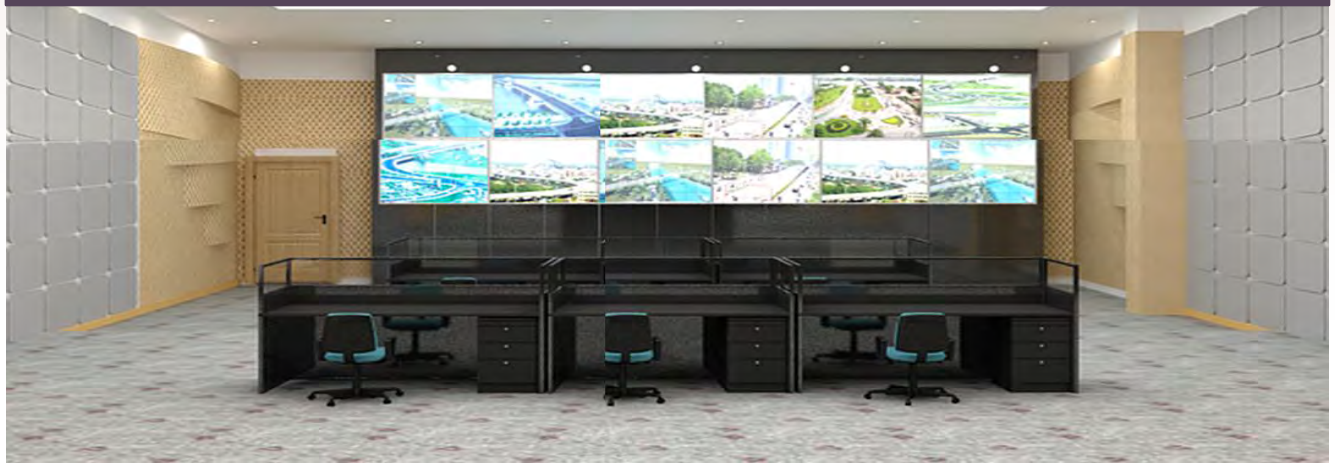
IOCC – Interior design

Meeting room

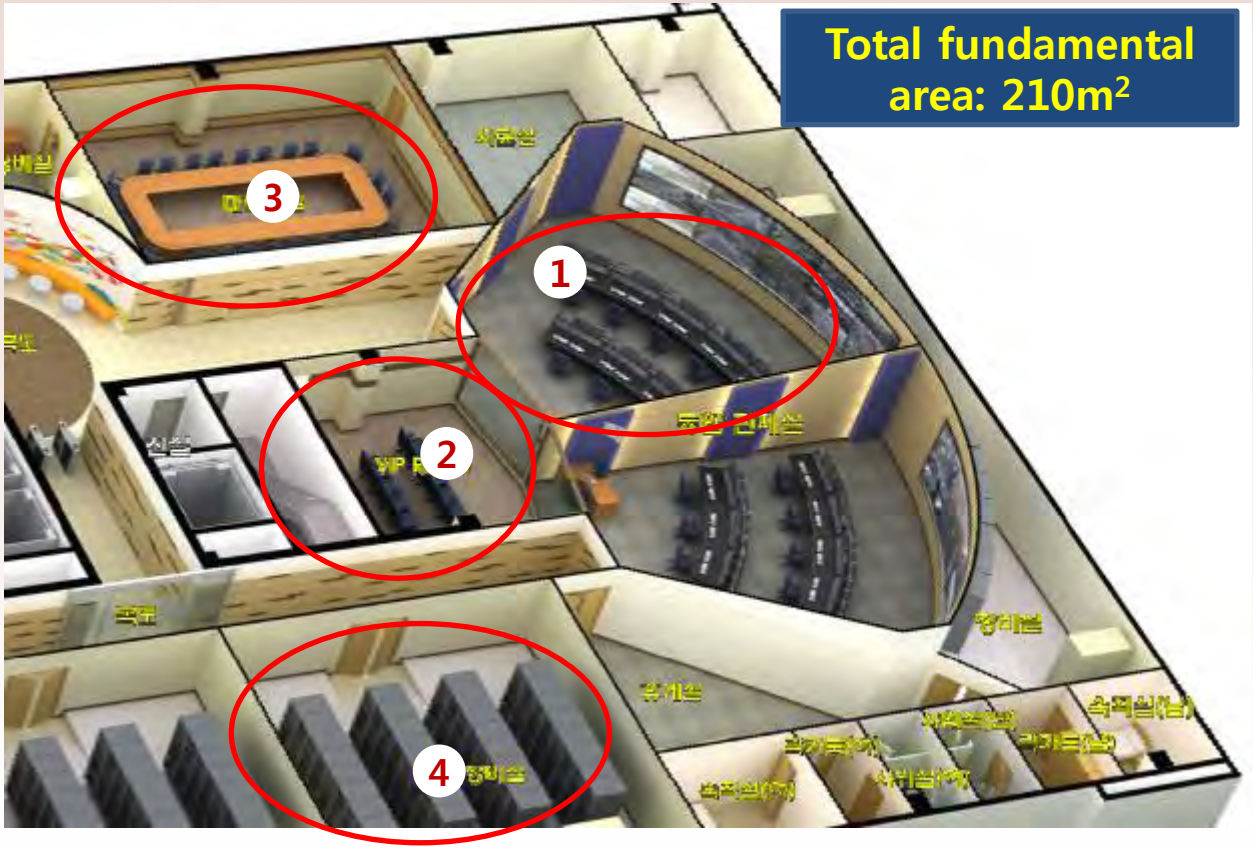
Display monitoring

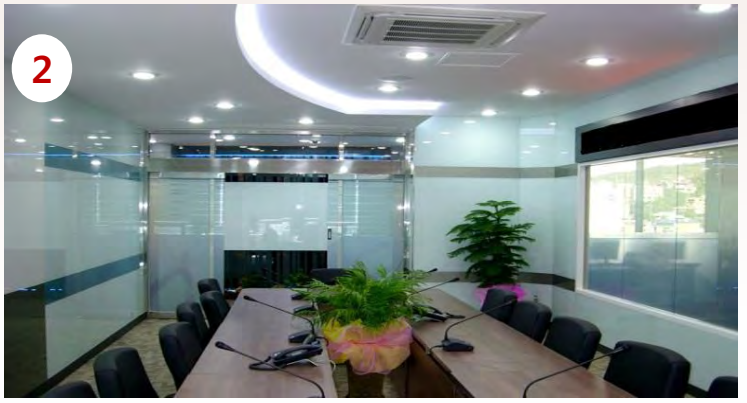


Situation monitoring room

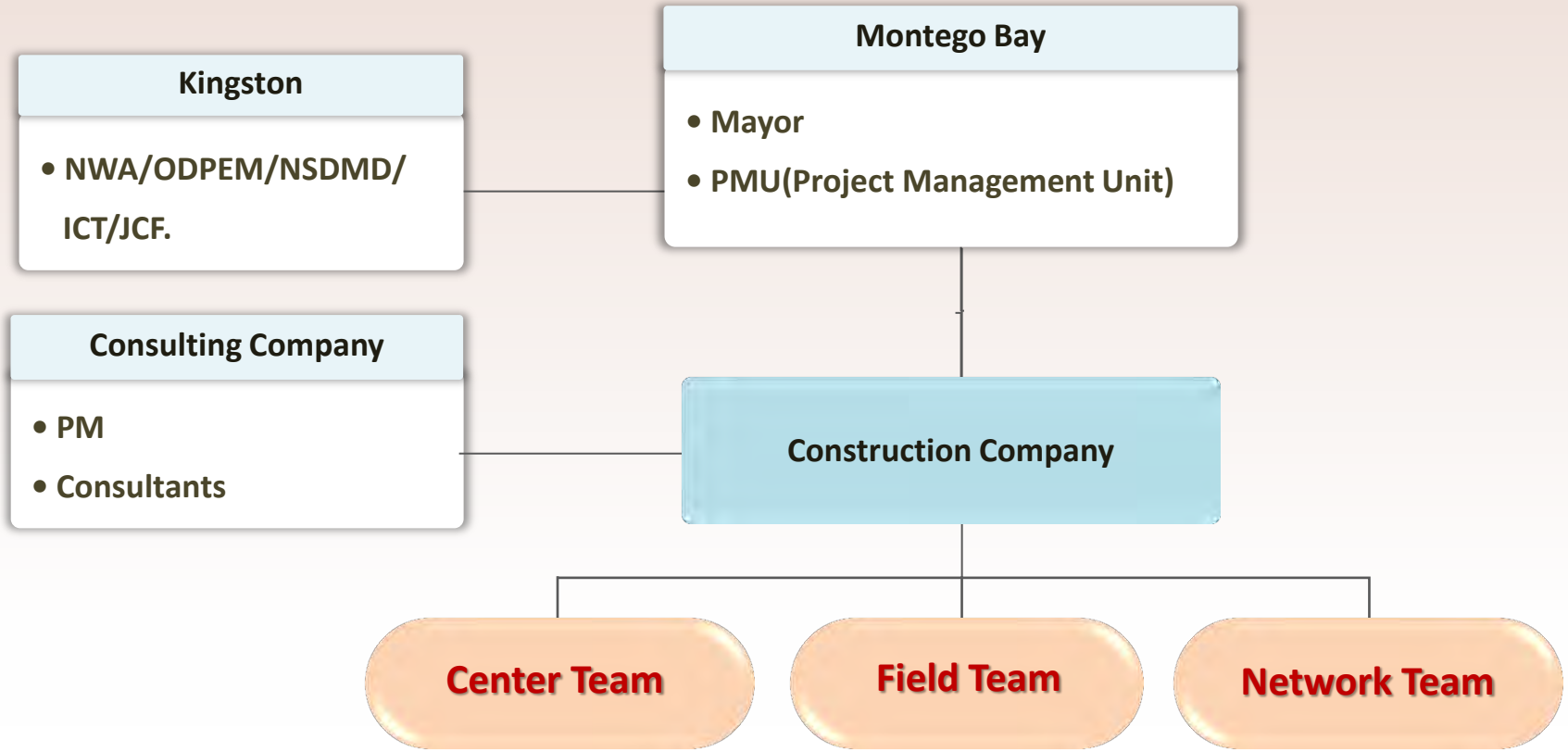


IOCC Interior – Ideal IOCC Area(Fundamental Area)

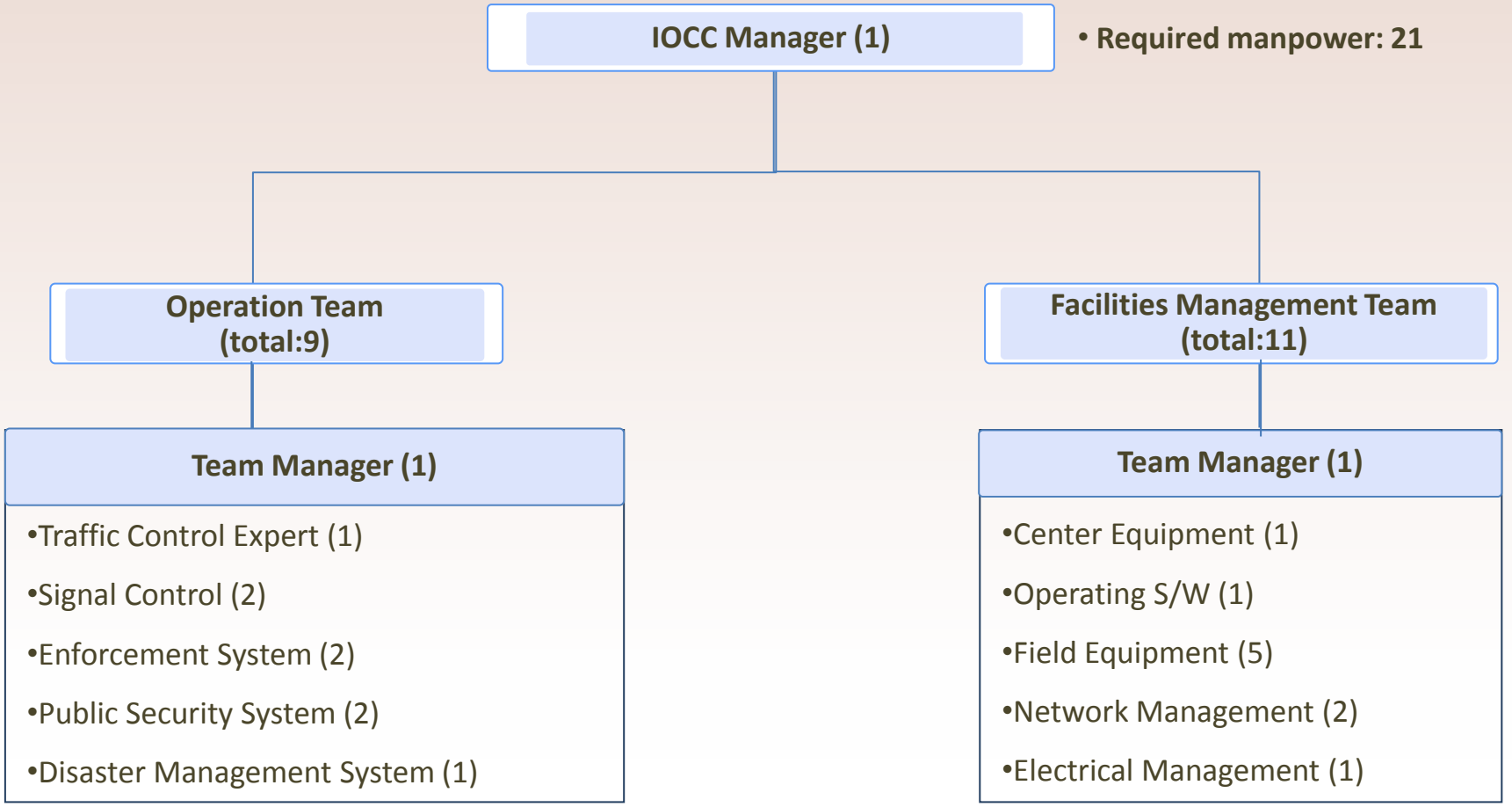




IOCC – Project Execution Organization



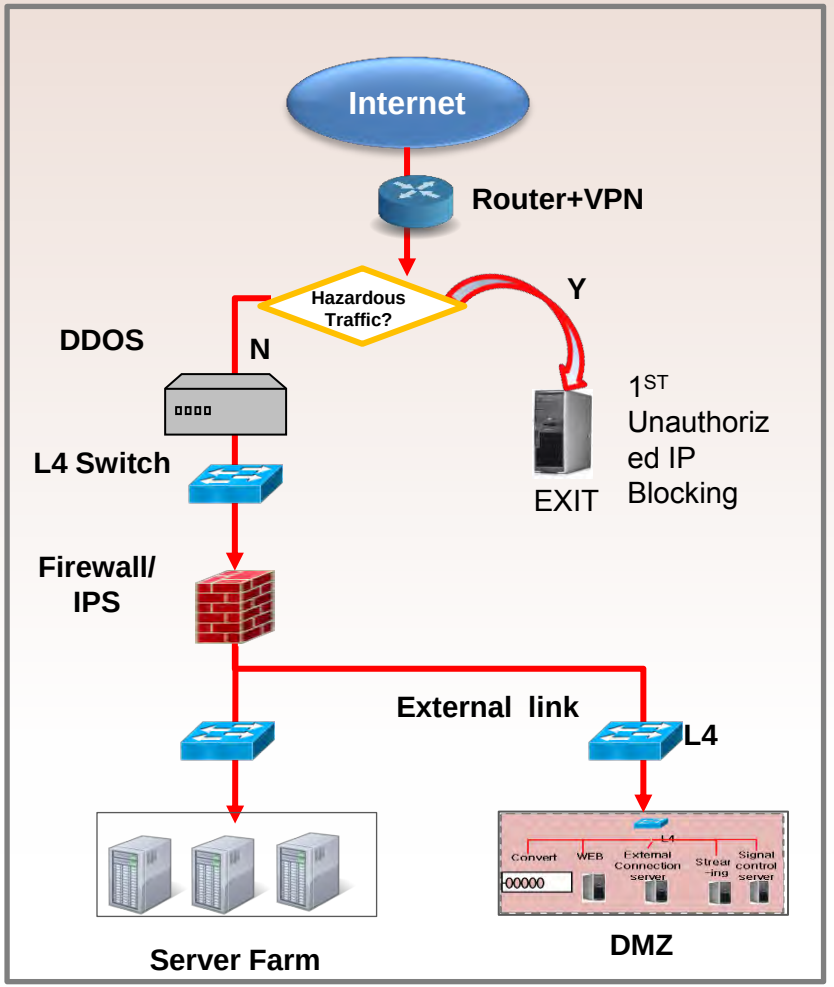
IOCC – Operation and Maintenance Organization



Solutions for Cyber Security

Objects	Solutions
1. Database	• **Blocking unauthorized data access** • Access control by user account • DBMS Installation to use a unique DBMS's security method and logging monitoring
2. Server and OS	• **Define on user account and password** • Access control and separation enhanced security on the file system • System logging monitoring • Install security software
3. PC	• Install CMOS's password • sunning screen saver and set password • Install **vaccine software/running**
4. Application Software	• **authority control depending on the level of user** • tracing a log of the application software access

5. Network Equipment

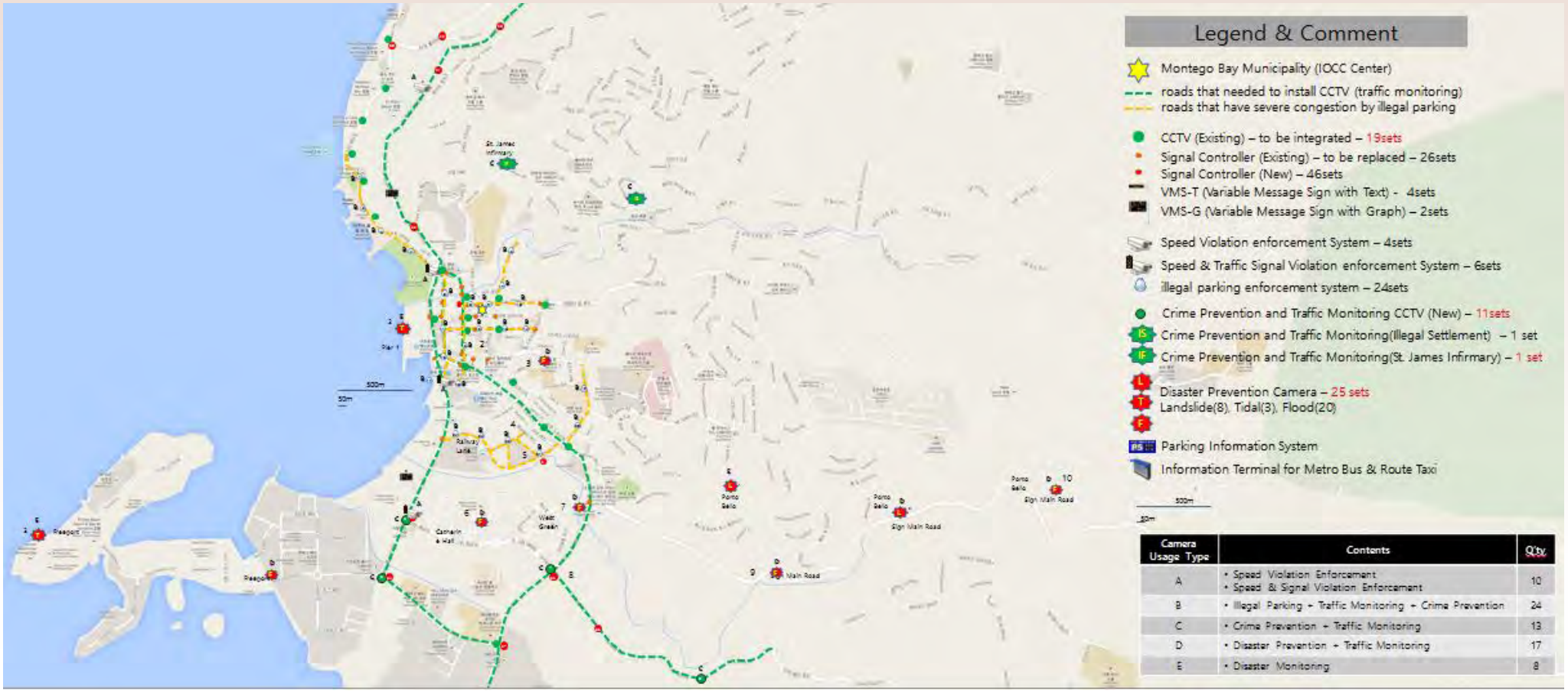


Site Equipment Installation Plan per Phase

CCTV Cameras are recommended as multi-purpose for efficiency

Sub System			Phase 1	Phase 2	Total
Advanced Traffic Signal Control System			33	41	72
Advanced Traveler Information System		VMS – Text	-	4	4
		VMS - Graphic	3	-	3
		AVI	4	4	8
		VDS	4	6	10
CCTV Camera	A	Speed Violation Enforcement	2	2	4
		Speed + Signal Violation Enforcement	3	3	6
	B	Illegal Parking Enforcement + Traffic Monitoring + Crime Prevention	13	11	24
	C	Crime Prevention + Traffic Monitoring	5	8	13
	D	Disaster Prevention + Traffic Monitoring	8	9	17
	E	Disaster	-	8	8
	CCTV Camera Sub Total		31	41	72
Route Taxi & Metro Bus Management System			-	2000	2000
Parking Information System			1	4	5
Gunshot Alert System			-	2	2
IOCC			Basic Parts	Full Parts(duplex and back up)	1
Network Infrastructure			1	1	2

4.42 Comprehensive Design
Multi-Purpose Location of Site Equipment(1)



Camera Usage Type	Contents	Q'ty
A	• Speed Violation Enforcement • Speed & Signal Violation Enforcement	10
B	• Illegal Parking + Traffic Monitoring + Crime Prevention	24
C	• Crime Prevention + Traffic Monitoring	13
D	• Disaster Prevention + Traffic Monitoring	17
E	• Disaster Monitoring	8

4.43 Comprehensive Design
Multi-Purpose Location of Site Equipment(2)

Camera Usage Type	Contents	Q'ty
A	• Speed Violation Enforcement • Speed & Signal Violation Enforcement	10
B	• Illegal Parking + Traffic Monitoring + Crime Prevention	24
C	• Crime Prevention + Traffic Monitoring	13
D	• Disaster Prevention + Traffic Monitoring	17
E	• Disaster Monitoring	8

4.44 Comprehensive Design
Next Step

The Necessity of IOCC in Montego Bay	• MB is the gateway of Jamaica for the world tourist • Criminal rate of Anyang has been decreased 18% after IOCC implementation • The main goals of SECI can be achieved by IOCC partially
Concrete Action Plan	• Detailed implementation plan phase by phase • Role assignment for the implementation among stakeholders • Technical Assistance needs to be followed
Administrative Support	• Consensus building among stakeholders ; Ministries & institutes etc, • Willingness to IOCC implementation & Dedicated staff & comm. for the project • Legal and policy support for the IOCC implementation
Funding Resources	• Max. Utilization of existing facility and plan (ex. Public Safety Backbone network) • Minimize trial and error based on the prior implementation experiences • Matching fund from IDB , Central & local government etc.

Thank you very much !!!