UTILIZING EFCOS DATA FOR DISASTER MANAGEMENT @ MMDRRMOC/MMDA-FCIC

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Seminar/Workshop on EFCOS Operations
18 February 2016

FLOOD CONTROL INFORMATION CENTER & DISASTER RISK REDUCTION AND MANAGEMENT OPERATION CENTER

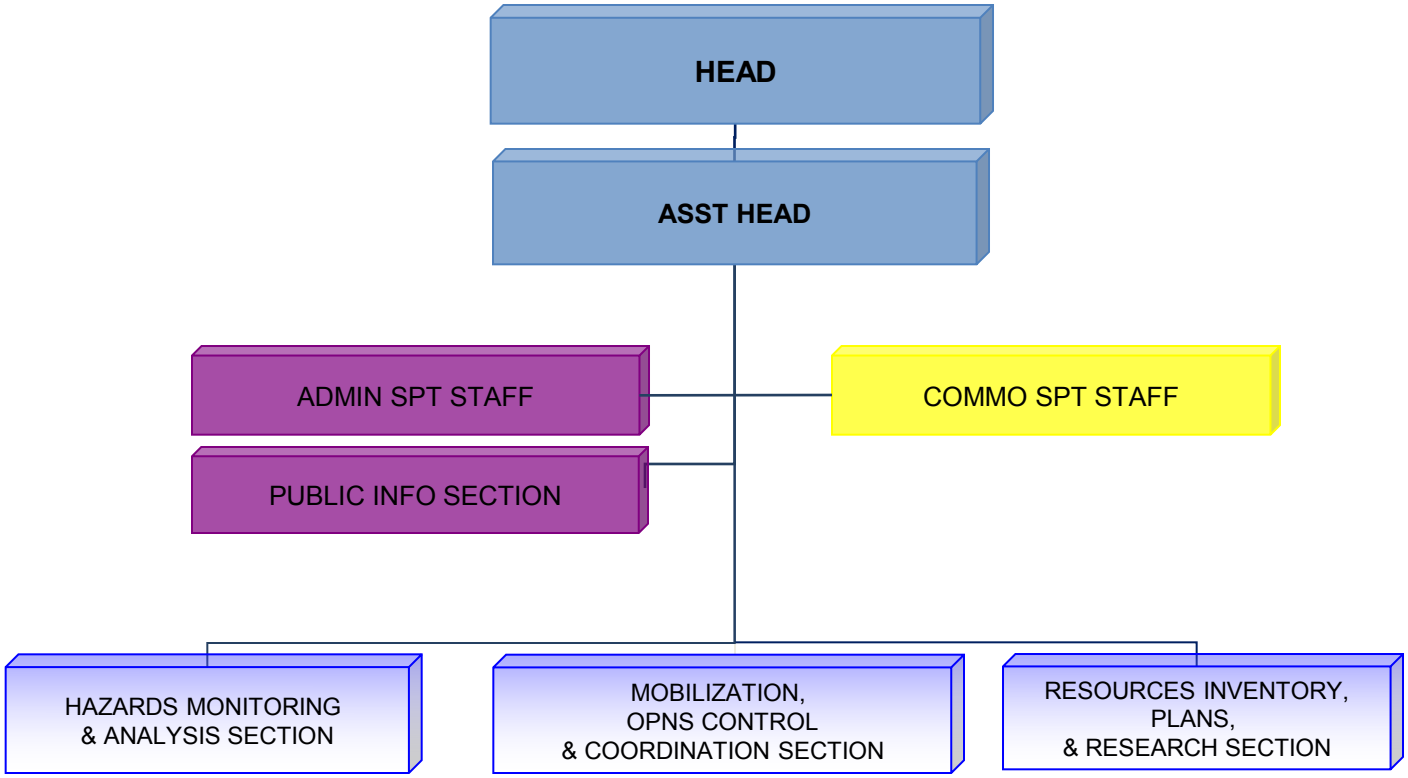
(3 August 2012)

- SERVE AS AN OPERATIONS COORDINATION AND CONTROL FACILITY FOR MMDA AND MMDRRMC DURING INCLEMENT WEATHER AND EMERGENCIES
- PROVIDE DECISION SUPPORT SYSTEM FOR MMDA AND MMDRRMC
- ESTABLISH AND PROVIDE COMMUNICATIONS AND DECISION LINKS AMONG MMDA OPERATING UNITS, METRO LGUS, MMDRRMC, AND NDRRMC DURING CRITICAL SITUATIONS
- SERVE AS INFORMATION AND KNOWLEDGE CENTER FOR MMDA AND OTHER CLIENTS ON HYDRO-METEOROLOGICAL CONCERNS
- PROVIDE COMPLEMENTARY PUBLIC SAFETY ADVISORIES AND WARNING

MISSION AND FUNCTION

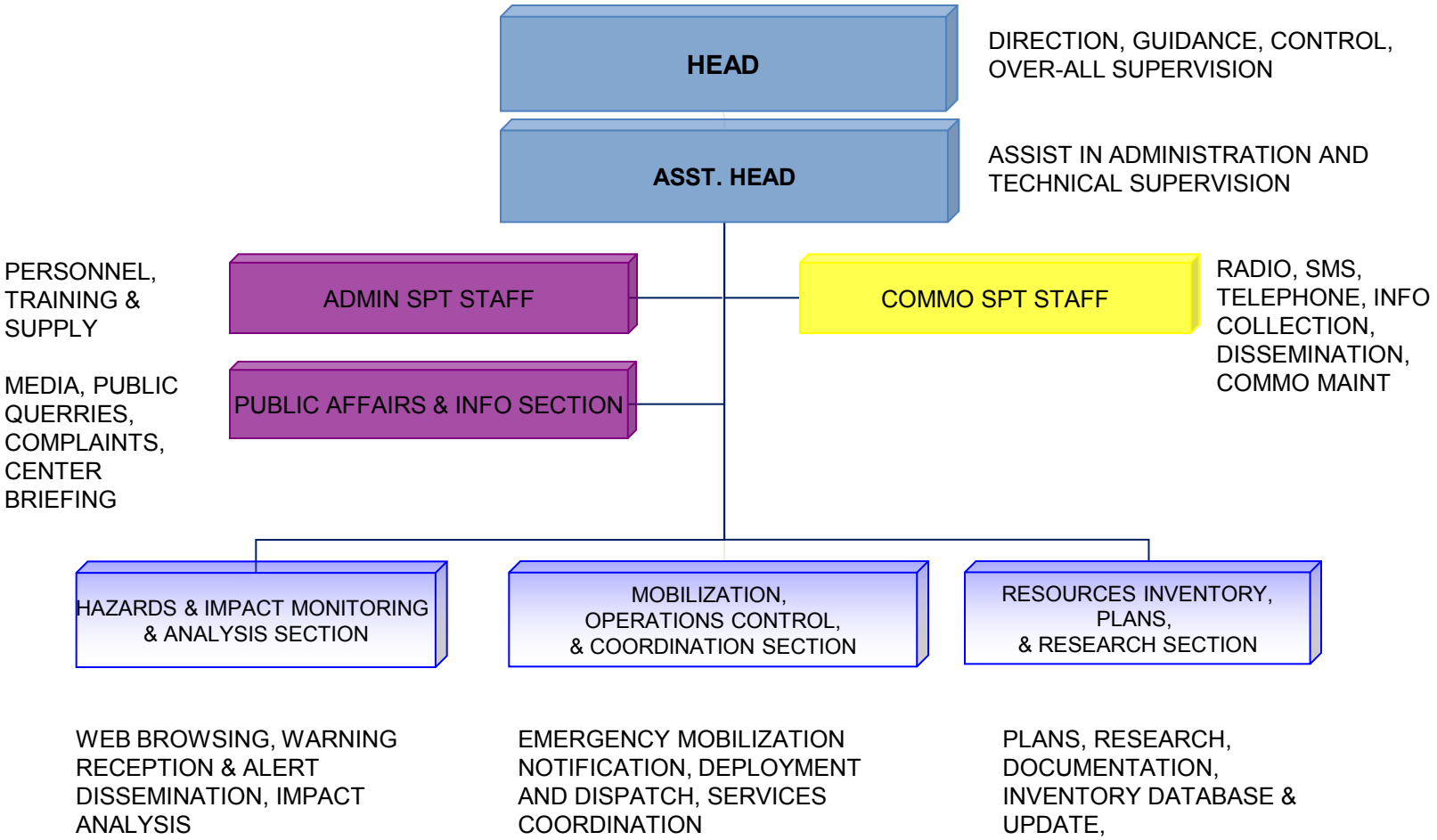
MMDA FLOOD CONTROL INFORMATION CENTER/METRO MANILA DISASTER RISK REDUCTION AND MANAGEMENT OPERATION CENTER (FCIC - MMDRRMOC)

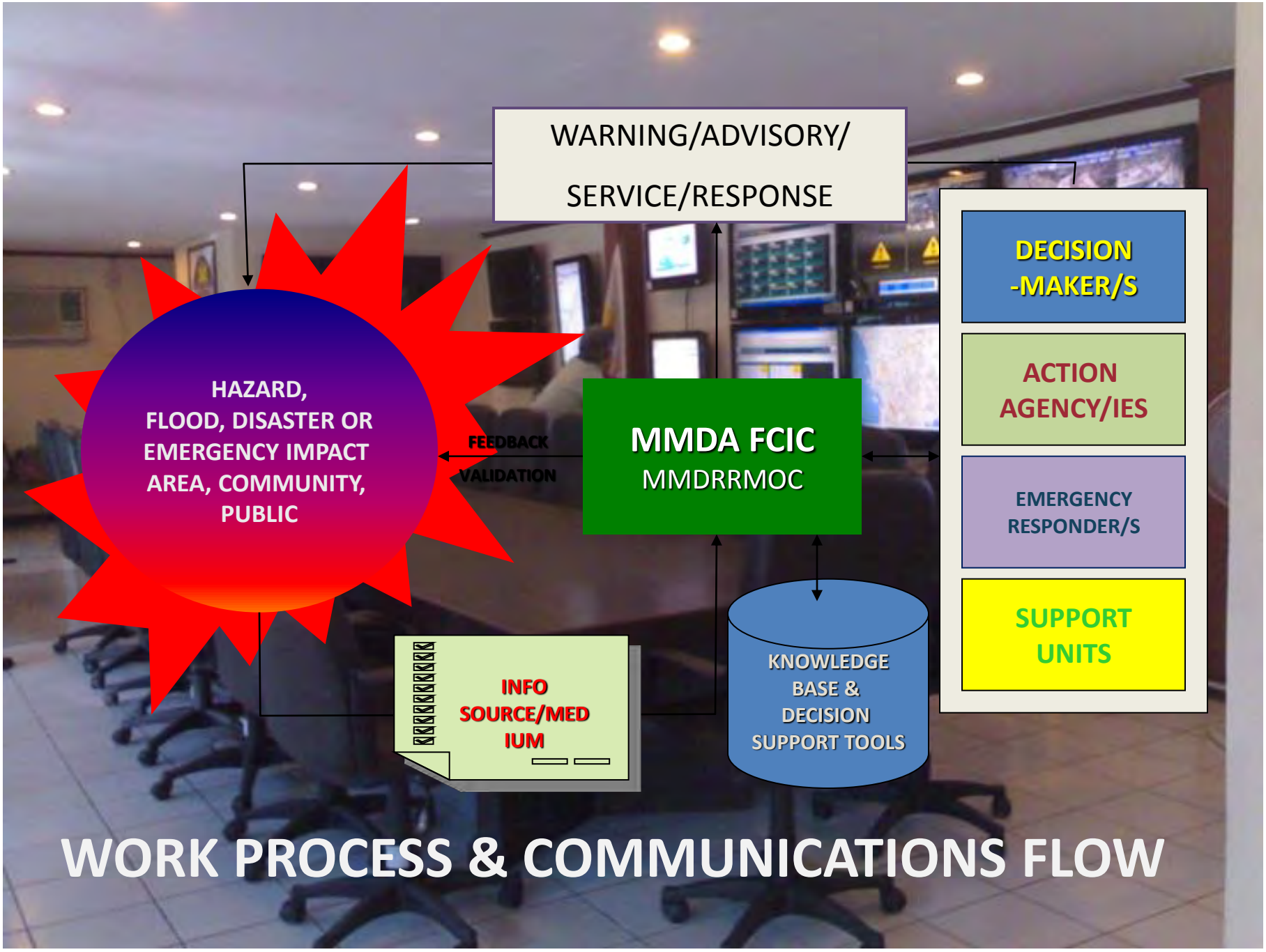
ORGANIZATIONAL STRUCTURE



MMDA FLOOD CONTROL INFORMATION CENTER/METRO MANILA DISASTER RISK REDUCTION AND MANAGEMENT OPERATION CENTER (FCIC - MMDRRMOC)

FUNCTIONAL STRUCTURE





WORK PROCESS & COMMUNICATIONS FLOW

THUNDERSTORM WARNING

WARNING	MEANING	DISSEMINATION
Information 	Thunderstorm is *less likely to develop* in the Metro Manila area	This will disseminated thru . Twitter and Website.
Watch 	Thunderstorm formation is *likely* to develop within the next twelve (12) hours. This is more general than a warning.	This will be disseminated thru Twitter, Website and fax
Warning 	Thunderstorm is *threatening a specific area(s) within the next 2 hours.* Updates will be issued as frequent as necessary	This will be disseminated thru SMS. Twitter. website

Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA)

HEAVY RAINFALL WARNING LEVELS

RAINFALL VALUES (mm)	MEANING	WARNING
Rainfall of **7.5 to 15 mm per hour** has fallen or expected to fall and most likely to continue for the next 3 hours.	Community **AWARENESS** **FLOODING** is **POSSIBLE** in low lying areas and near river channels For flooded areas, **receding of flood** is **expected** due to less rainfall.	**Advisory**
Rainfall of **more than 15mm up to 30mm within 1 hour** has fallen or expected to fall or if continuous rainfall for the past 3 hours is more than **45mm to 65mm** and most likely to continue for the next 3hours.	Community **PREPAREDNESS** **FLOODING** is **THREATHENING** in low lying areas and near river channels If flooding occurs, expect a **recession of flooding** due to less rainfall.	**Alert**
Rainfall of **more than 30mm within 1 hour** has fallen or expected to fall or if continuous rainfall for the **past 3 hours is more than 65mm** and most likely to continue for the next 3 hours.	Community **RESPONSE** **SERIOUS FLOODING** is **EXPECTED** Take necessary precautionary measures	**Action**

Disclaimer: ***Rainfall threshold values are arbitrary and may vary depending on the area of concern. These will be refined as soon as more data become available.***

FLOOD IMPACT TO MOTORISTS

Flood Depth	Flood Level	Impact to Motorist
Extremely High	36” - above	Not passable to all types of vehicle
Very High	19” - 36”	Not passable to medium vehicles but passable to buses and trucks
High	13” - 18”	Not passable to light vehicle but passable to medium vehicles
Medium	6” - 12”	Flooded but passable to all types of vehicles
Low	Below 6”	Flooded but passable

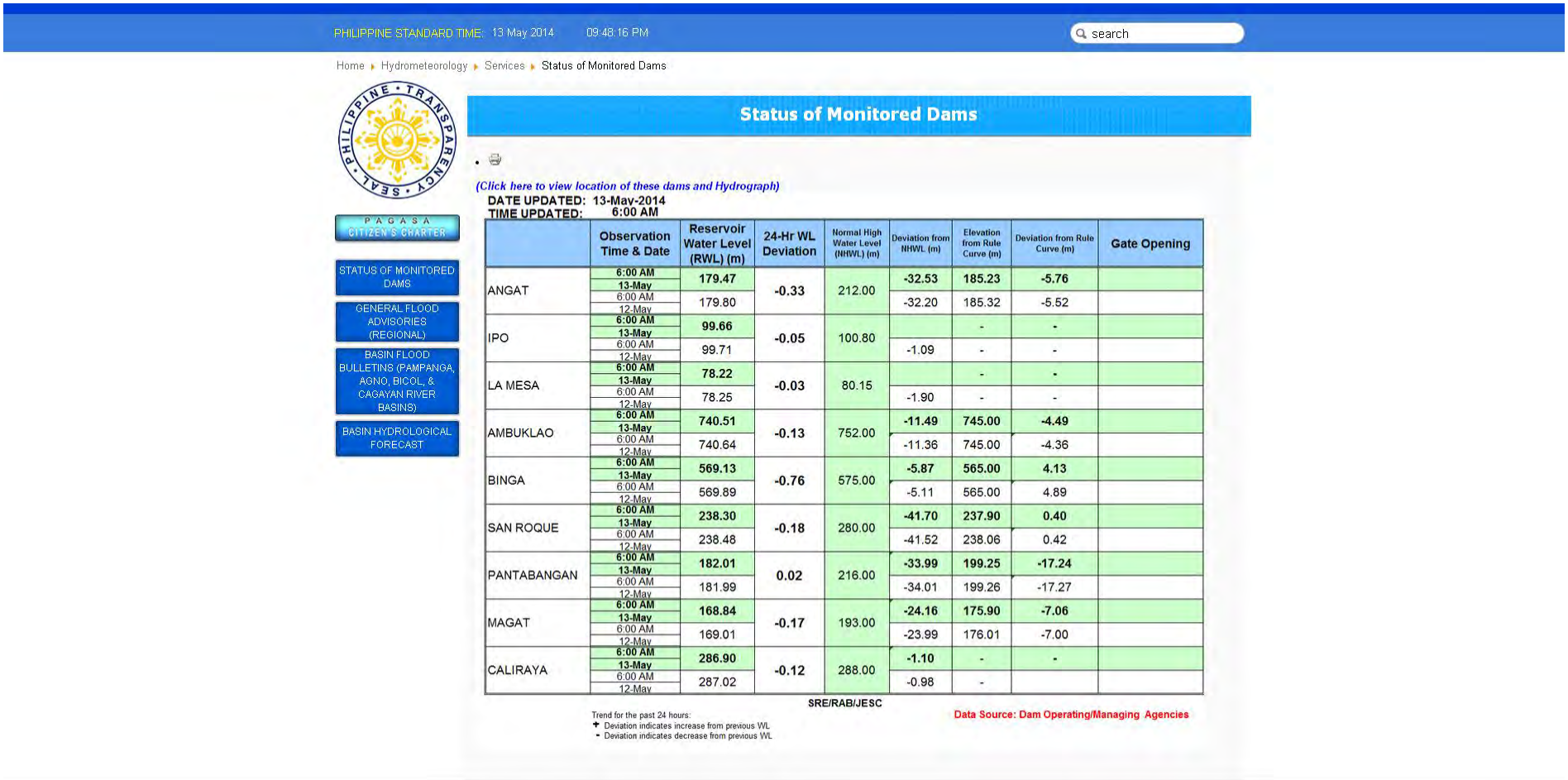
FCIC protocol when alert is raised by PAGASA or when rain is observed in MM

Alert Color Code	Rainfall values	Duration	Rain Category	Potential Impact	Action Level	FCIC Action/s
None	< 2.5 mm/hr	30 min.	Light	None	Awareness	Monitor
None	2.5 – 7.5 mm/hr	1 Hour	Moderate	Ponding; congestion	Awareness	Monitor
Yellow	7.5 – 15mm/hr	3 Hours	Heavy	Pocket flooding	Awareness	• Relay • Monitor
Orange	15 – 30 mm/hr	6 Hours	Intense	Flooding is threatening	Preparatory	• Relay • Monitor • Alert
Red	> 30 mm/hr	12 Hours +	Torrential	Evacuation on low lying areas for possible flash flood	Emergency Action	• Relay • Monitor • Mobilize or Dispatch • Coordinate

PAG-ASA

pagasa.dost.gov.ph/

PAGASA – Status of Monitored Dams



PHILIPPINE STANDARD TIME: 13 May 2014 09:48:16 PM

search

Home ▸ Hydrometeorology ▸ Services ▸ Status of Monitored Dams

PAGASA CITIZEN'S CHARTER

STATUS OF MONITORED DAMS

GENERAL FLOOD ADVISORIES (REGIONAL)

BASIN FLOOD BULLETINS (PAMPANGA, AGNO, BICOL, & CAGAYAN RIVER BASINS)

BASIN HYDROLOGICAL FORECAST

Status of Monitored Dams

(Click here to view location of these dams and Hydrograph)

DATE UPDATED: 13-May-2014
TIME UPDATED: 6:00 AM

	Observation Time & Date	Reservoir Water Level (RWL) (m)	24-Hr WL Deviation	Normal High Water Level (NHWL) (m)	Deviation from NHWL (m)	Elevation from Rule Curve (m)	Deviation from Rule Curve (m)	Gate Opening
ANGAT	6:00 AM 13-May	179.47	-0.33	212.00	-32.53	185.23	-5.76	
	6:00 AM 12-May	179.80			-32.20	185.32	-5.52	
IPO	6:00 AM 13-May	99.66	-0.05	100.80		-	-	
	6:00 AM 12-May	99.71			-1.09	-	-	
LA MESA	6:00 AM 13-May	78.22	-0.03	80.15		-	-	
	6:00 AM 12-May	78.25			-1.90	-	-	
AMBUKLAO	6:00 AM 13-May	740.51	-0.13	752.00	-11.49	745.00	-4.49	
	6:00 AM 12-May	740.64			-11.36	745.00	-4.36	
BINGA	6:00 AM 13-May	569.13	-0.76	575.00	-5.87	565.00	4.13	
	6:00 AM 12-May	569.89			-5.11	565.00	4.89	
SAN ROQUE	6:00 AM 13-May	238.30	-0.18	280.00	-41.70	237.90	0.40	
	6:00 AM 12-May	238.48			-41.52	238.06	0.42	
PANTABANGAN	6:00 AM 13-May	182.01	0.02	216.00	-33.99	199.25	-17.24	
	6:00 AM 12-May	181.99			-34.01	199.26	-17.27	
MAGAT	6:00 AM 13-May	168.84	-0.17	193.00	-24.16	175.90	-7.06	
	6:00 AM 12-May	169.01			-23.99	176.01	-7.00	
CALIRAYA	6:00 AM 13-May	286.90	-0.12	288.00	-1.10	-	-	
	6:00 AM 12-May	287.02			-0.98	-		

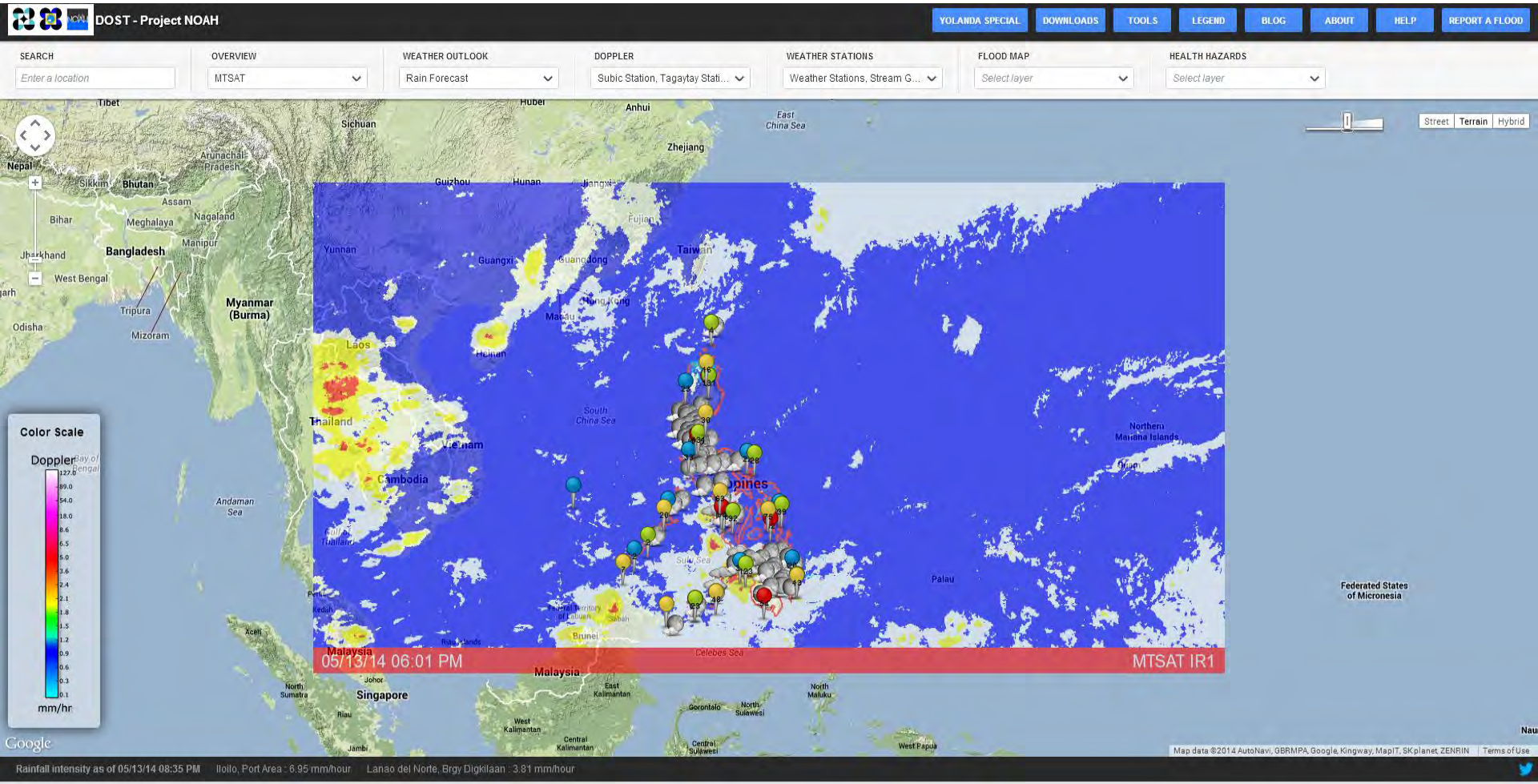
SRE/RAB/JESC

Trend for the past 24 hours:
+ Deviation indicates increase from previous WL
- Deviation indicates decrease from previous WL

Data Source: Dam Operating/Managing Agencies

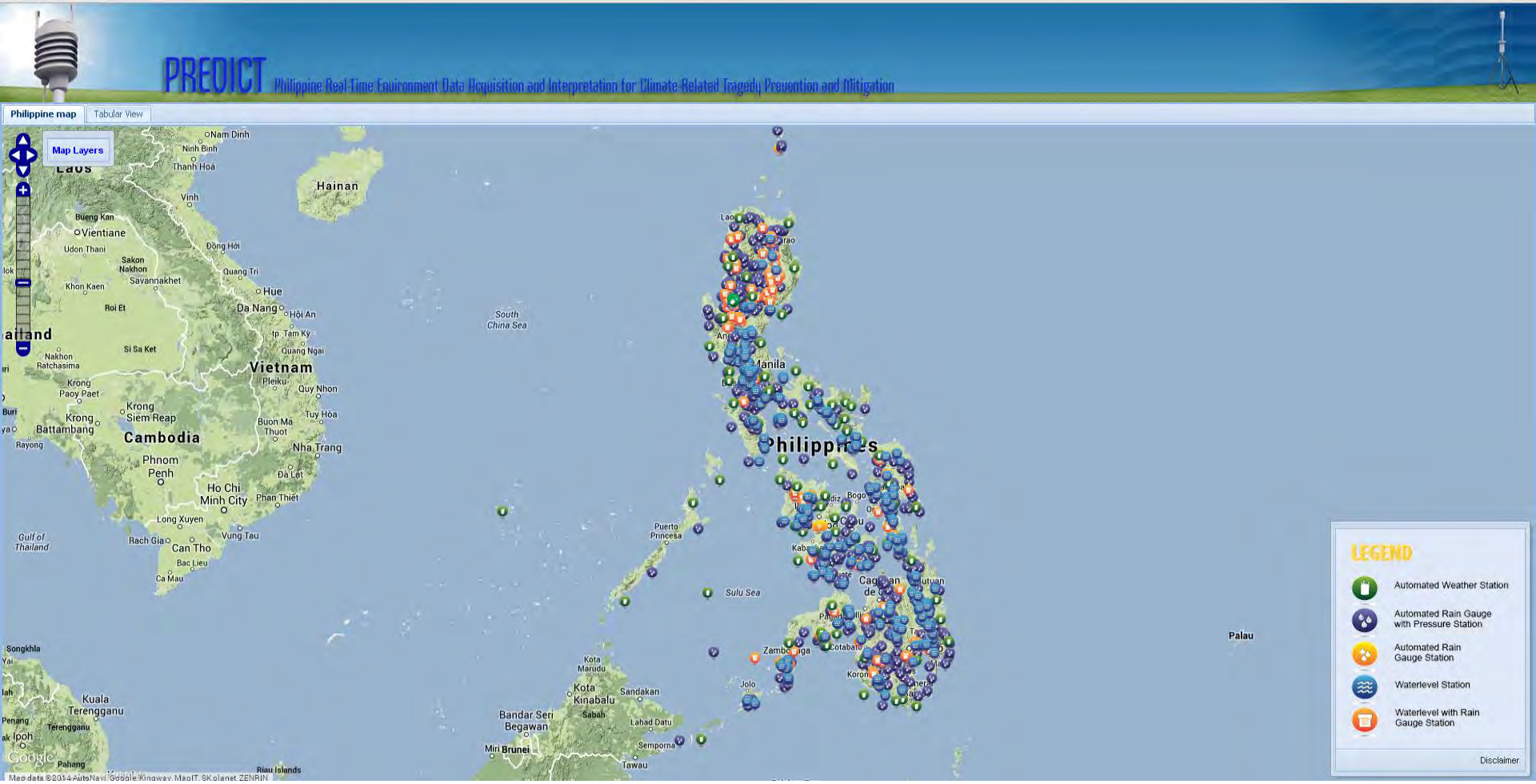
www.pagasa.dost.gov.ph/hydrometeorology/services/status-of-monitored-dams

Project Noah



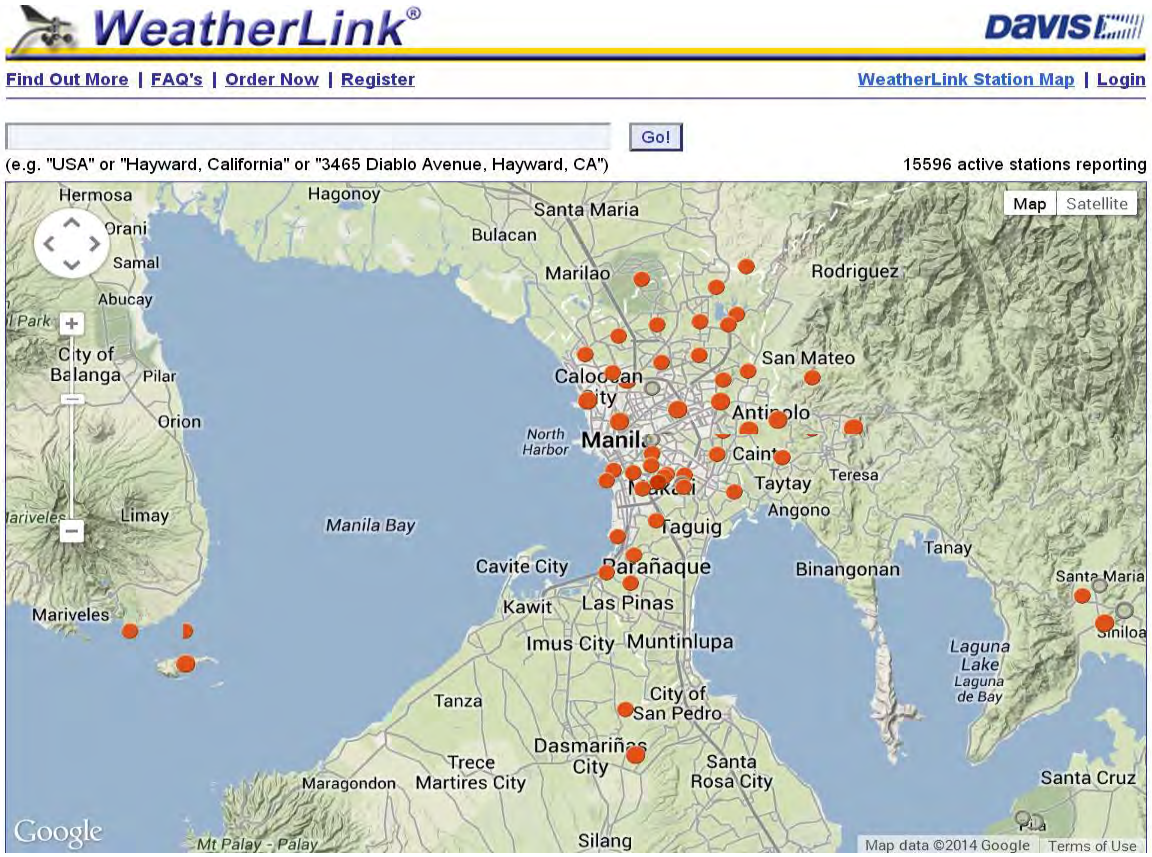
Noah.dost.gov.ph

ASTI - DOST



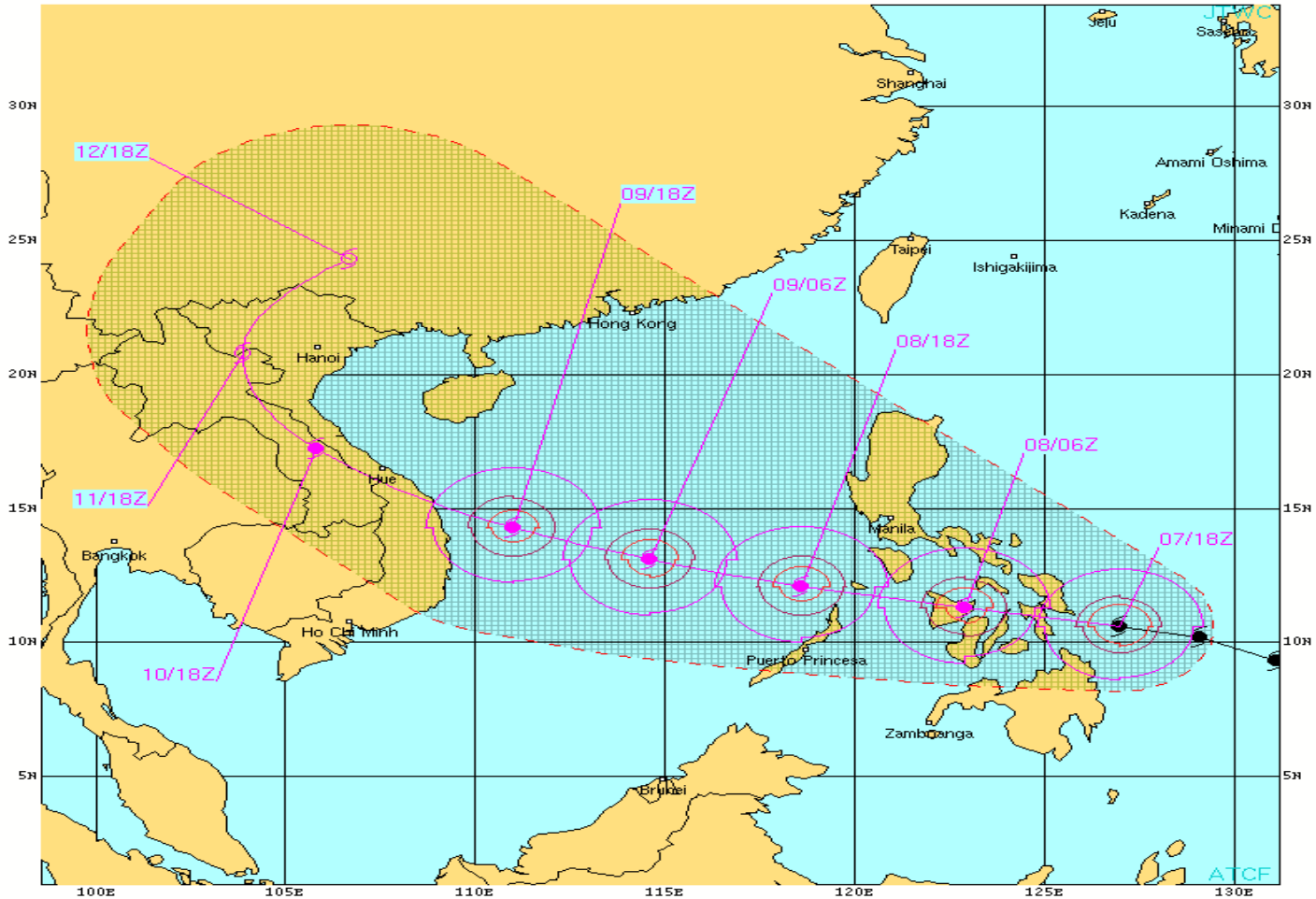
fmon.asti.dost.gov.ph

Weatherlink



www.weatherlink.com

NRL - Monterey



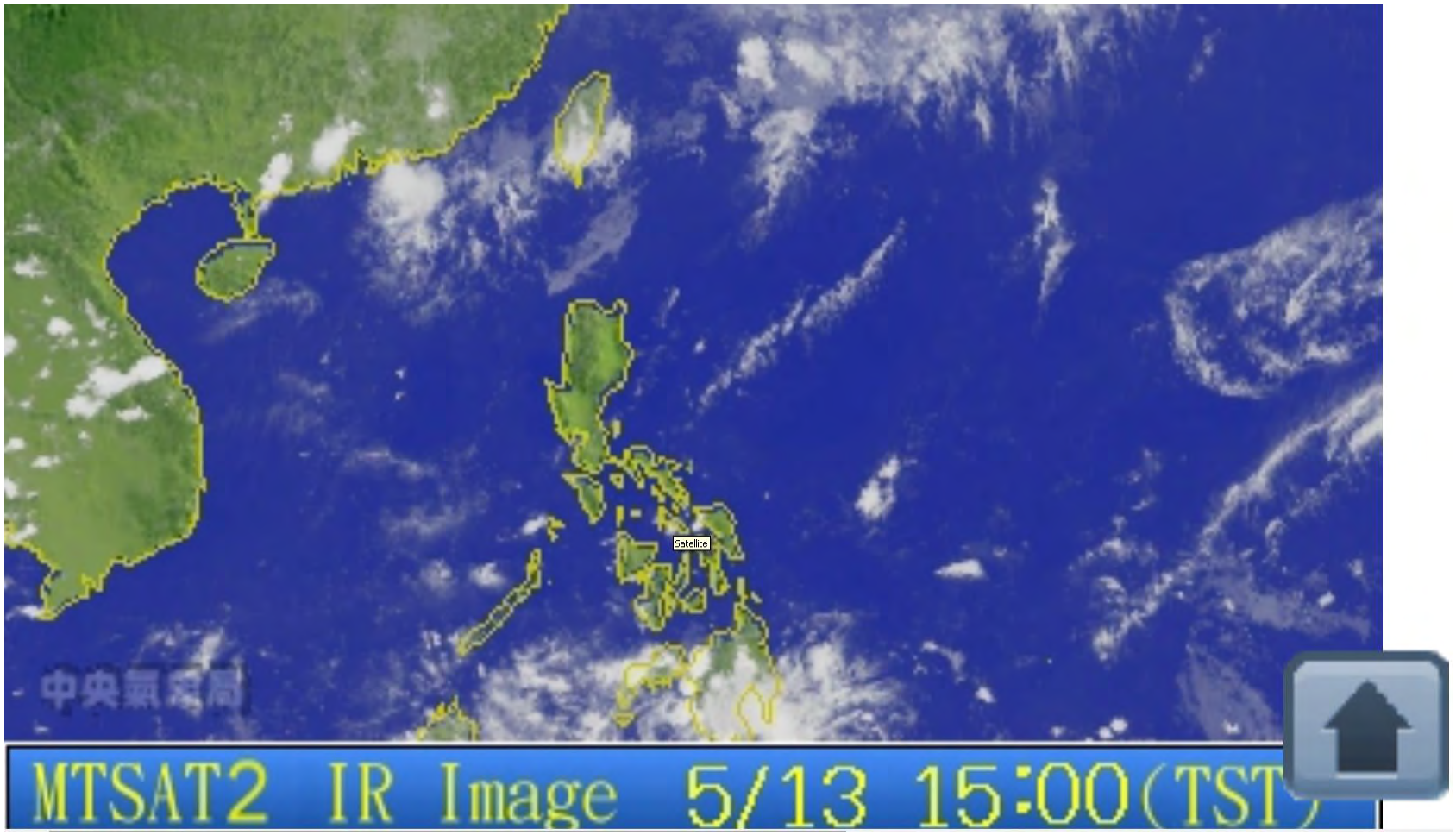
SUPER TYPHOON 31W (HAIYAN) WARNING #19
WTPN33 PGTW 072100
071800Z POSIT: NEAR 10.6N 127.0E
MOVING 280 DEGREES TRUE AT 21 KNOTS
MAXIMUM SIGNIFICANT WAVE HEIGHT: 50 FEET
07/18Z, WINDS 170 KTS, GUSTS TO 205 KTS
08/06Z, WINDS 145 KTS, GUSTS TO 175 KTS
08/18Z, WINDS 135 KTS, GUSTS TO 165 KTS
09/06Z, WINDS 125 KTS, GUSTS TO 150 KTS
09/18Z, WINDS 110 KTS, GUSTS TO 135 KTS
10/18Z, WINDS 065 KTS, GUSTS TO 080 KTS
11/18Z, WINDS 045 KTS, GUSTS TO 055 KTS
12/18Z, WINDS 040 KTS, GUSTS TO 050 KTS

CPA TO:	NM	DTG
ZAMBOANGA	268	08/06Z
MANILA	175	08/13Z
SUBIC_BAY	177	08/15Z
PUERTO_PRINCESA	139	08/16Z
HO_CHI_MINH_CITY	295	10/02Z
DA_NANG	23	10/06Z
HANOI	108	12/00Z

BEARING AND DISTANCE	DIR	DIST (NM)	TAU (HRS)
MANILA	223	205	24
PUERTO_PRINCESA	358	144	24
SUBIC_BAY	210	187	24
ZAMBOANGA	327	374	24

◇ LESS THAN 34 KNOTS
◯ 34-63 KNOTS
● MORE THAN 63 KNOTS
PAST 6 HOURLY CYCLONE POSITS IN BLACK
FORECAST CYCLONE POSITS IN COLOR

CENTRAL WEATHER BUREAU OF TAIWAN

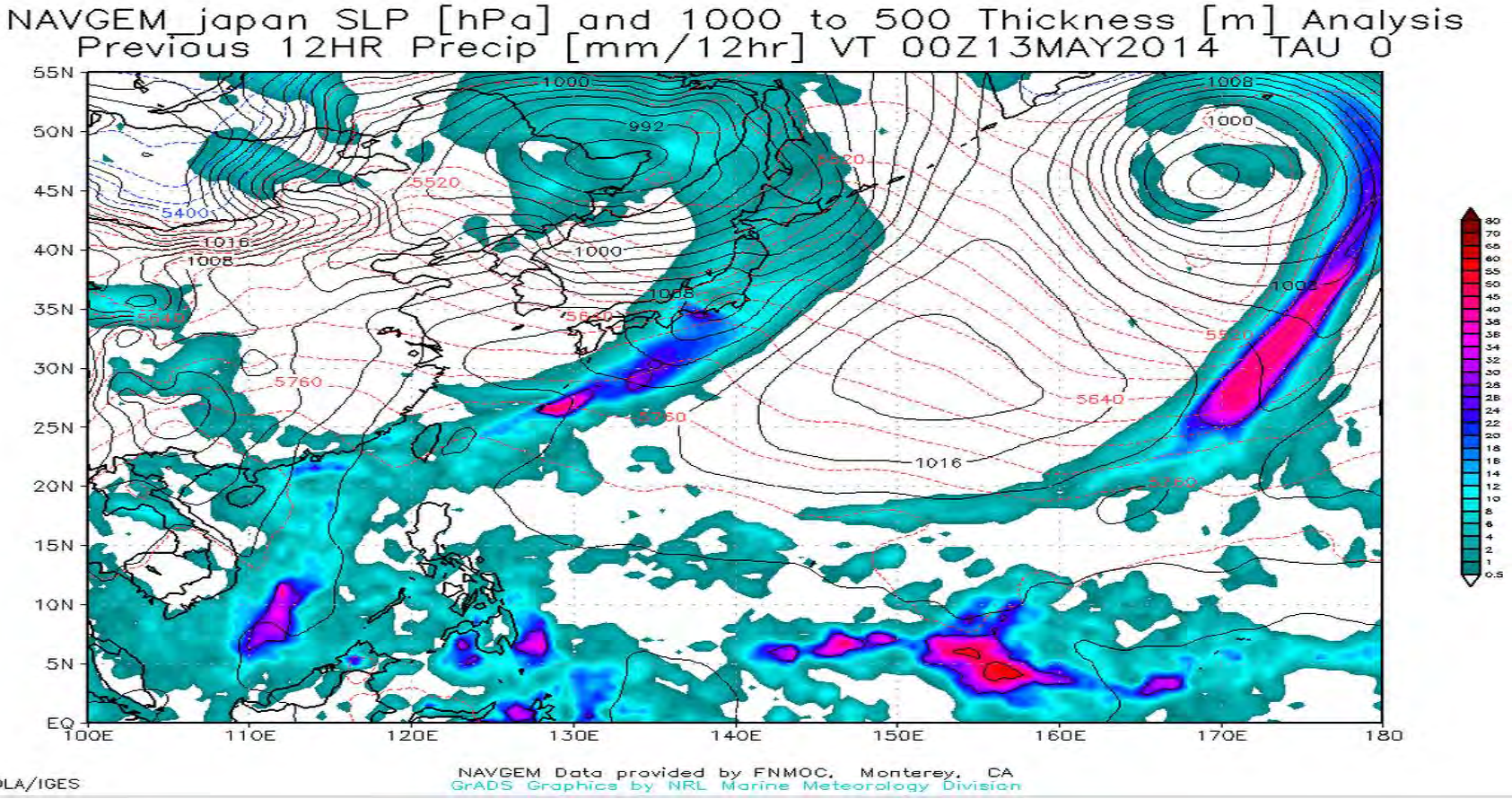


www.cwb.gov.tw/V7e/observe/satellite/Sat_EA.htm /

FNMOC

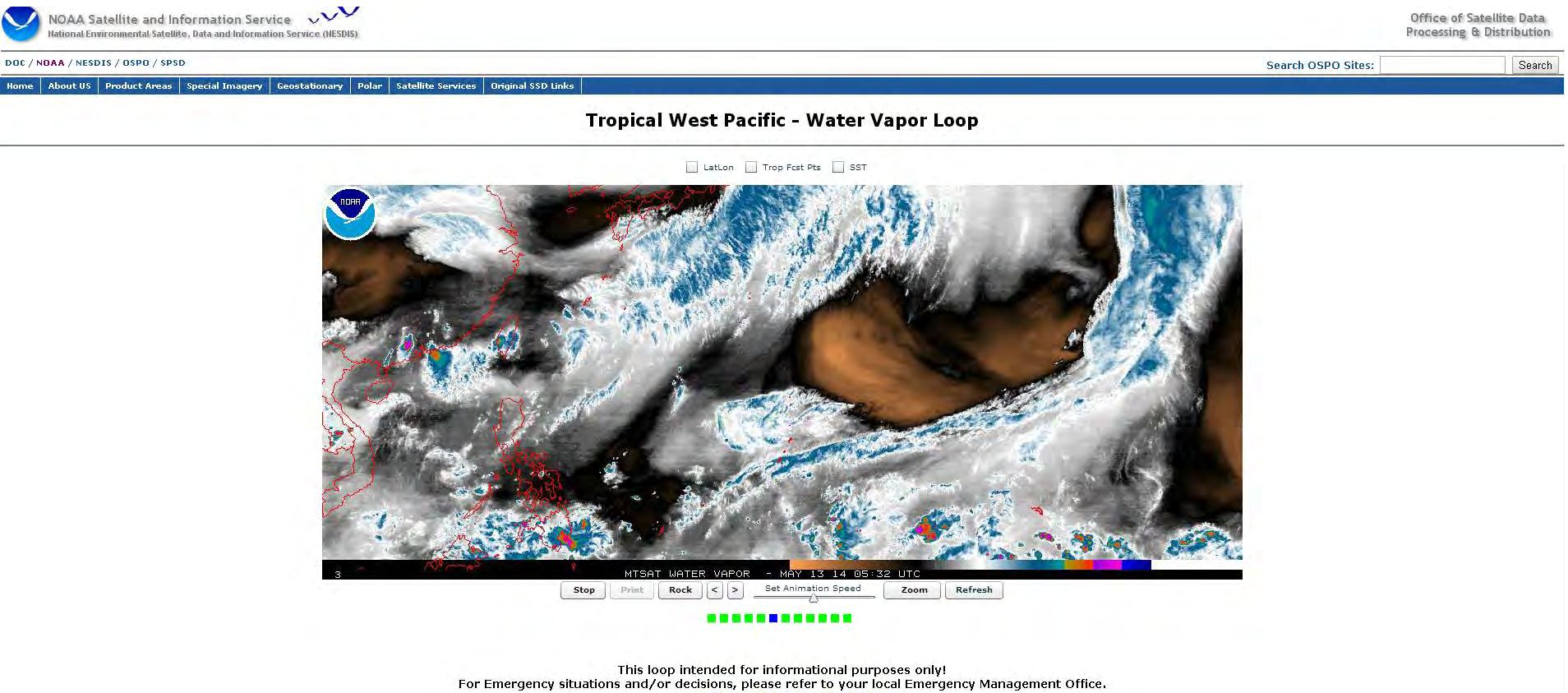
(Fleet Numerical Meteorology and Oceanography Center)

NOGAPS Japan Tau 00 SLP and Thickness

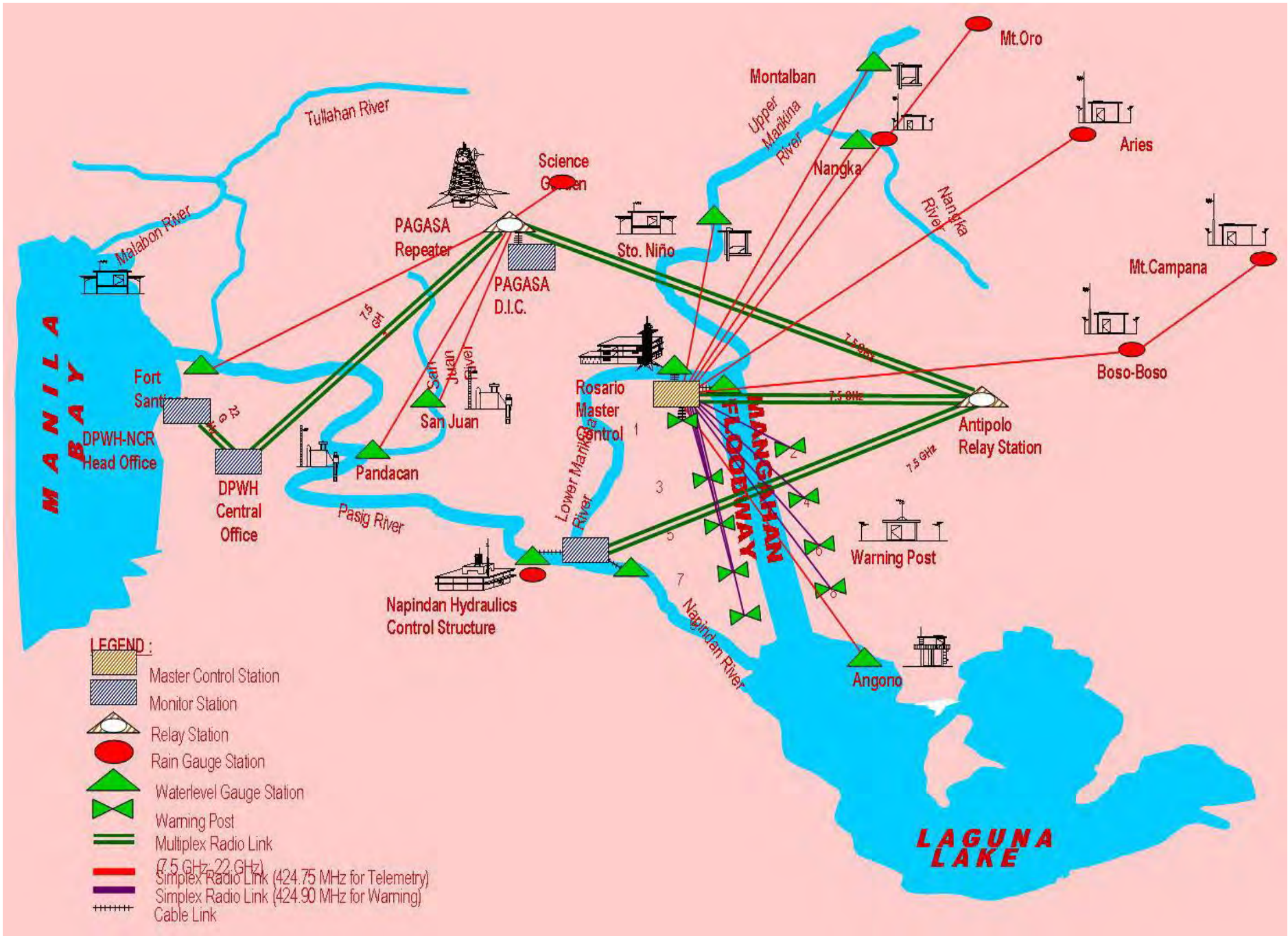


www.nrlmry.navy.mil/metoc/nogaps/NOG_japan_alltau_slpt.html

NOAA PRODUCTS



www.ssd.noaa.gov/mtsat/twpac/flash-wv.html


MANILA BAY
Malabon River
Tullahan River
Fort Santiago
DPWH-NCR Head Office
DPWH Central Office
PAGASA Repeater
PAGASA D.I.C.
Science Garden
Pandacan
Pasig River
San Juan River
San Juan
Sto. Niño
Rosario Master Control
Lower Marikina River
Napindan Hydraulics Control Structure
Napindan River
MANGGAHAN FLOODWAY
Montalban
Upper Marikina River
Nangka
Nangka River
Mt.Oro
Aries
Mt.Campana
Boso-Boso
Antipolo Relay Station
Warning Post
Angono
LAGUNA LAKE
7.5 GHz
LEGEND :
Master Control Station
Monitor Station
Relay Station
Rain Gauge Station
Waterlevel Gauge Station
Warning Post
Multiplex Radio Link (7.5 GHz, 22 GHz)
Simplex Radio Link (424.75 MHz for Telemetry)
Simplex Radio Link (424.90 MHz for Warning)
Cable Link

METRO MANILA EMERGENCY COMMUNICATIONS NETWORK

MMDA FLOOD CONTROL & SEW MGT OFFICE

MMDA EFCOS & PUMPING STATIONS

MMDA FCSMO
District Opns Engineers

10 Flood Ctrl Bayanihan Zone Alliances

17 Metro LGUs

NDRRMOC

GMA 7

THREATENED OR AFFECTED COMMUNITIES AND GENERAL PUBLIC

MM DRRMC Action Agencies

Volunteers

MMDA Metro Base

MMDA FCIC/ MMDRRMOC

MM Emergency Strike Force

Other MMDA Operating Units

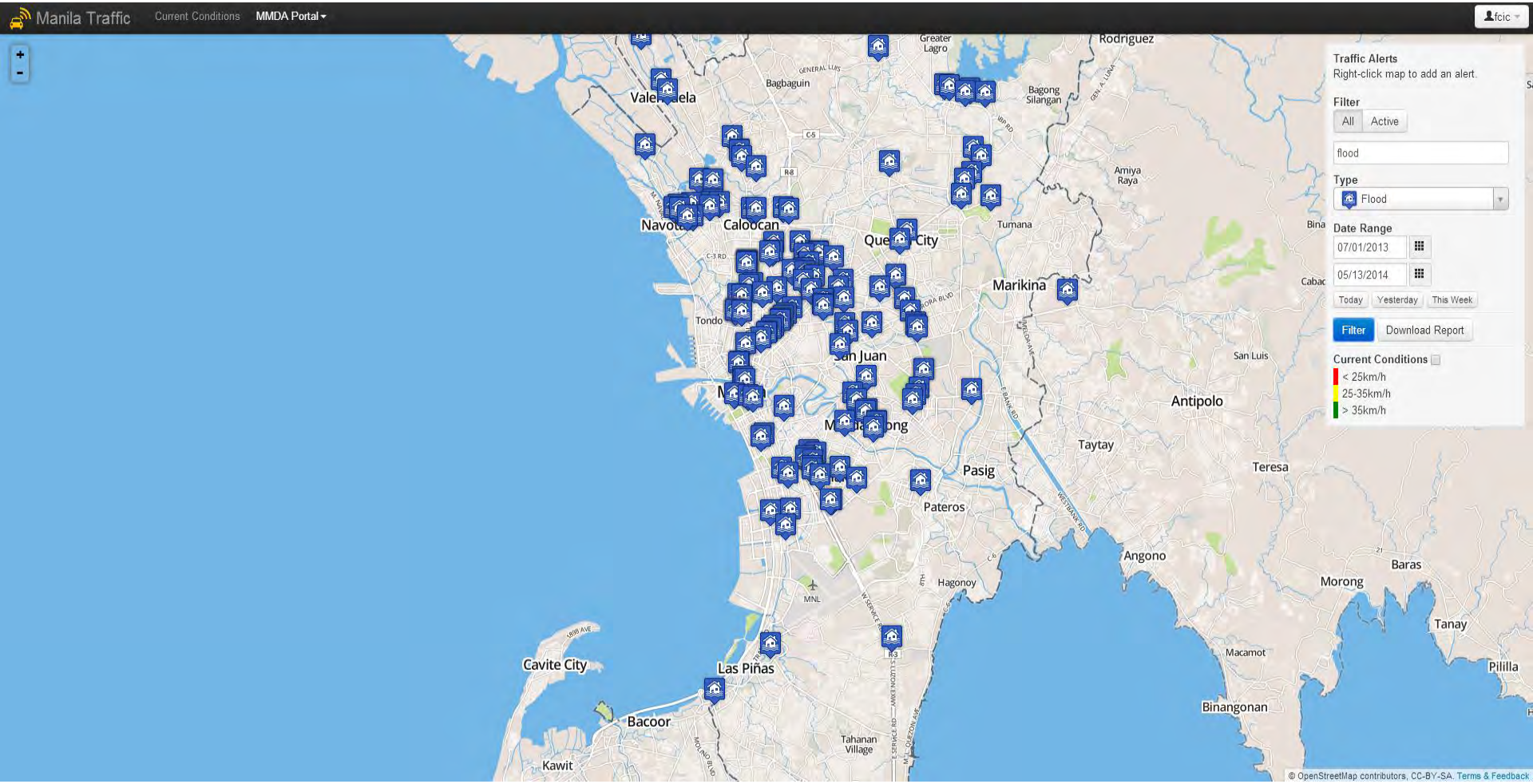
HPSEPO Pub Sfty Div Emerg Response Group

TDO Road Emergency Group

Task Force "UNOS"

Task Force 'RAINBOW"

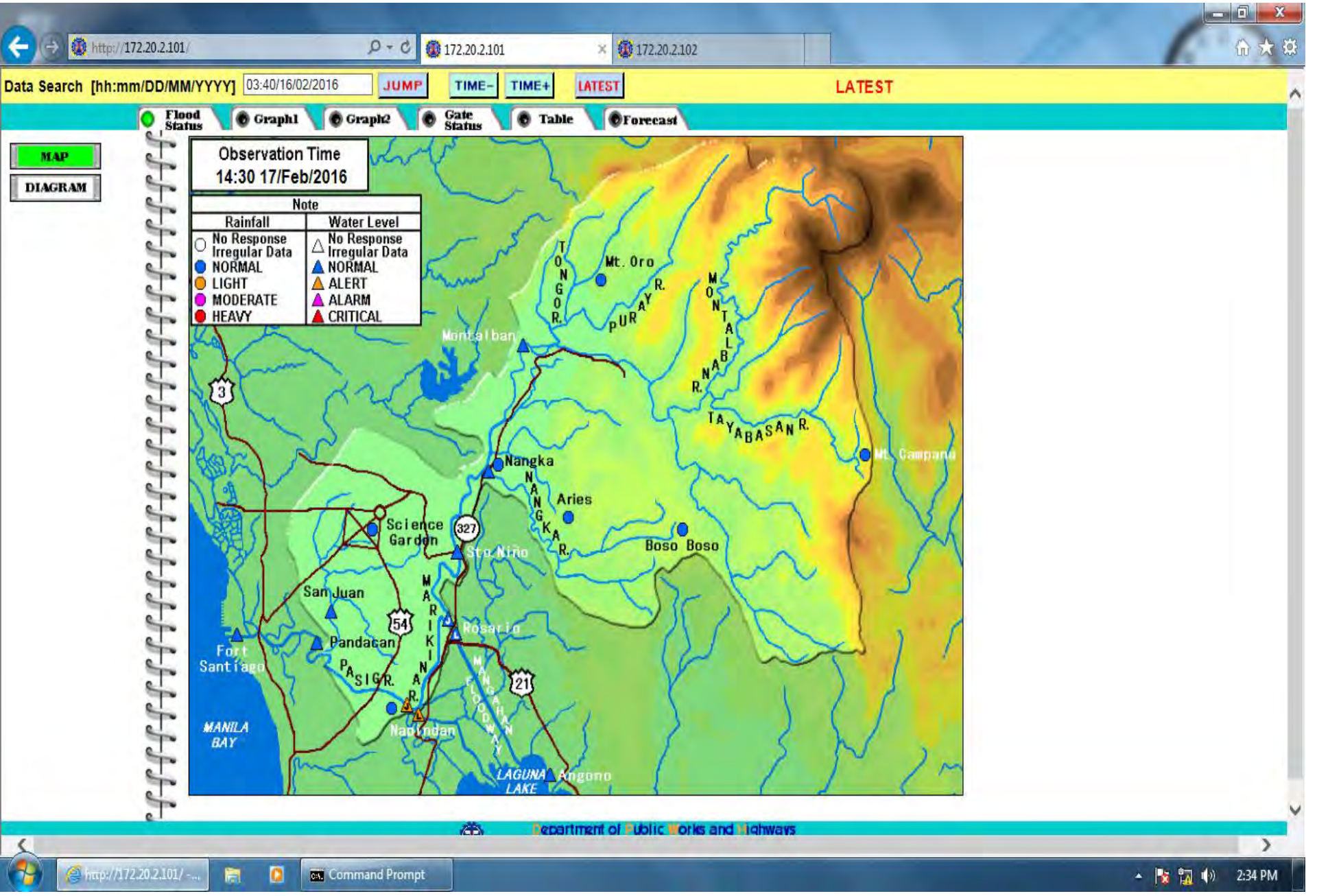
Incident Mapping



mmda.dev.conveyal.com

ISSUES AND NEEDS PRESENTED TO WORLD BANK, 4 JUNE 2014

- Latency of Information-crucial to timely decision and credibility
- Almost real-time links to data source to serves as trigger of timely action and response prior to processed warning from PAGASA (such as Doppler Radar, Project Noah, etc…)
- Improved Platform for Plotting and Sharing Information and Actions that can be viewed by numerous stakeholders
- Improved archiving and reporting application to aid flood control measures programming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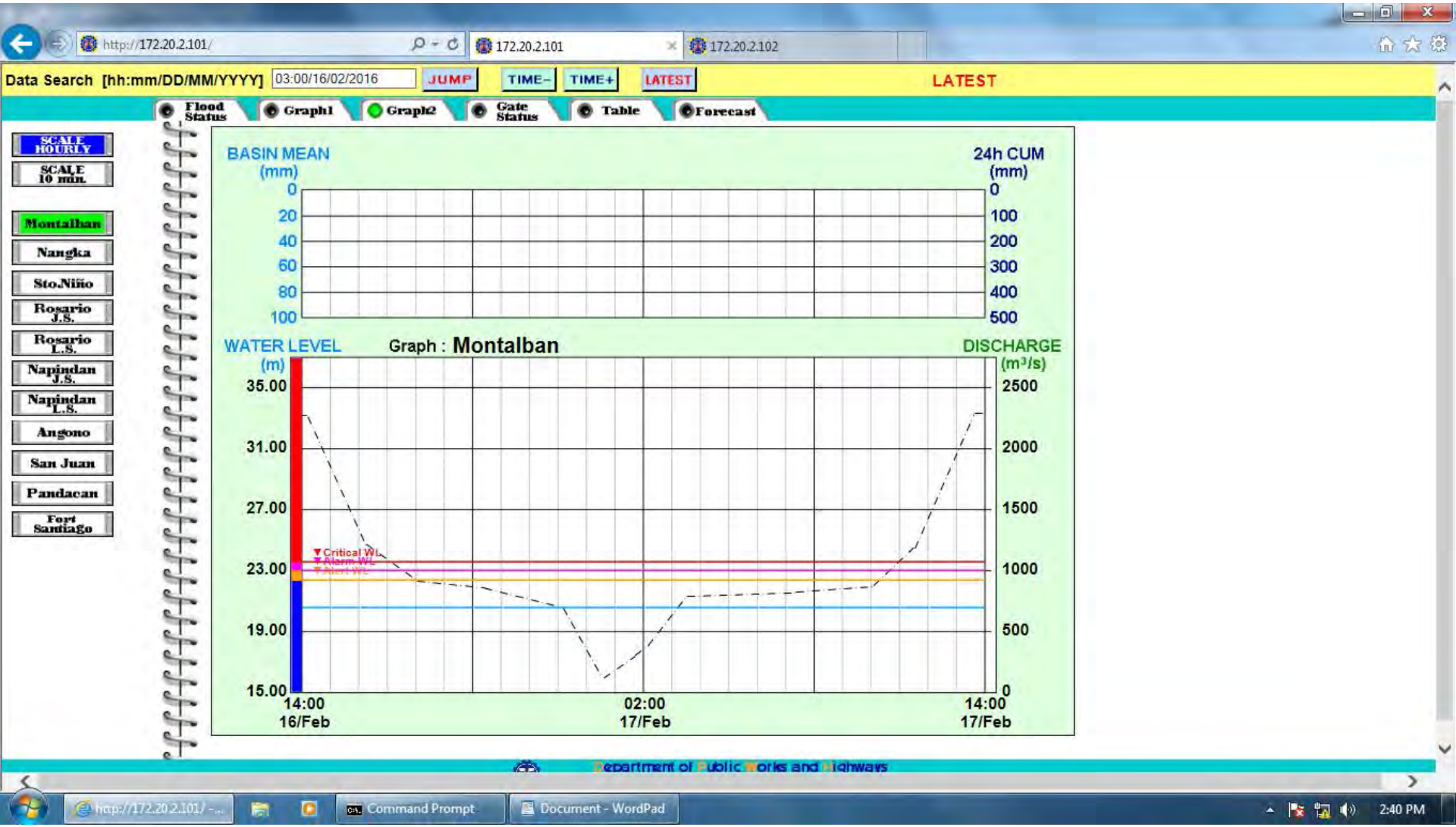
172.20.2.101
172.20.2.102
Data Search [hh:mm/DD/MM/YYYY]
03:40/16/02/2016
JUMP
TIME-
TIME+
LATEST
LATEST
Flood Status
Graph1
Graph2
Gate Status
Table
Forecast
MAP
DIAGRAM
Observation Time
14:30 17/Feb/2016
Note
Rainfall
No Response
Irregular Data
NORMAL
LIGHT
MODERATE
HEAVY
Water Level
No Response
Irregular Data
NORMAL
ALERT
ALARM
CRITICAL
Montalban
Mt. Oro
TONGOR.
PURAY R.
MONTALBAN R.
TAYABASAN R.
Mt. Campana
Nangka
NANGKA R.
Aries
Boso Boso
Science Garden
Sto.Niño
San Juan
Pandacan
Fort Santiago
PASIG R.
MARIKINA R.
Rosario
Napindan
MANILA BAY
MANGGAHAN FLOODWAY
LAGUNA LAKE
Angono
3
54
327
21
Department of Public Works and Highways
Command Prompt
2:34 PM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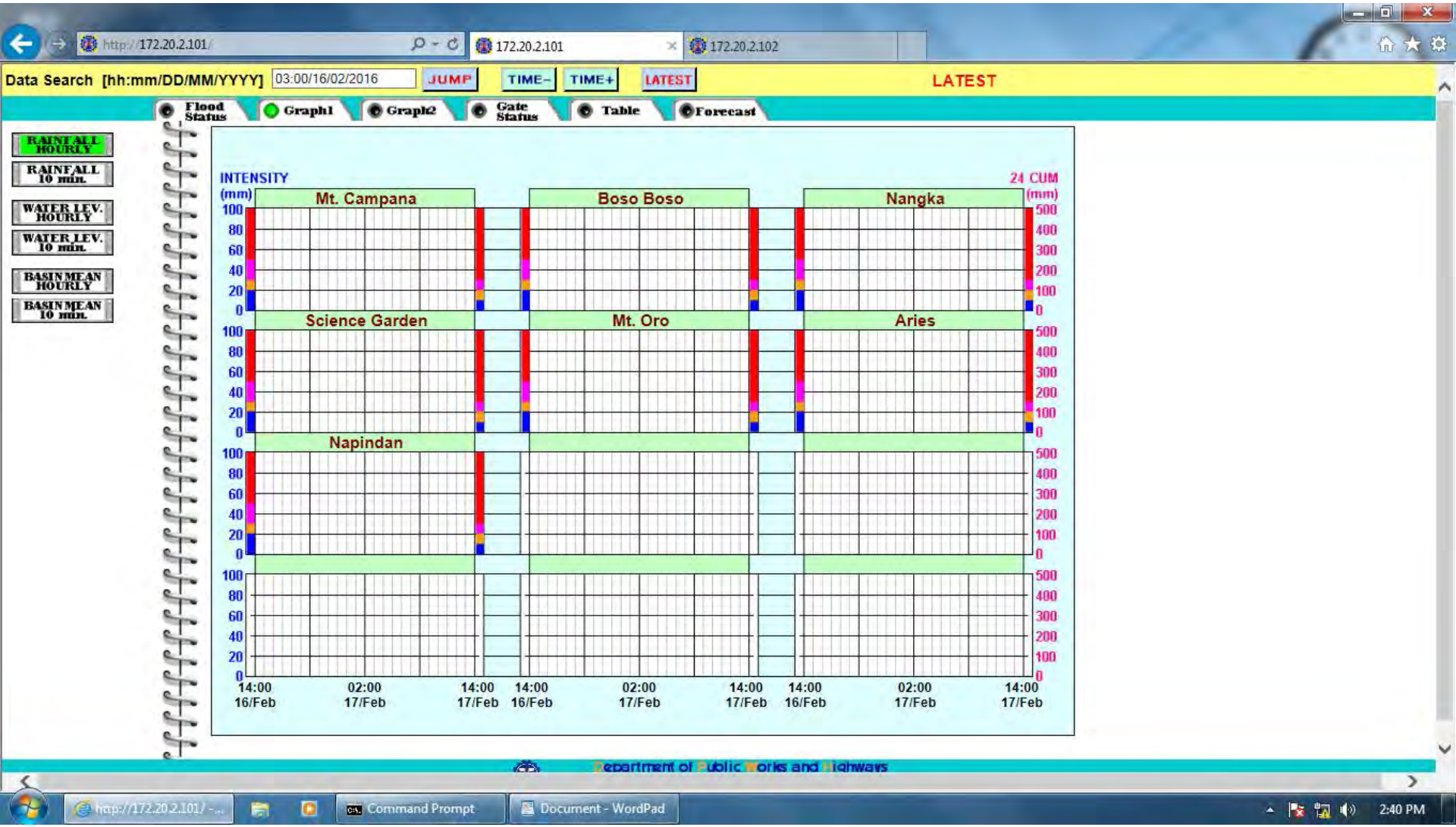
Data Search [hh:mm/DD/MM/YYYY]
03:00/16/02/2016
JUMP
TIME-
TIME+
LATEST
LATEST
Flood Status
Graph1
Graph2
Gate Status
Table
Forecast
SCALE HOURLY
SCALE 10 min.
Montalban
Nangka
Sto.Niño
Rosario J.S.
Rosario L.S.
Napindan J.S.
Napindan L.S.
Angono
San Juan
Pandacan
Fort Santiago
BASIN MEAN
(mm)
0
20
40
60
80
100
24h CUM
(mm)
0
100
200
300
400
500
WATER LEVEL
Graph : Montalban
DISCHARGE
(m³/s)
(m)
35.00
31.00
27.00
23.00
19.00
15.00
2500
2000
1500
1000
500
0
Critical WL
Alarm WL
14:00
16/Feb
02:00
17/Feb
14:00
17/Feb
Department of Public Works and Highways
Command Prompt
Document - WordPad
2:40 PM


http://172.20.2.101/
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Data Search [hh:mm/DD/MM/YYYY]
03:00/16/02/2016
JUMP
TIME-
TIME+
LATEST
LATEST
Flood Status
Graph1
Graph2
Gate Status
Table
Forecast
RAINFALL HOURLY
RAINFALL 10 min.
WATER LEV. HOURLY
WATER LEV. 10 min.
BASIN MEAN HOURLY
BASIN MEAN 10 min.
INTENSITY (mm)
24 CUM (mm)
Mt. Campana
Boso Boso
Nangka
Science Garden
Mt. Oro
Aries
Napindan
100
80
60
40
20
0
500
400
300
200
100
0
14:00 16/Feb
02:00 17/Feb
14:00 17/Feb
14:00 16/Feb
02:00 17/Feb
14:00 17/Feb
14:00 16/Feb
02:00 17/Feb
14:00 17/Feb
Department of Public Works and Highways
Command Prompt
Document - WordPad
2:40 PM

http://172.20.2.101/ | 172.20.2.101 | 172.20.2.102

Data Search [hh:mm/DD/MM/YYYY] 03:40/16/02/2016 JUMP TIME- TIME+ LATEST LATEST

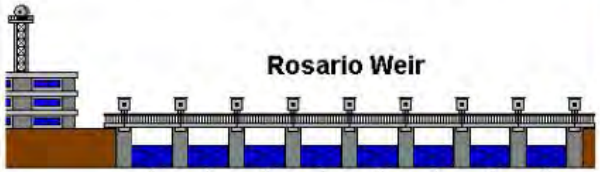
Flood Status | Graph1 | Graph2 | Gate Status | Table | Forecast

RosarioWeir Status
RosarioWeir OP. Chart
NapindanWeir Status
NapindanWeir OP. Chart

Observation Time
14:40 17/Feb/2016

Gate State

Last Operation Time : 14:34 28/Jan/2016

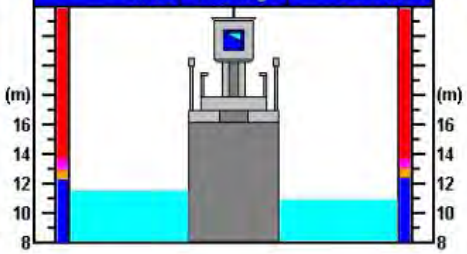


(Junction Side View)

Full Open
Open
Full Close
Error

Water Level &Discharge

Junction Side		Lake Side
11.63 m	Water Level	10.96 m
--- m³/s	Discharge	0.00 m³/s



Department of Public Works and Highways

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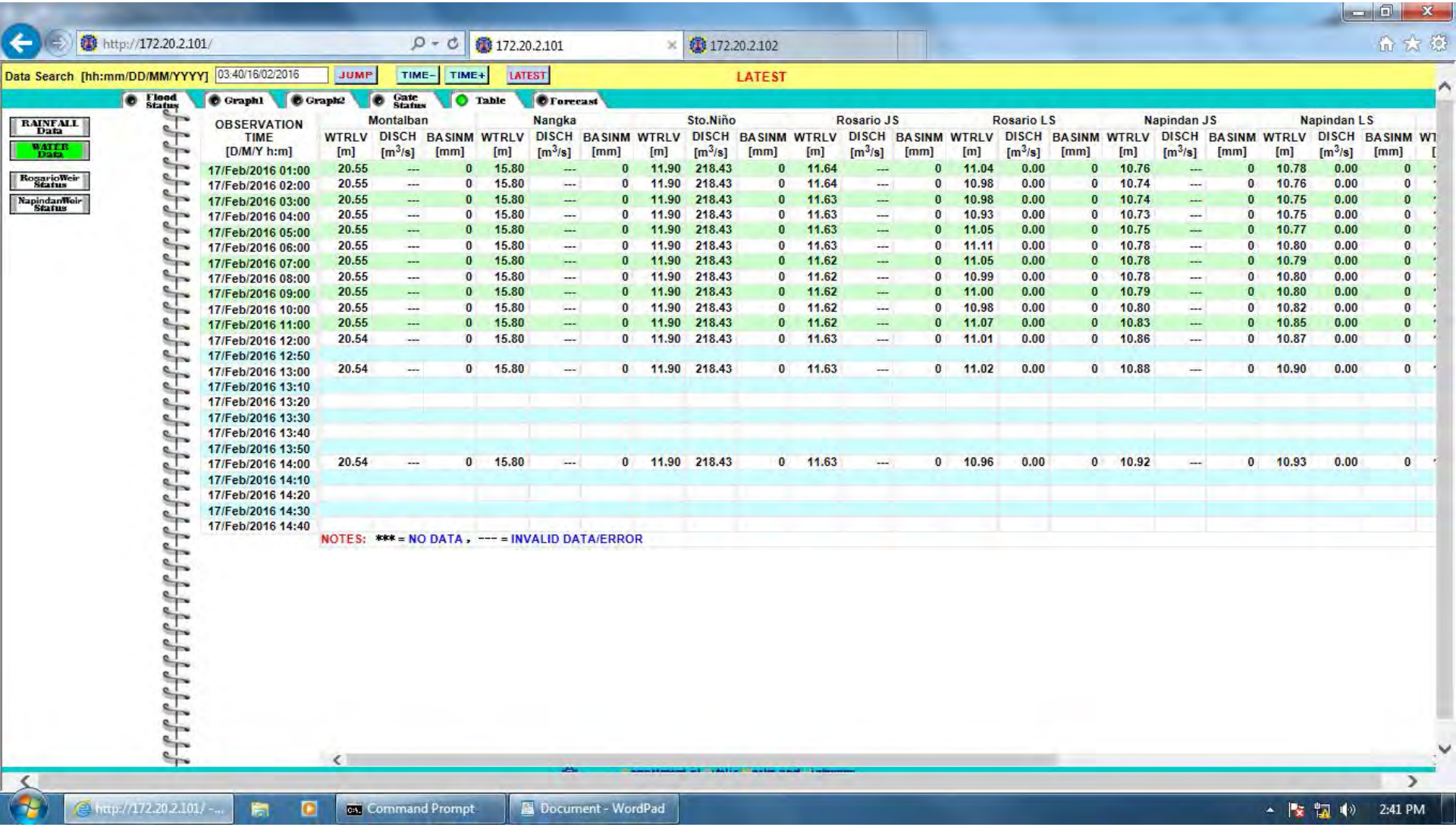
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172.20.2.101
172.20.2.102
Data Search [hh:mm/DD/MM/YYYY] 03:40/16/02/2016
JUMP
TIME-
TIME+
LATEST
LATEST
Flood Status
Graph1
Graph2
Gate Status
Table
Forecast
RAINFALL Data
WATER Data
RogarioWeir Status
NapindanWeir Status
OBSERVATION TIME [D/M/Y h:m]
Montalban
Nangka
Sto.Niño
Rosario JS
Rosario LS
Napindan JS
Napindan LS
WTRLV [m]
DISCH [m3/s]
BASINM [mm]
17/Feb/2016 01:00 20.55 --- 0 15.80 --- 0 11.90 218.43 0 11.64 --- 0 11.04 0.00 0 10.76 --- 0 10.78 0.00 0
17/Feb/2016 02:00 20.55 --- 0 15.80 --- 0 11.90 218.43 0 11.64 --- 0 10.98 0.00 0 10.74 --- 0 10.76 0.00 0
17/Feb/2016 03:00 20.55 --- 0 15.80 --- 0 11.90 218.43 0 11.63 --- 0 10.98 0.00 0 10.74 --- 0 10.75 0.00 0
17/Feb/2016 04:00 20.55 --- 0 15.80 --- 0 11.90 218.43 0 11.63 --- 0 10.93 0.00 0 10.73 --- 0 10.75 0.00 0
17/Feb/2016 05:00 20.55 --- 0 15.80 --- 0 11.90 218.43 0 11.63 --- 0 11.05 0.00 0 10.75 --- 0 10.77 0.00 0
17/Feb/2016 06:00 20.55 --- 0 15.80 --- 0 11.90 218.43 0 11.63 --- 0 11.11 0.00 0 10.78 --- 0 10.80 0.00 0
17/Feb/2016 07:00 20.55 --- 0 15.80 --- 0 11.90 218.43 0 11.62 --- 0 11.05 0.00 0 10.78 --- 0 10.79 0.00 0
17/Feb/2016 08:00 20.55 --- 0 15.80 --- 0 11.90 218.43 0 11.62 --- 0 10.99 0.00 0 10.78 --- 0 10.80 0.00 0
17/Feb/2016 09:00 20.55 --- 0 15.80 --- 0 11.90 218.43 0 11.62 --- 0 11.00 0.00 0 10.79 --- 0 10.80 0.00 0
17/Feb/2016 10:00 20.55 --- 0 15.80 --- 0 11.90 218.43 0 11.62 --- 0 10.98 0.00 0 10.80 --- 0 10.82 0.00 0
17/Feb/2016 11:00 20.55 --- 0 15.80 --- 0 11.90 218.43 0 11.62 --- 0 11.07 0.00 0 10.83 --- 0 10.85 0.00 0
17/Feb/2016 12:00 20.54 --- 0 15.80 --- 0 11.90 218.43 0 11.63 --- 0 11.01 0.00 0 10.86 --- 0 10.87 0.00 0
17/Feb/2016 12:50
17/Feb/2016 13:00 20.54 --- 0 15.80 --- 0 11.90 218.43 0 11.63 --- 0 11.02 0.00 0 10.88 --- 0 10.90 0.00 0
17/Feb/2016 13:10
17/Feb/2016 13:20
17/Feb/2016 13:30
17/Feb/2016 13:40
17/Feb/2016 13:50
17/Feb/2016 14:00 20.54 --- 0 15.80 --- 0 11.90 218.43 0 11.63 --- 0 10.96 0.00 0 10.92 --- 0 10.93 0.00 0
17/Feb/2016 14:10
17/Feb/2016 14:20
17/Feb/2016 14:30
17/Feb/2016 14:40
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http://172.20.2.101/ | 172.20.2.101 | 172.20.2.102

Data Search [hh:mm/DD/MM/YYYY] 03:40/16/02/2016 JUMP TIME- TIME+ LATEST

LATEST

Flood Status | Graph1 | Graph2 | Gate Status | Table | Forecast

RAINFALL Data
WATER Data
RosarioWeir Status
NapindanWeir Status

OBSERVATION TIME [D/M/Y h:m]	Mt.Campana		Boso Boso		Nangka		Science Garden		Mt.Oro		Aries		Napindan	
	INTEN [mm]	CUM RF [mm]	INTEN [mm]	CUM RF [mm]	INTEN [mm]	CUM RF [mm]	INTEN [mm]	CUM RF [mm]	INTEN [mm]	CUM RF [mm]	INTEN [mm]	CUM RF [mm]	INTEN [mm]	CUM RF [mm]
17/Feb/2016 01:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17/Feb/2016 02:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17/Feb/2016 03:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17/Feb/2016 04:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17/Feb/2016 05:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17/Feb/2016 06:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17/Feb/2016 07:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17/Feb/2016 08:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17/Feb/2016 09:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17/Feb/2016 10:00	0	0	0	0	0	0	0	0	***	0	0	0	0	0
17/Feb/2016 11:00	0	0	0	0	0	0	0	0	***	0	0	0	0	0
17/Feb/2016 12:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17/Feb/2016 12:50														
17/Feb/2016 13:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17/Feb/2016 13:10														
17/Feb/2016 13:20														
17/Feb/2016 13:30														
17/Feb/2016 13:40														
17/Feb/2016 13:50														
17/Feb/2016 14:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17/Feb/2016 14:10														
17/Feb/2016 14:20														
17/Feb/2016 14:30														
17/Feb/2016 14:40														

NOTES: *** = NO DATA , --- = INVALID DATA/ERROR

Department of Public Works and Highways

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Observations

Rainfall

- Aries
- Boso Boso
- Mt. Campana
- Mt. Oro
- Nangka
- Napindan
- Science Garden

Water Level

- Angono
- Fort Santiago
- Montalban
- Nangka
- Napindan DS
- Napindan US
- Pandacan
- Rosario DS
- Rosario US
- San Juan
- Sto Nino

Discharge

- Fort Santiago
- Montalban
- Nangka
- Napindan DS
- Napindan US
- Pandacan
- Rosario DS
- Rosario US
- San Juan
- Sto Nino

Gate Levels

- Napindan1
- Napindan2
- Napindan3
- Napindan4
- Rosario1
- Rosario2
- Rosario3
- Rosario4
- Rosario5
- Rosario6
- Rosario7
- Rosario8

Forecasts

Catchment Rainfall

- Lower Pasig River
- Upper Pasig River

Water Level

- Angono
- Fort Santiago
- Montalban
- Nangka
- Napindan DS
- Napindan US
- Pandacan
- Rosario DS
- Rosario US
- San Juan
- Sto Nino

Discharge

- Fort Santiago
- Montalban
- Nangka
- Napindan DS
- Napindan US
- Pandacan
- Rosario DS
- Rosario US
- San Juan
- Sto Nino

Gate Levels

- Napindan1
- Napindan2
- Napindan3
- Napindan4
- Rosario1
- Rosario2
- Rosario3
- Rosario4
- Rosario5
- Rosario6
- Rosario7
- Rosario8

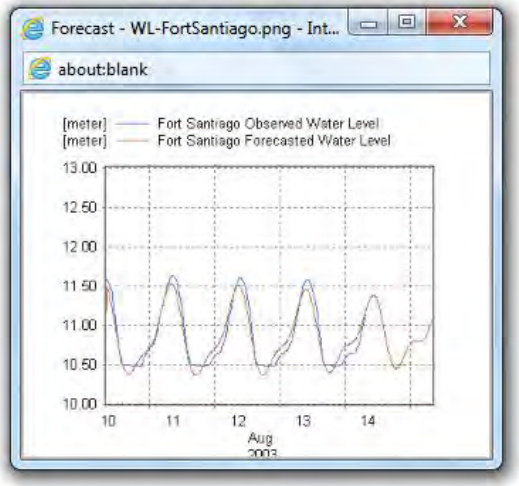
Maps and Bulletins

Maps

Rainfall Status
Water Level Status
Rainfall Map

Bulletins

Water Level Status



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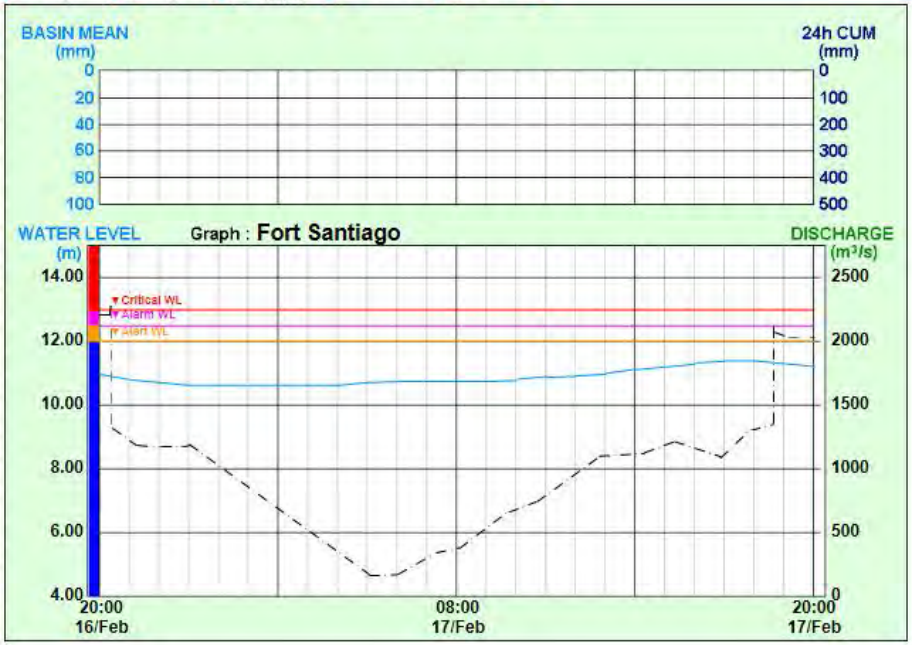
Data Search [hh:mm/DD/MM/YYYY] 16:00/26/09/2009 JUMP TIME− TIME+ LATEST LATEST

Flood Status | Graph1 | Graph2 | Gate Status | Table | Forecast

SCALE HOURLY
SCALE 10 min.

Montalban
Nangka
Sto.Niño
Rosario J.S.
Rosario L.S.
Napindan J.S.
Napindan L.S.
Angono
San Juan
Pandacan
Fort Santiago



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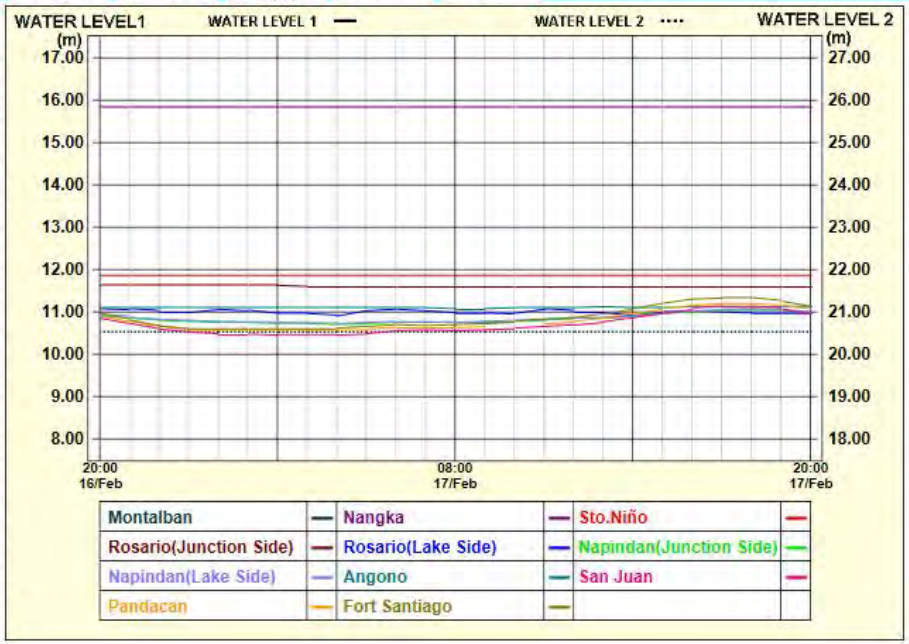
Data Search [hh:mm/DD/MM/YYYY] 16:00/26/09/2009 JUMP TIME- TIME+ LATEST LATEST

Flood Status | Graph1 | Graph2 | Gate Status | Table | Forecast

RAINFALL HOURLY
RAINFALL 10 min.
WATER LEV. HOURLY
WATER LEV. 10 min.
BASIN MEAN HOURLY
BASIN MEAN 10 min.



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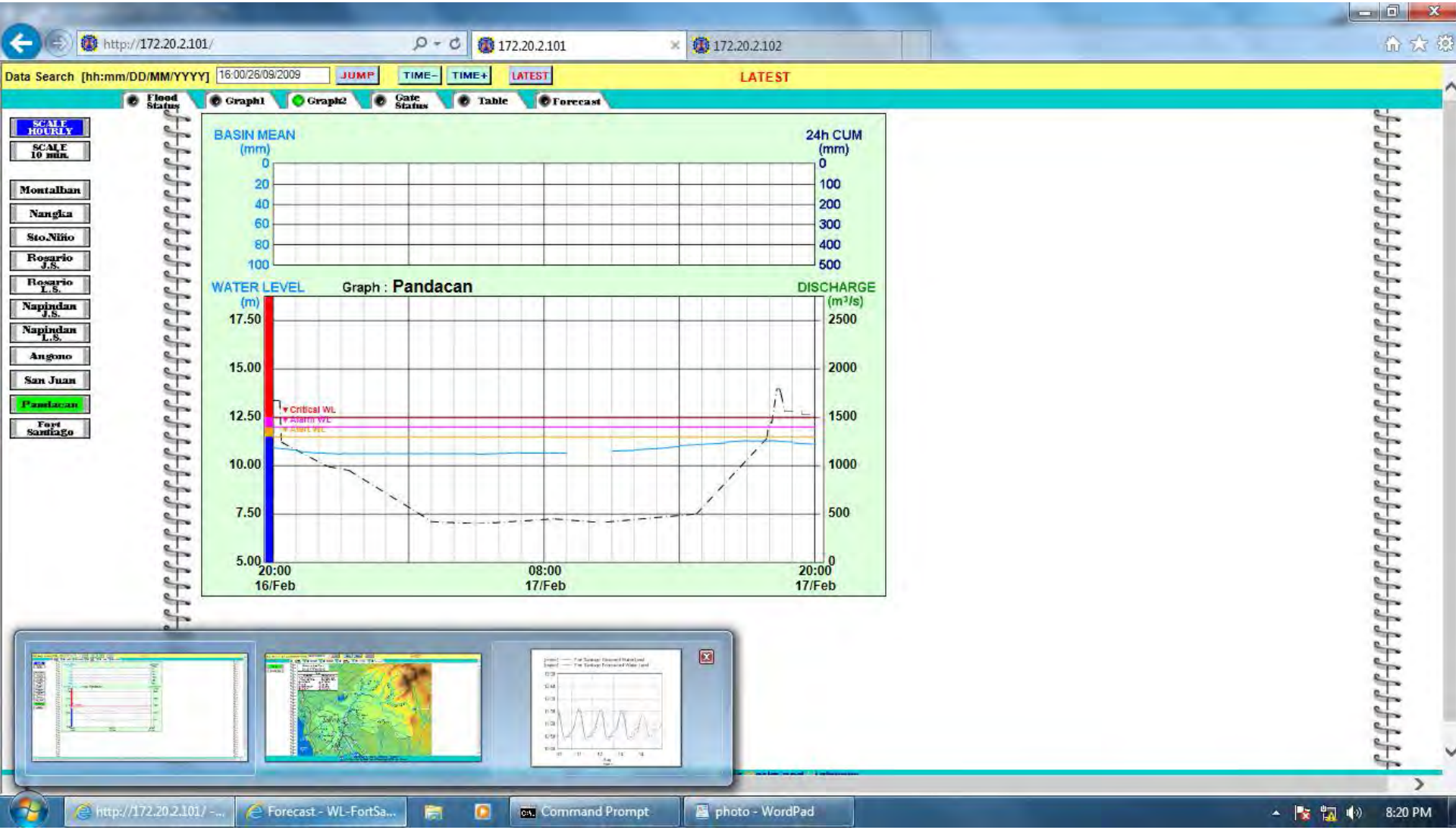
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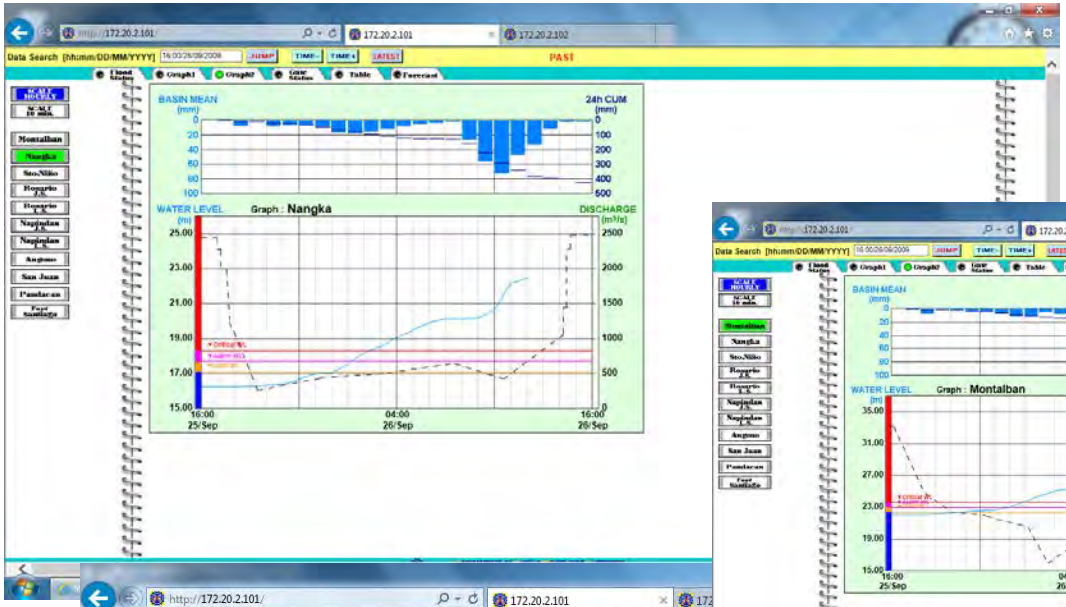
16:00/26/09/2009
JUMP
TIME−
TIME+
LATEST
LATEST
Flood Status
Graph1
Graph2
Gate Status
Table
Forecast
SCALE HOURLY
SCALE 10 min.
Montalban
Nangka
Sto.Niño
Rosario J.S.
Rosario L.S.
Napindan J.S.
Napindan L.S.
Angono
San Juan
Pandacan
Fort Santiago
BASIN MEAN (mm)
24h CUM (mm)
0
20
40
60
80
100
0
100
200
300
400
500
WATER LEVEL (m)
Graph : Pandacan
DISCHARGE (m³/s)
17.50
15.00
12.50
10.00
7.50
5.00
2500
2000
1500
1000
500
0
Critical WL
Alarm WL
Alert WL
20:00 16/Feb
08:00 17/Feb
20:00 17/Feb
http://172.20.2.101/ -...
Forecast - WL-FortSa...
Command Prompt
photo - WordPad
8:20 PM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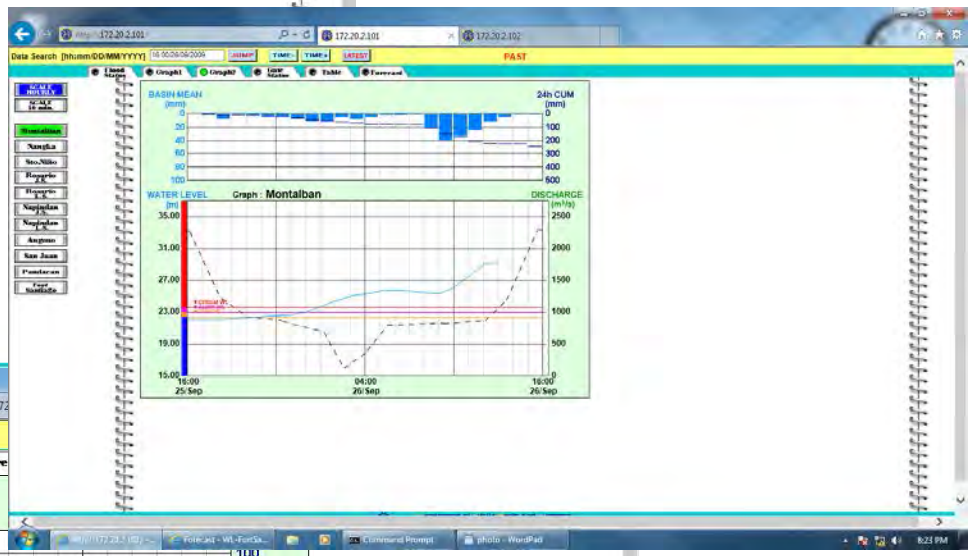
PAST
BASIN MEAN
24h CUM
WATER LEVEL
Graph : Nangka
DISCHARGE
25/Sep
26/Sep


Data Search [hh:mm/DD/MM/YYYY]
PAST
BASIN MEAN
24h CUM
WATER LEVEL
Graph : Montalban
DISCHARGE
25/Sep
26/Sep


http://172.20.2.101/
172.20.2.101
Data Search [hh:mm/DD/MM/YYYY]
03:00/16/02/2016
JUMP
TIME−
TIME+
LATEST
Flood Status
Graph1
Graph2
Gate Status
Table
SCALE HOURLY
SCALE 10 min.
Montalban
Nangka
Sto.Niño
Rosario J.S.
Rosario L.S.
Napindan J.S.
Napindan L.S.
Angono
San Juan
Pandacan
Fort Santiago
BASIN MEAN
(mm)
WATER LEVEL
(m)
Graph : Montalban
DISCHARGE
(m³/s)
Critical WL
Alarm WL
Alert WL
14:00
16/Feb
02:00
17/Feb
14:00
17/Feb
Department of Public Works and Highways
Command Prompt
Document - WordPad
2:40 PM

CONCLUSION

- IMPROVED ACCESS TO HYDRO-MET INFORMATION
- TIMELY INFORMATION APPLICABLE TO DISASTER RISK REDUCTION SUCH AS FLOOD FORECASTING FEATURES
- RELIABLE DATA TRANSMISSION BACKBONE
- IMPROVED ARCHIVING FOR FLOOD INCIDENCE CORRELATION AND REPORTING

OUR VISION…..

BECOME ONE OF THE PHILIPPINES' CENTERS OF EXCELLENCE ON DISASTER RISK REDUCTION AND MITIGATION

THANK YOU VERY MUCH FOR YOUR ATTENTION!

HAVE A NICE DAY!

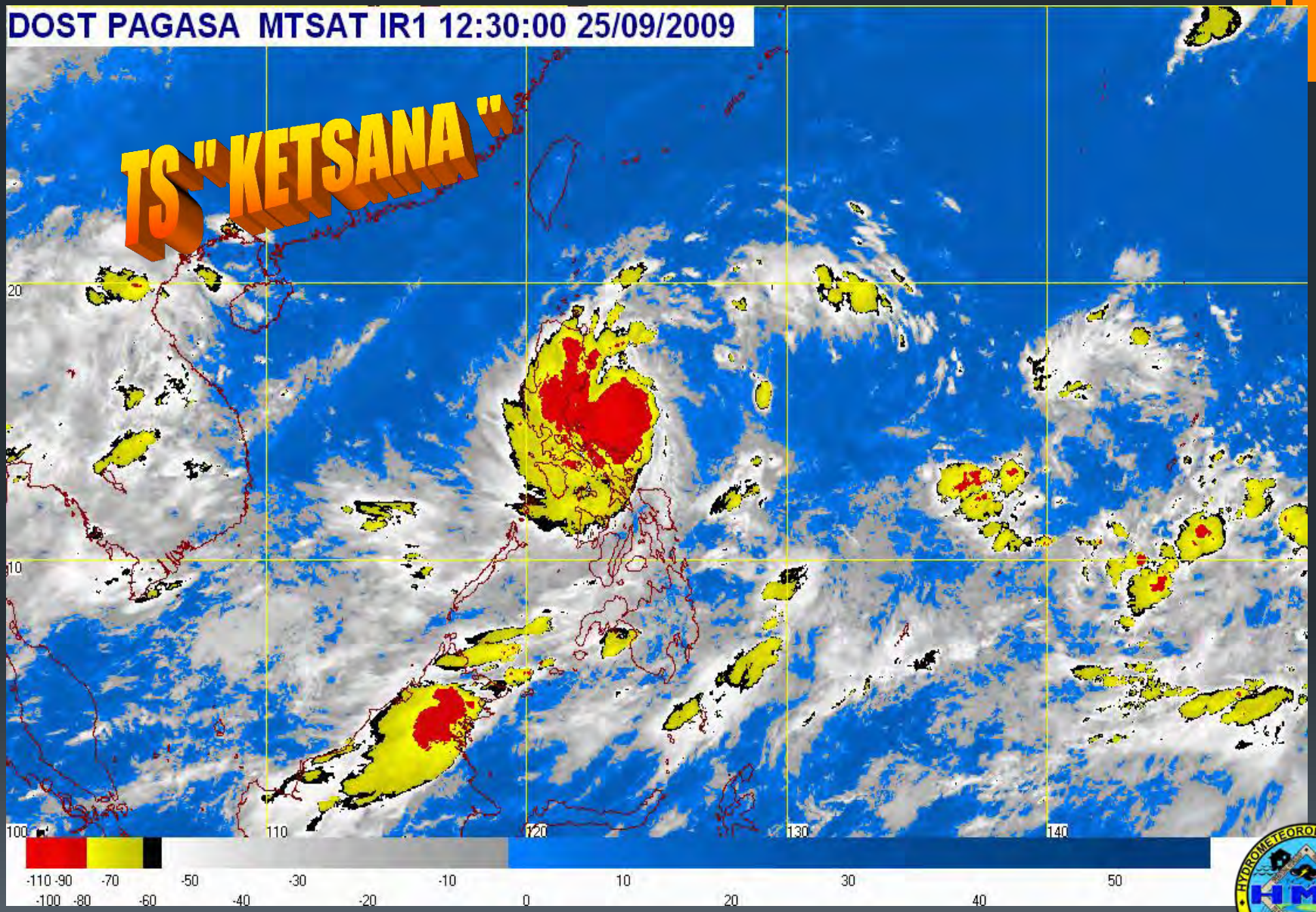
Department of Science and Technology
Philippine Atmospheric, Geophysical and Astronomical Services Administration

FLOOD FORECASTING & WARNING SYSTEM FOR METRO MANILA

ENG'R. MAXIMO F. PERALTA

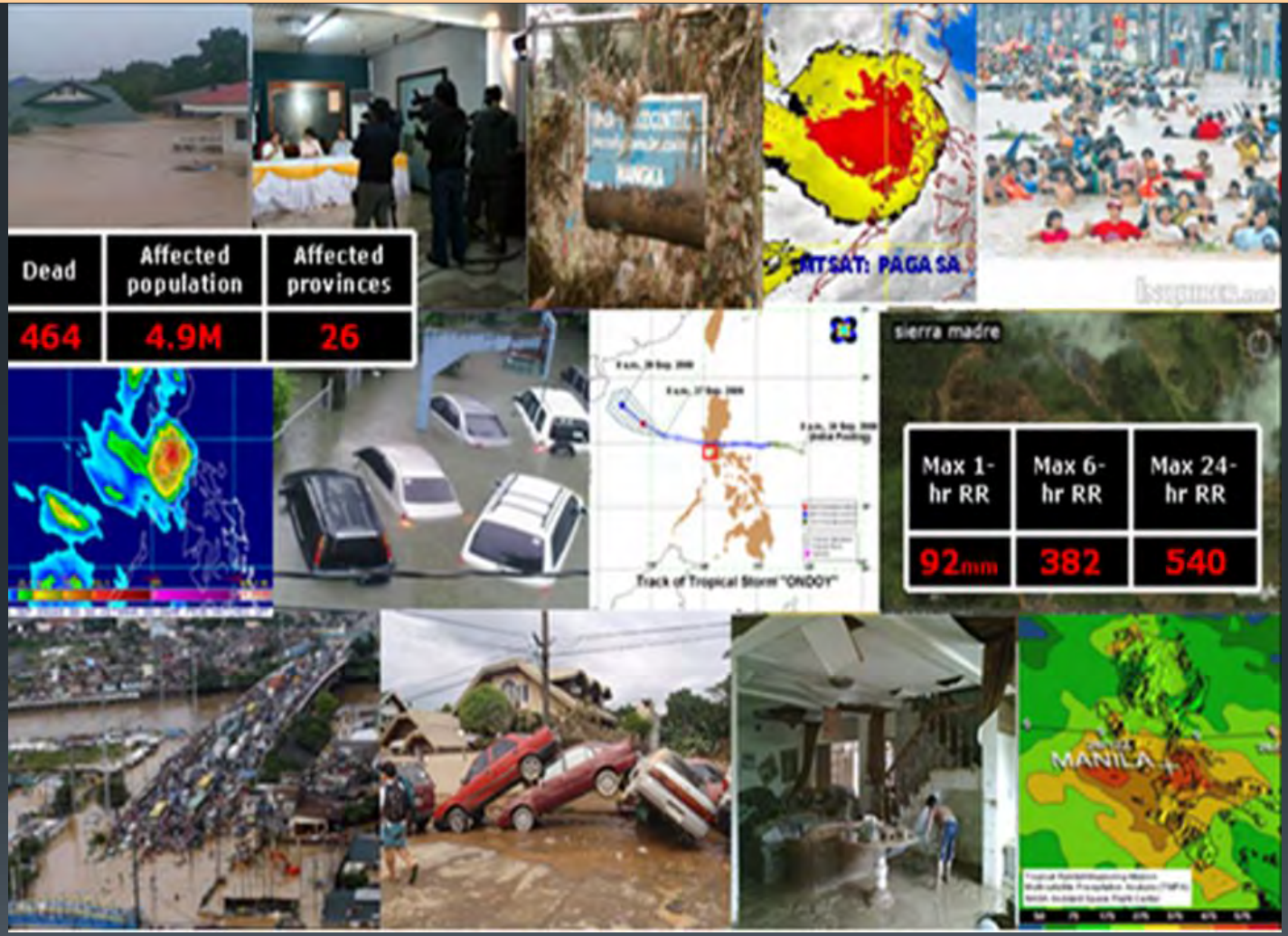
HYDROMETEOROLOGY DIVISION
Philippine **A**tmospheric **G**eophysical **and** **A**stronomical **S**ervices **A**dministration

BACKGROUND :



T.S. Ketsana crossing Central Luzon

IMPACT OF T.C. "KETSANA" (Ondoy)
September 26, 2009



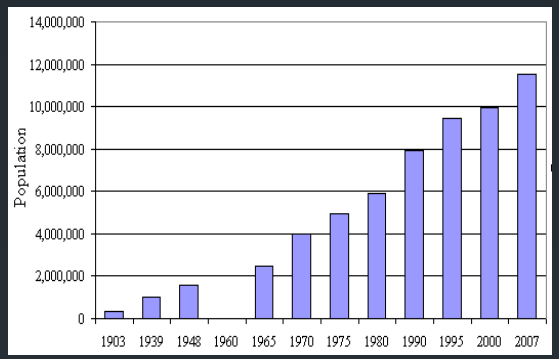
"tracking the sky….helping the country…"

Case study: Flood in Metro Manila due to TS Ondoy

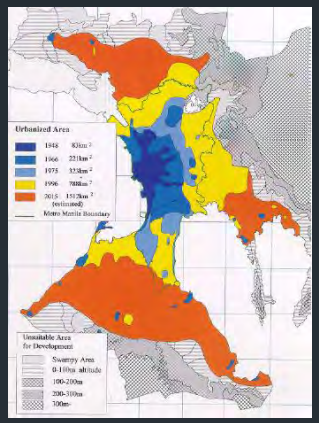
In 2003, Bankoff described in depth that Metro Manila's vulnerability to flooding has evolved as a result of the degree of interplay between climate, topography, resource use, and culture over time. The flood due to TS Ondoy in Sep 2009 proved it.

Intense rainfall

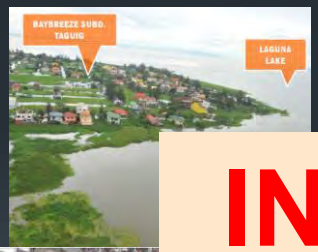
Insufficient carrying capacities

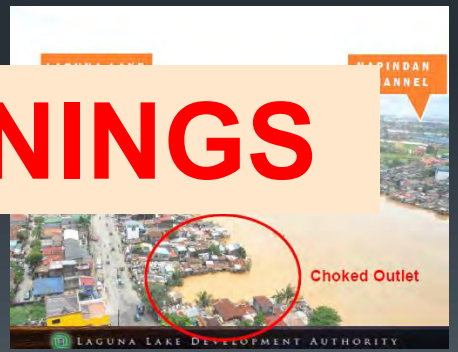


High/dense population



High urbanization level





Informal settlers

INSUFFICIENT WARNINGS

Unabated/rampant development

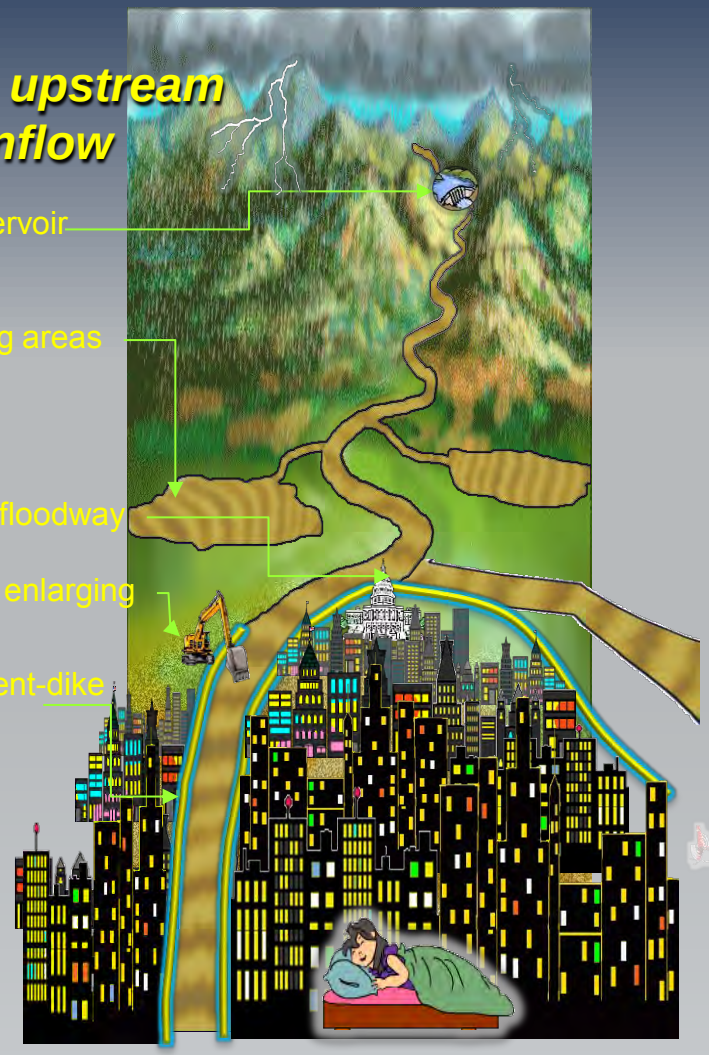
Deforestation

"tracking the sky….helping the country…"

WATER-RELATED DISASTER MITIGATION MEASURES

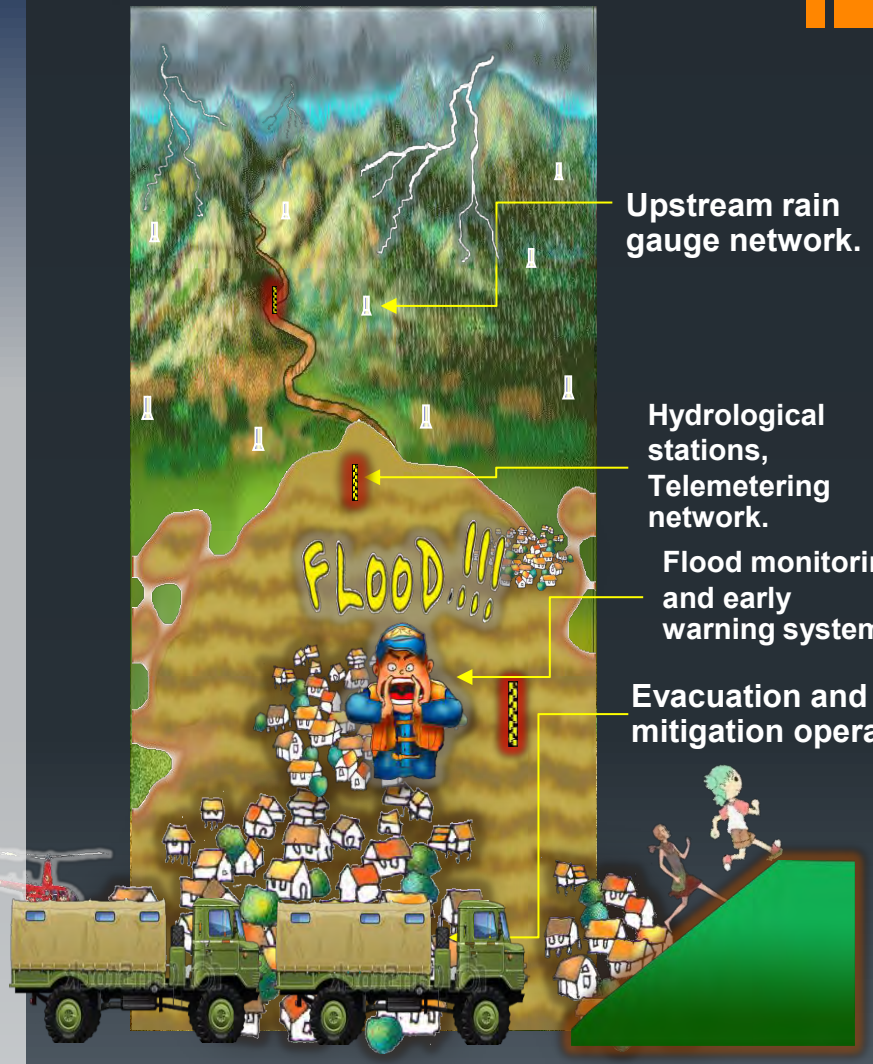
STRUCTURAL MEASURES

Reduce upstream runoff inflow



MOVE THE WATER AWAY FROM THE PEOPLE...!!

NON-STRUCTURAL MEASURES



Upstream rain gauge network.

Hydrological stations, Telemetering network.

Flood monitoring and early warning system.

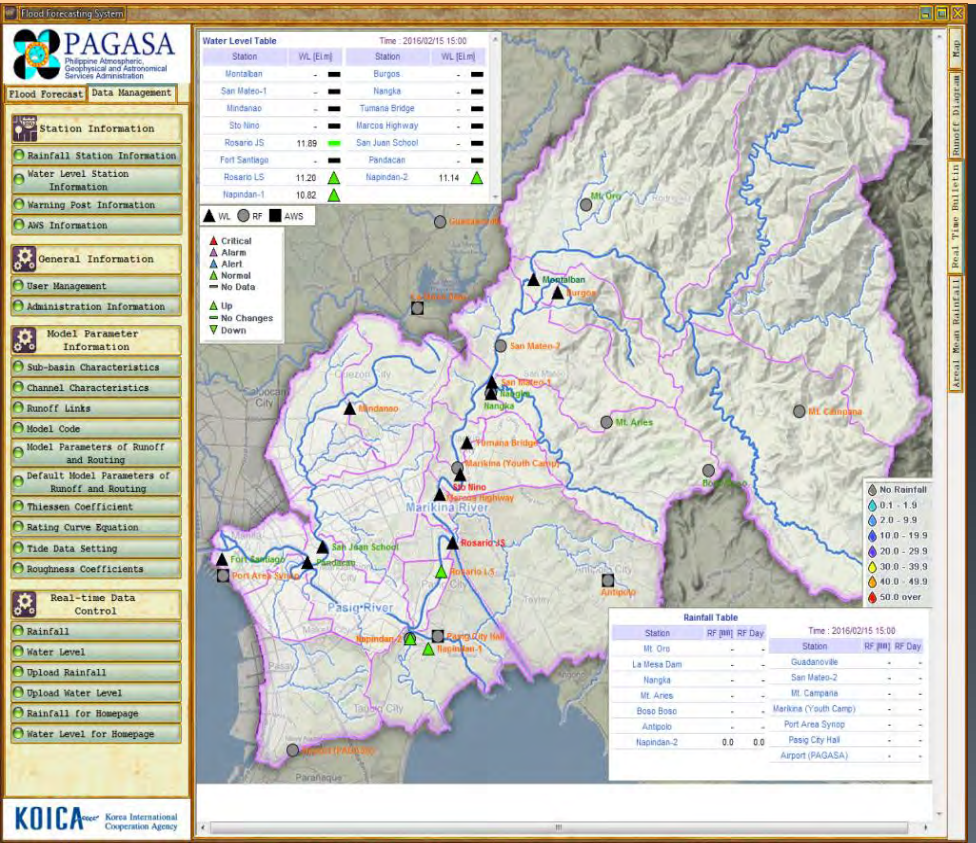
Evacuation and mitigation operation

MOVE THE PEOPLE AWAY FROM THE WATER ...!!

To complement the EFCOS Project:

"ESTABLISHMENT OF EARLY WARNING SYSTEM AND MONITORING SYSTEM FOR DISASTER MITIGATION IN METRO MANILA OR EWS 2 PROJECT"

TARGET AREA : PASIG-MARIKINA RIVER BASIN



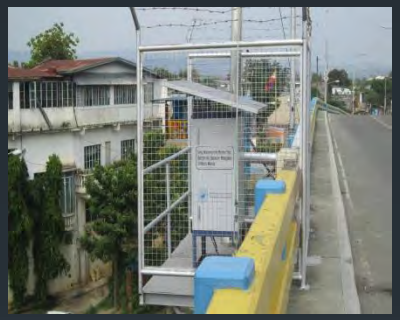
- Funded by Korean Government
- Established in **2010** after Typhoon Ondoy
- Installation was completed in **2012**
- IEC Conducted in **2013**
- Fully Operational in **2014**

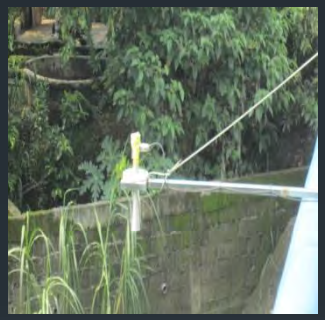
Project Component :

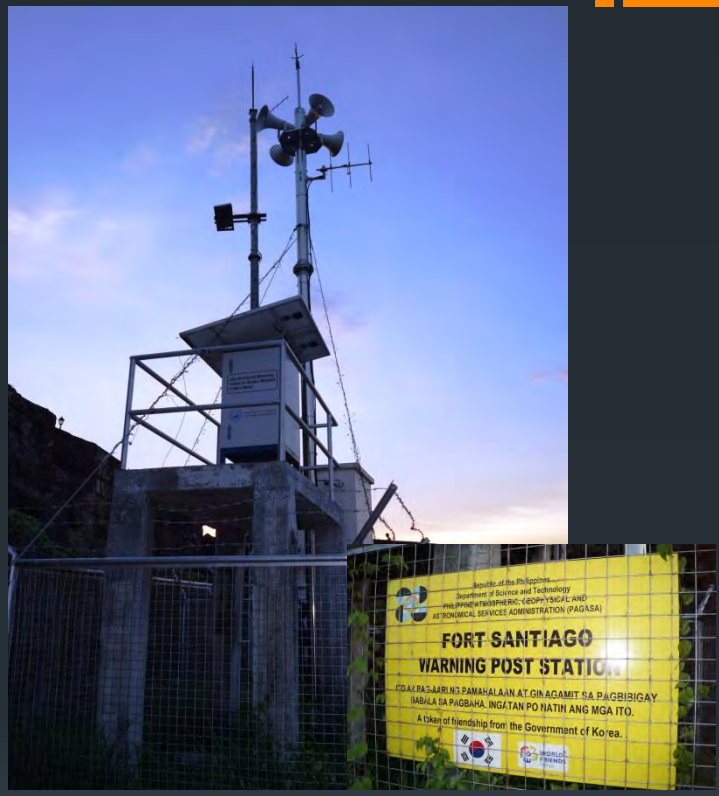
1. Data Collection System
2. Flood Forecast System
3. Early Warning System
4. Communication Network

HYDROMETEOROLOGY DIVISION
HMD
PAGASA - DOST

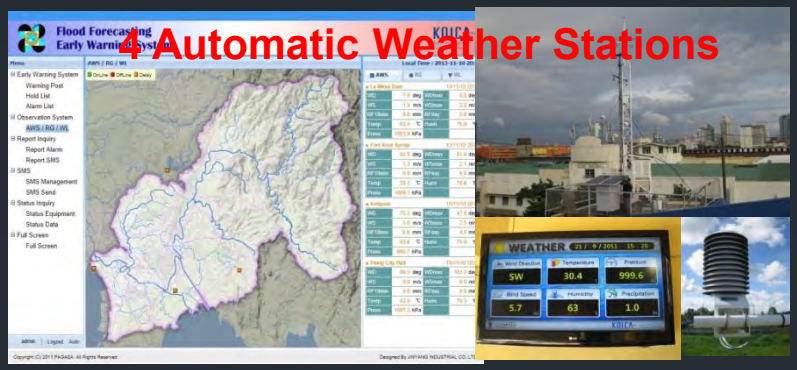
Example of Flood Monitoring Equipment:







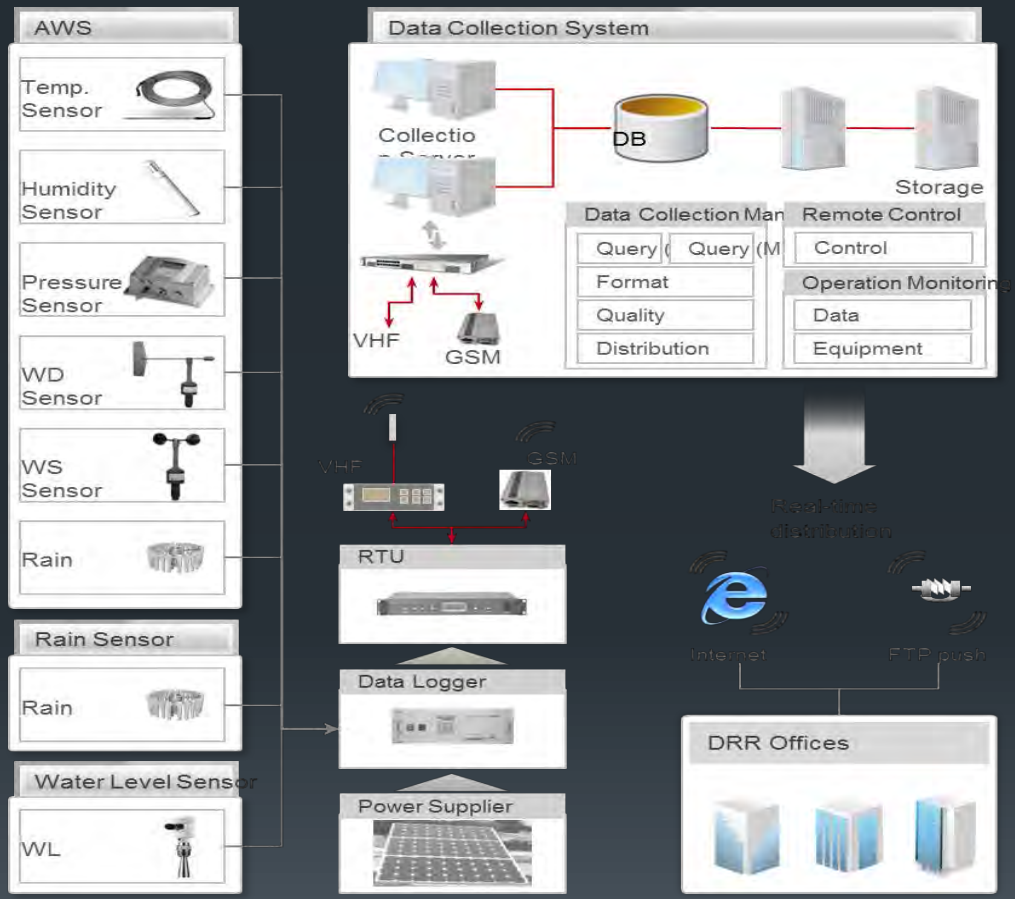
Data Collection System Module:



4 Automatic Weather Stations

10 Rainfall Gauging Stations

10 Waterlevel Gauging Stations

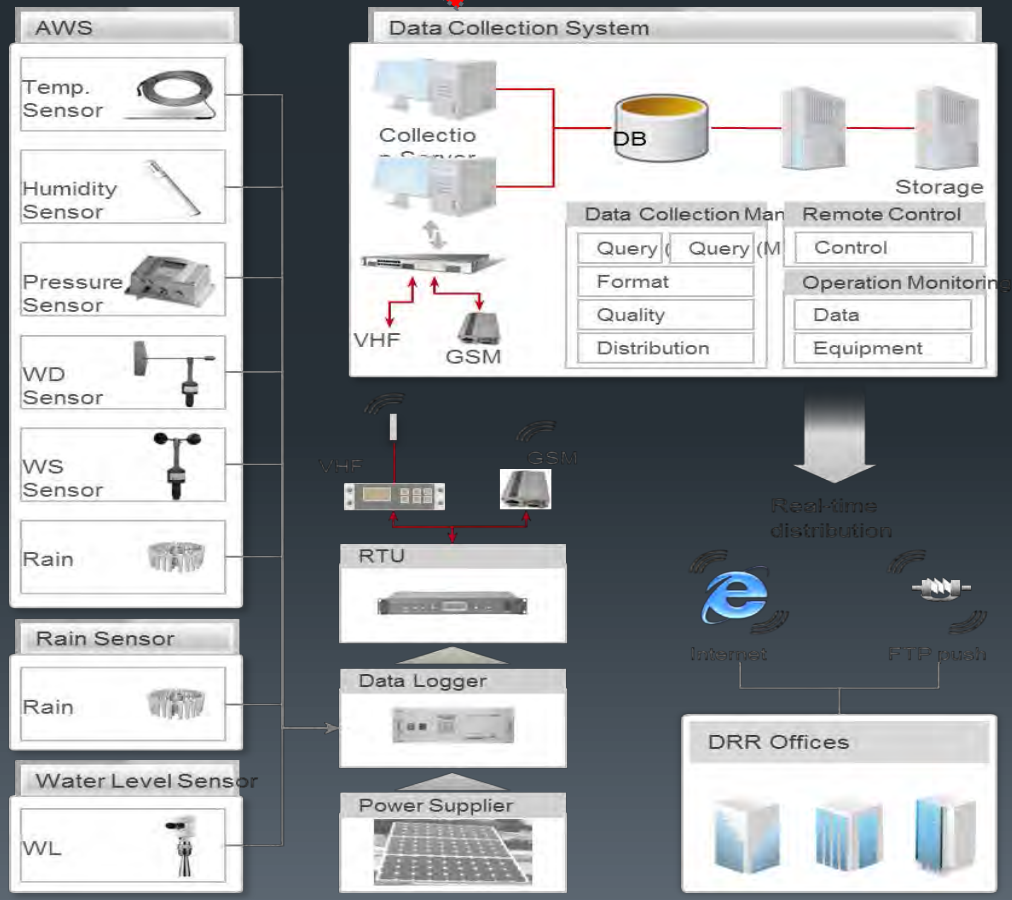


Expanded Data Collection System Module:

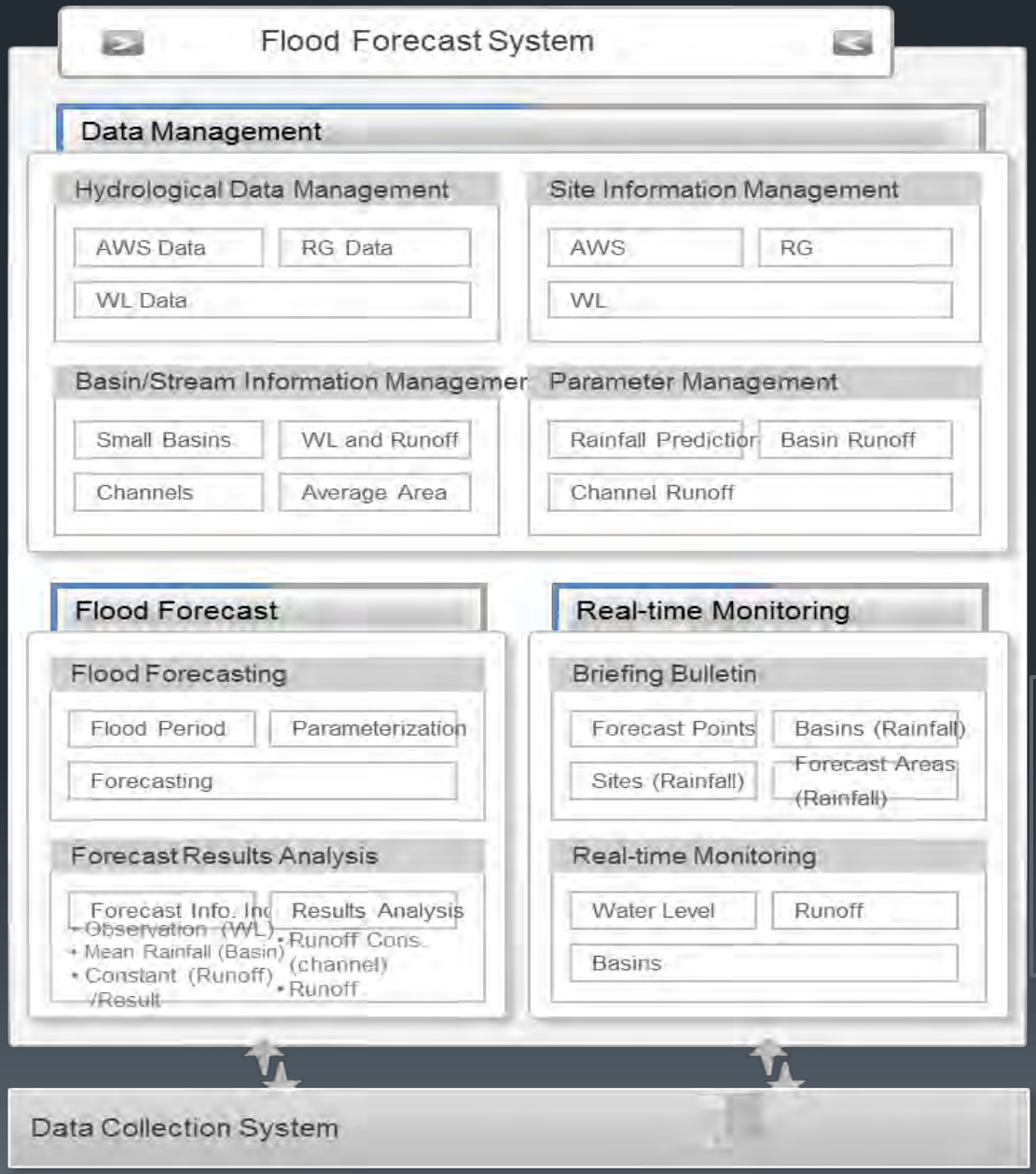
- EFCOS Stations were considered in the design of the Hydrological Network intended for Pasig Marikina River Basin.
- The collected data on the said stations were integrated to the system.

Location Map of EFCOS Stations

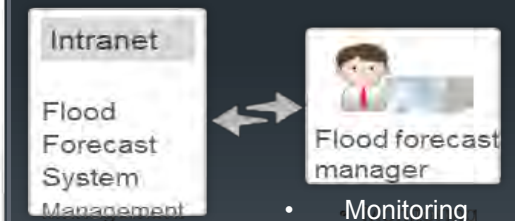
7 Rainfall Stations
11 Waterlevel Gauging Stations



FLOOD FORECASTING SYSTEM:



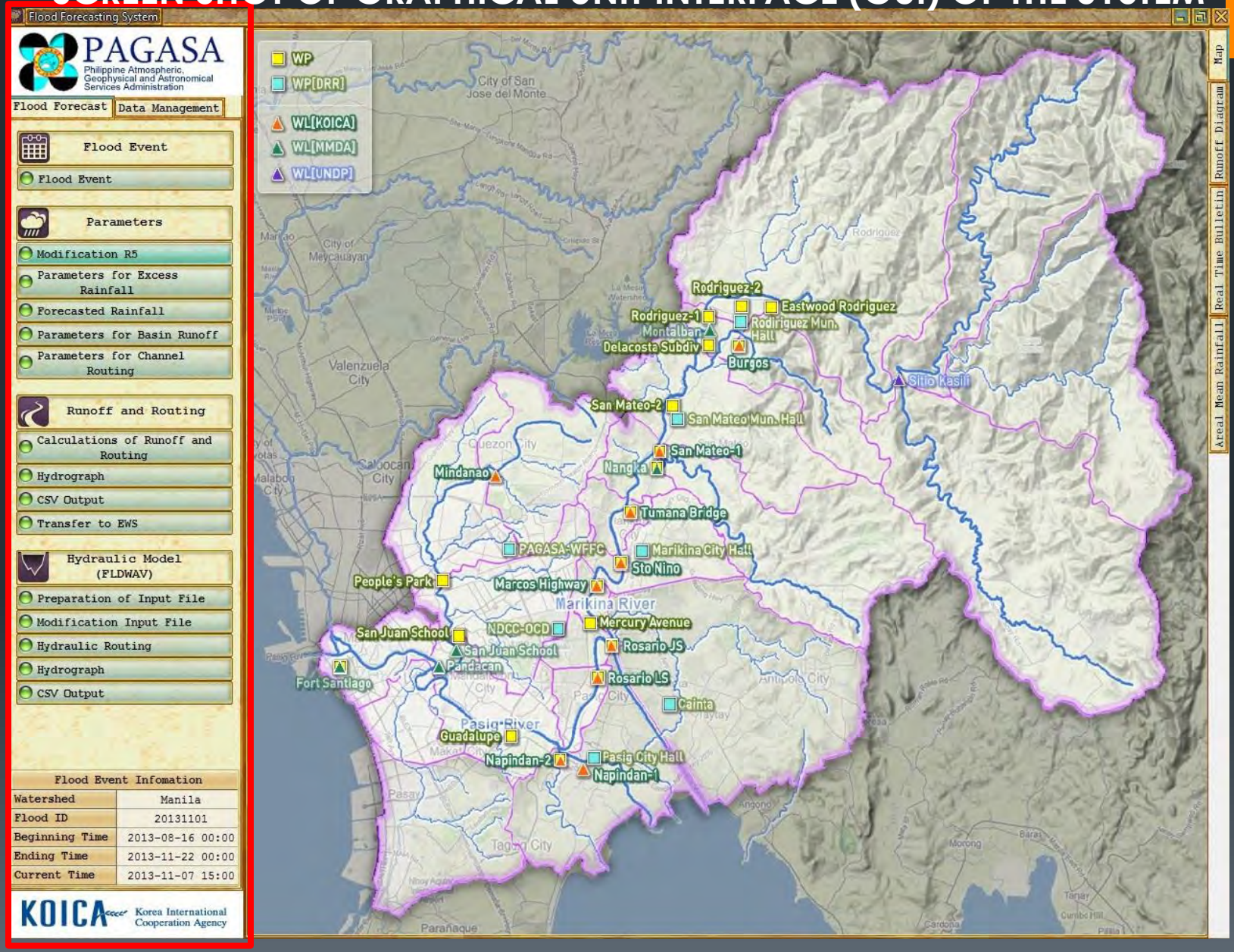
PAGASA DIC



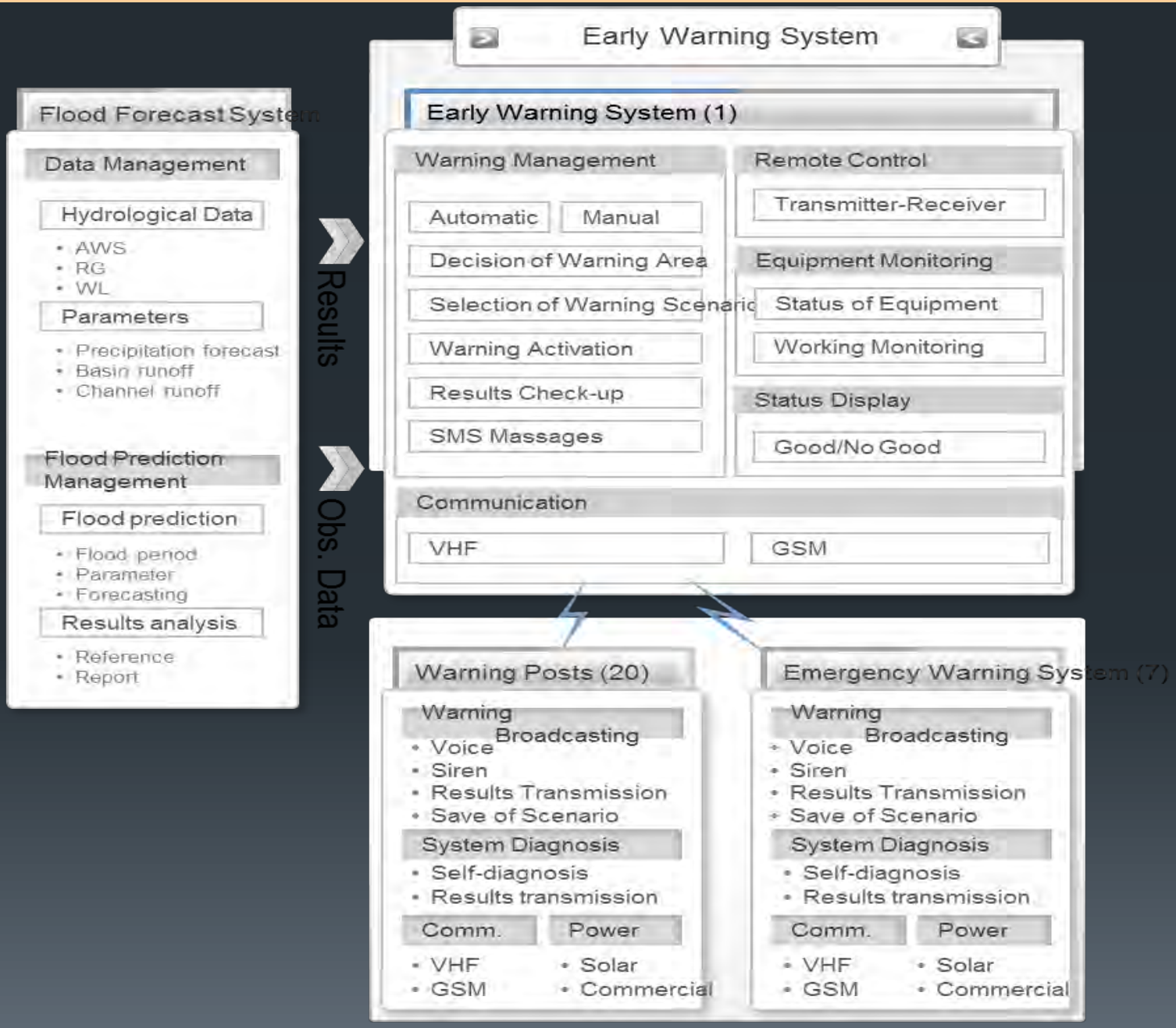
- Monitoring
- Decision making support

FLOOD FORECASTING SYSTEM:

SCREEN SHOT OF GRAPHICAL UNIT INTERFACE (GUI) OF THE SYSTEM

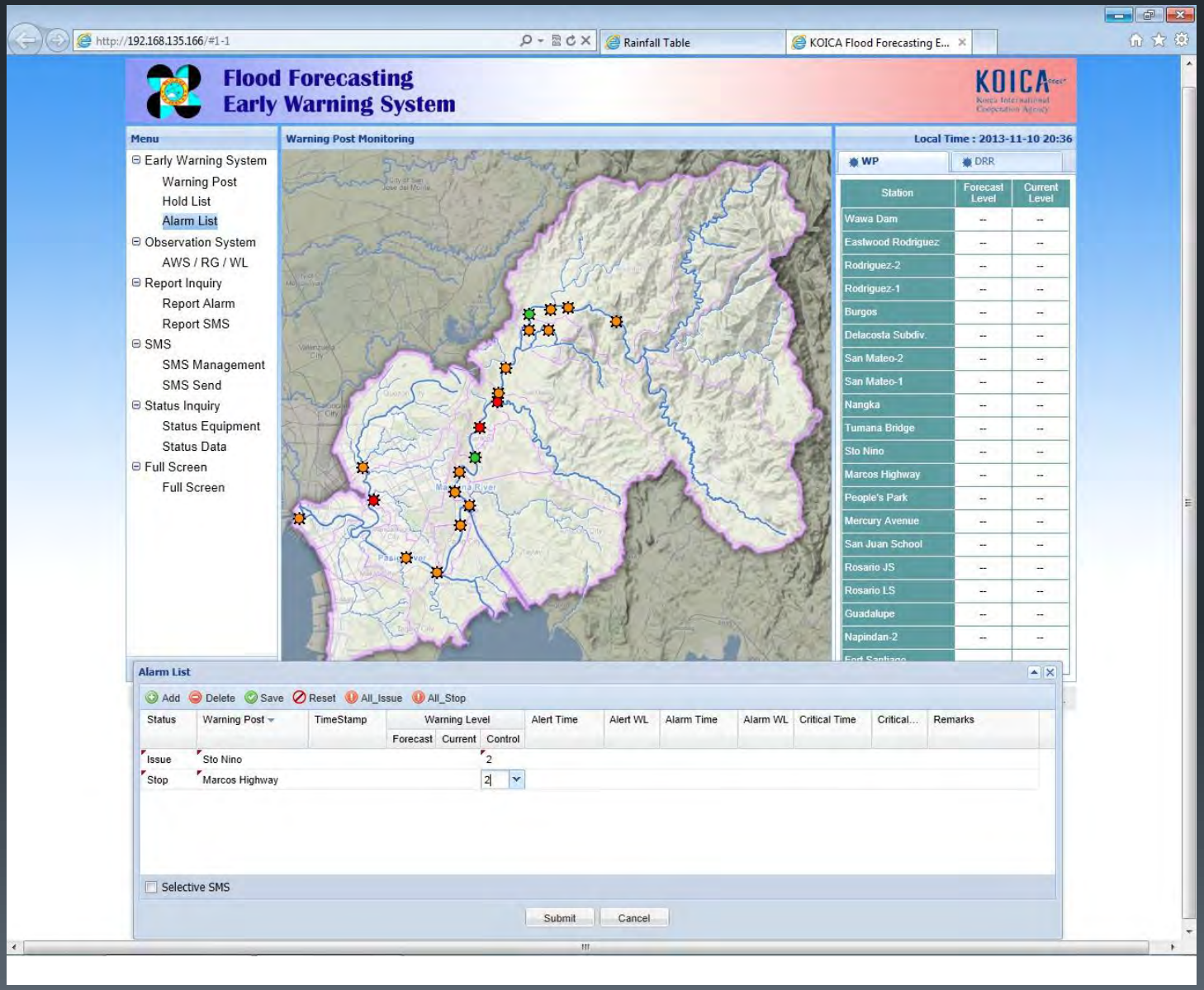


EARLY WARNING SYSTEM:



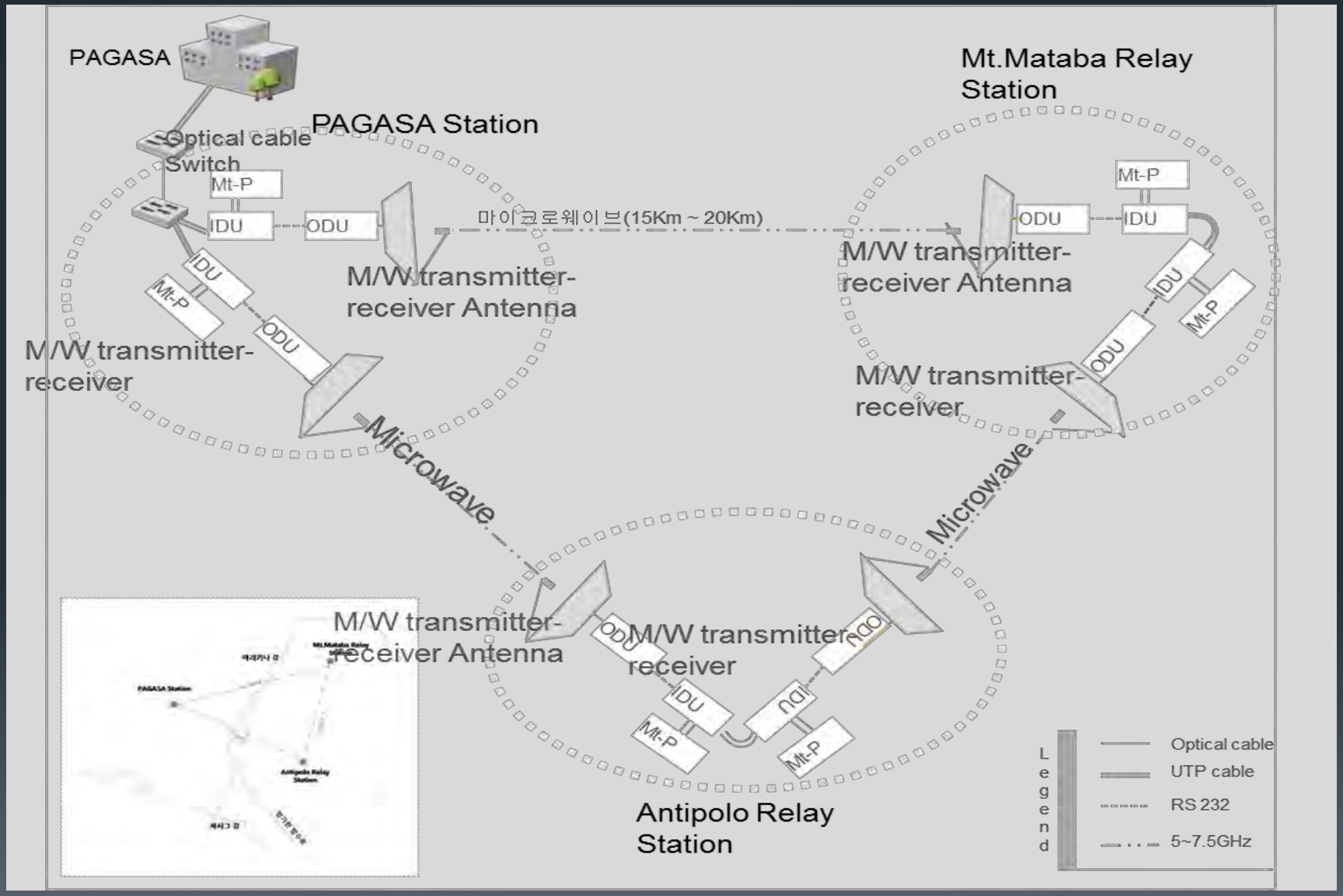
EARLY WARNING SYSTEM:

- Location of 20 Warning Post along Pasig Marikina River Basin



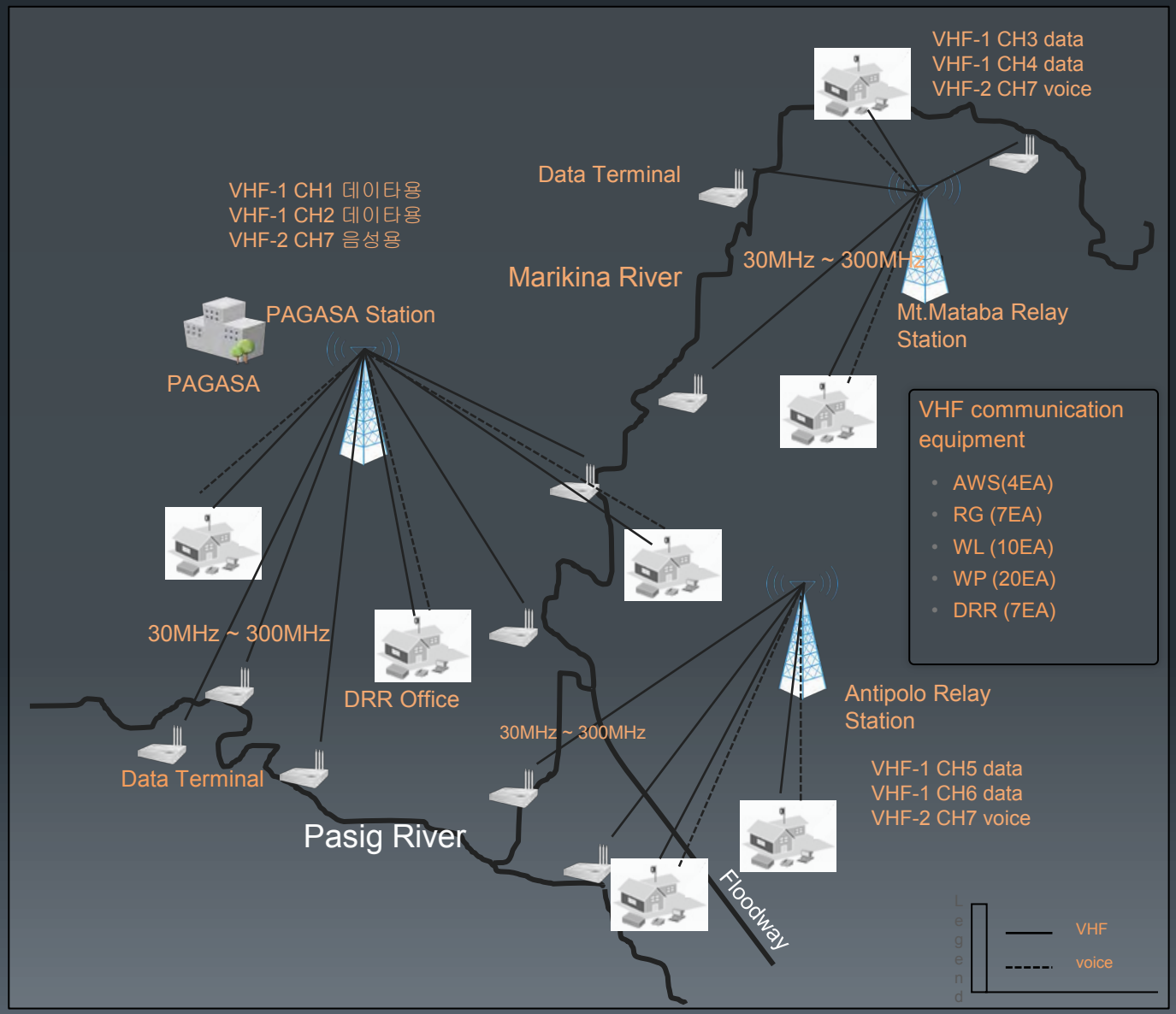
COMMUNICATION SYSTEM:

Microwave Communication



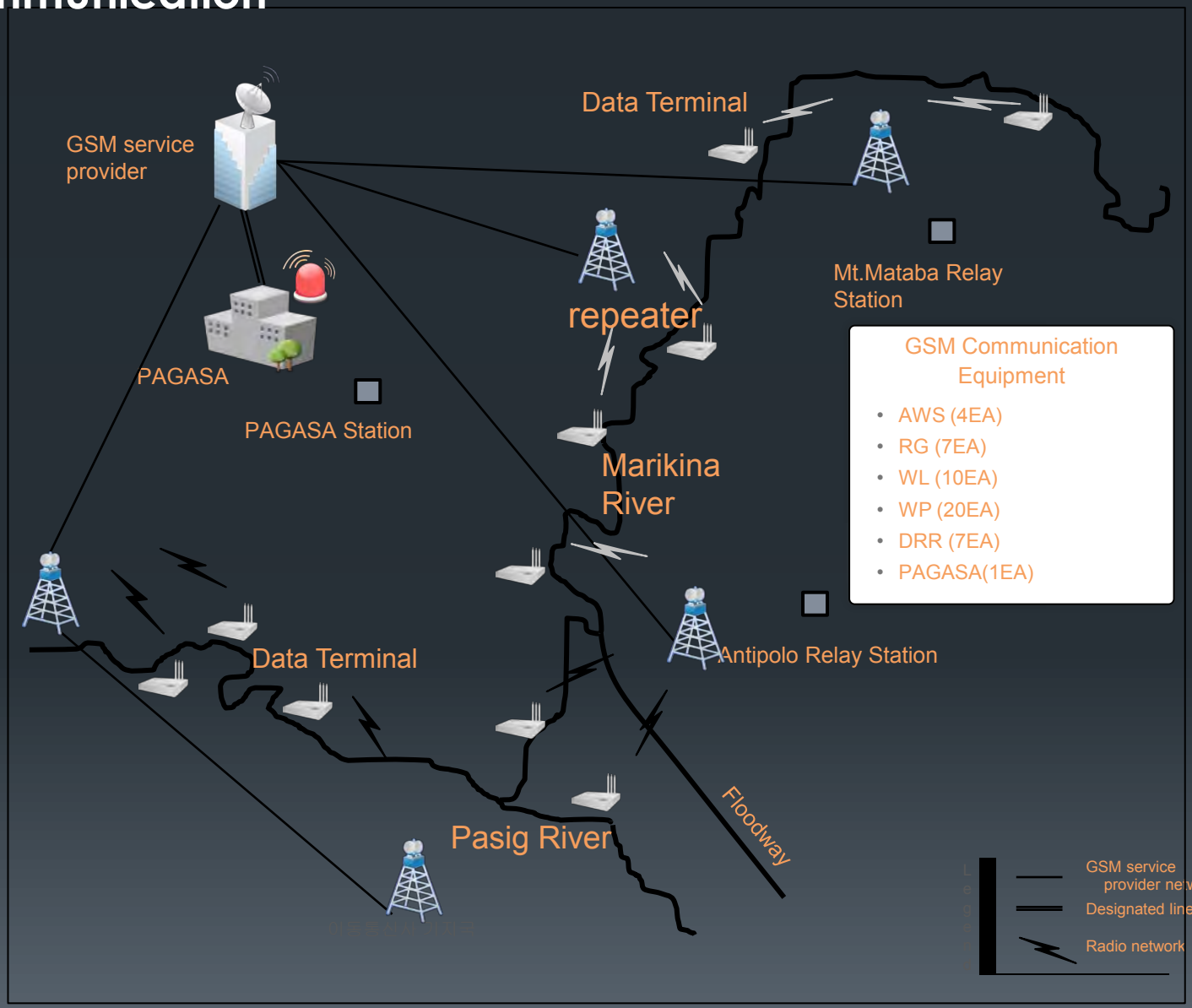
COMMUNICATION SYSTEM:

VHF Radio Communication

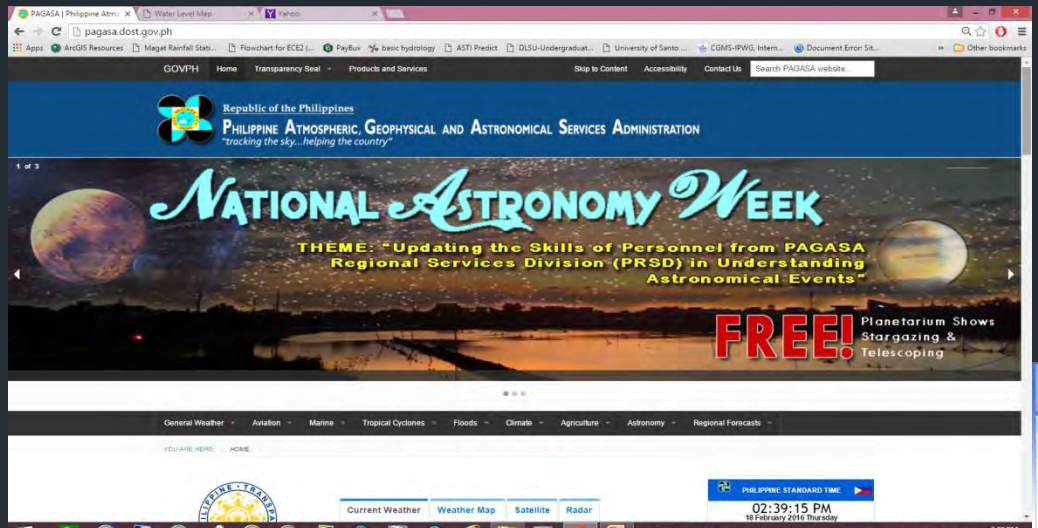


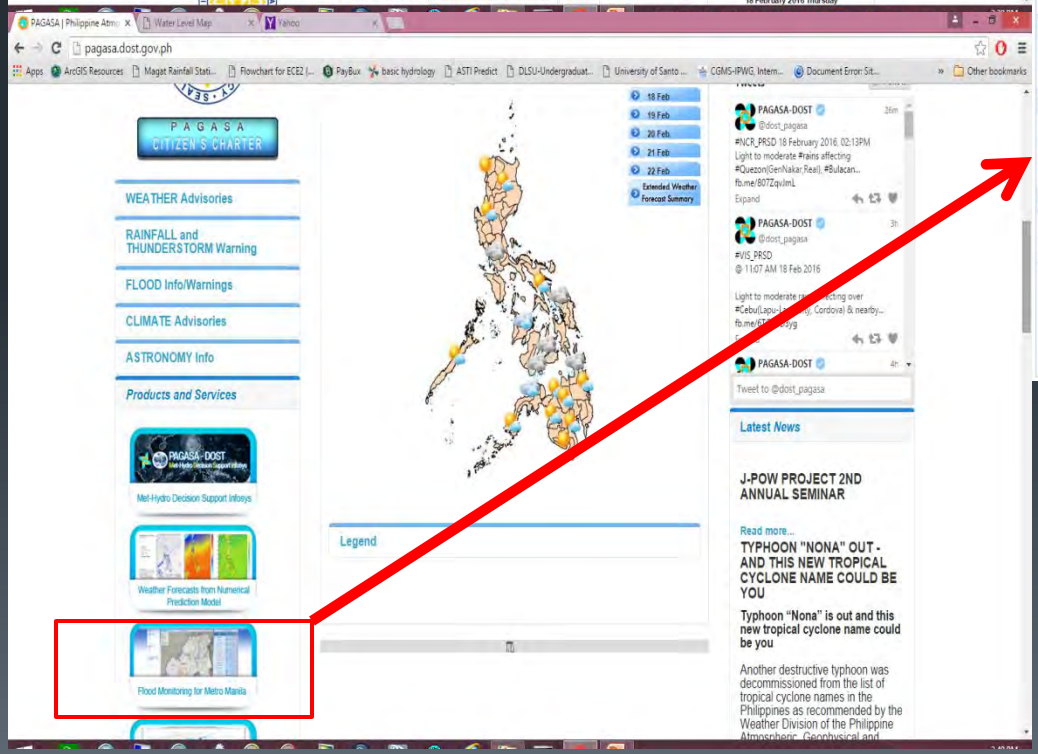
COMMUNICATION SYSTEM:

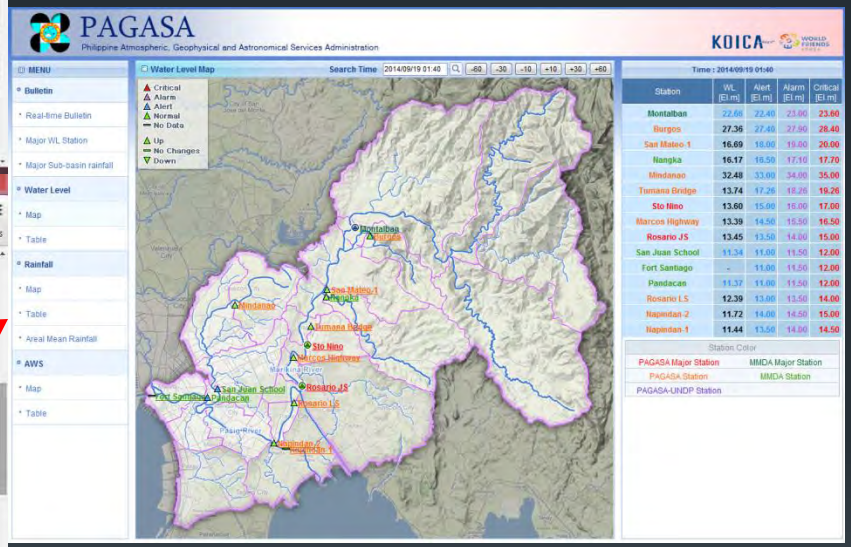
GSM Communication



PAGASA WEBSITE:

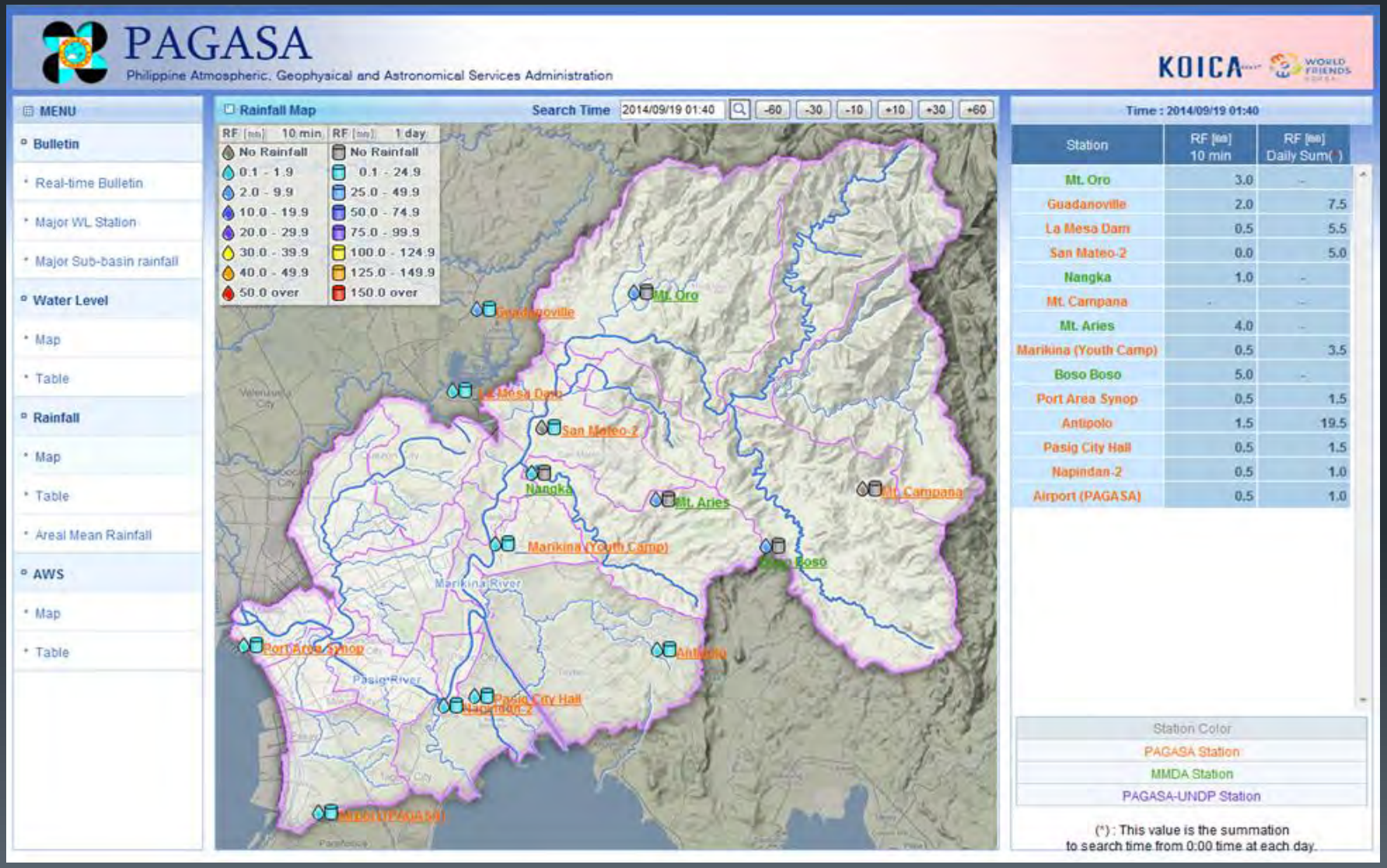




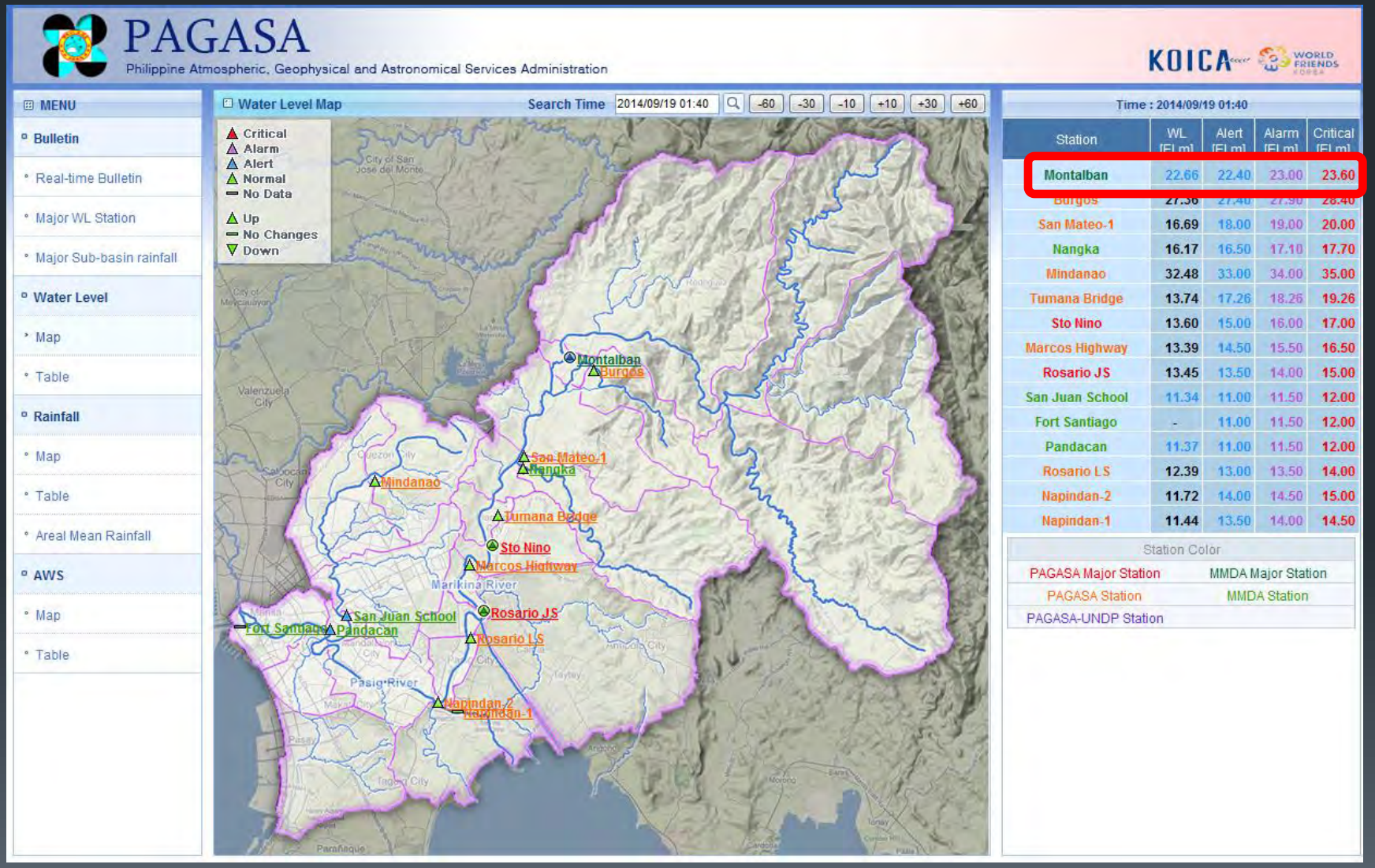


EXAMPLE OF FLOOD WARNING ACTIVATION DURING THE PASSAGE OF TYPHOON MARIO (SEPTEMBER 14, 2014)

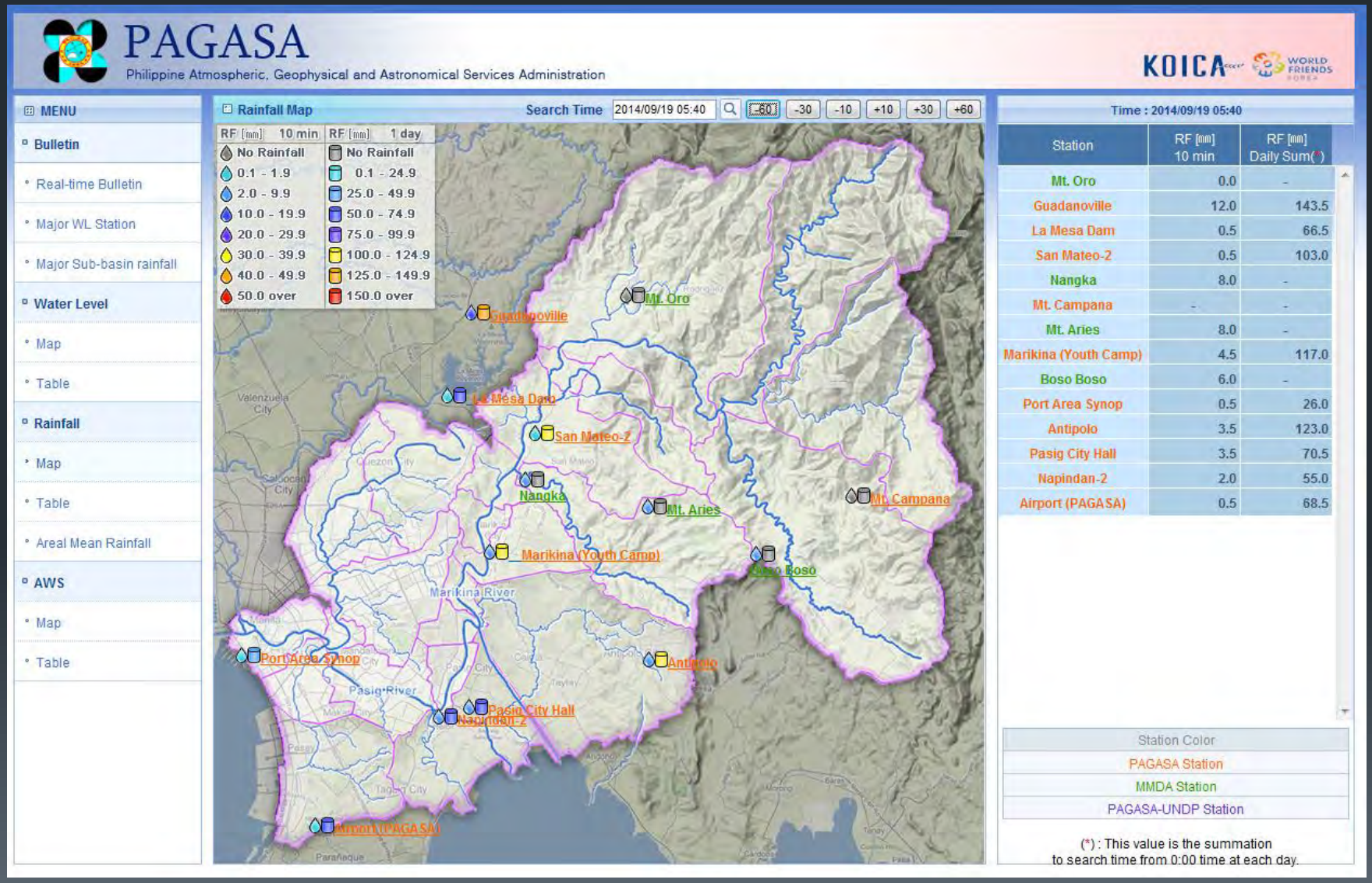
RAINFALL INTENSITY of PMRB as of 1:40 AM September 19, 2014



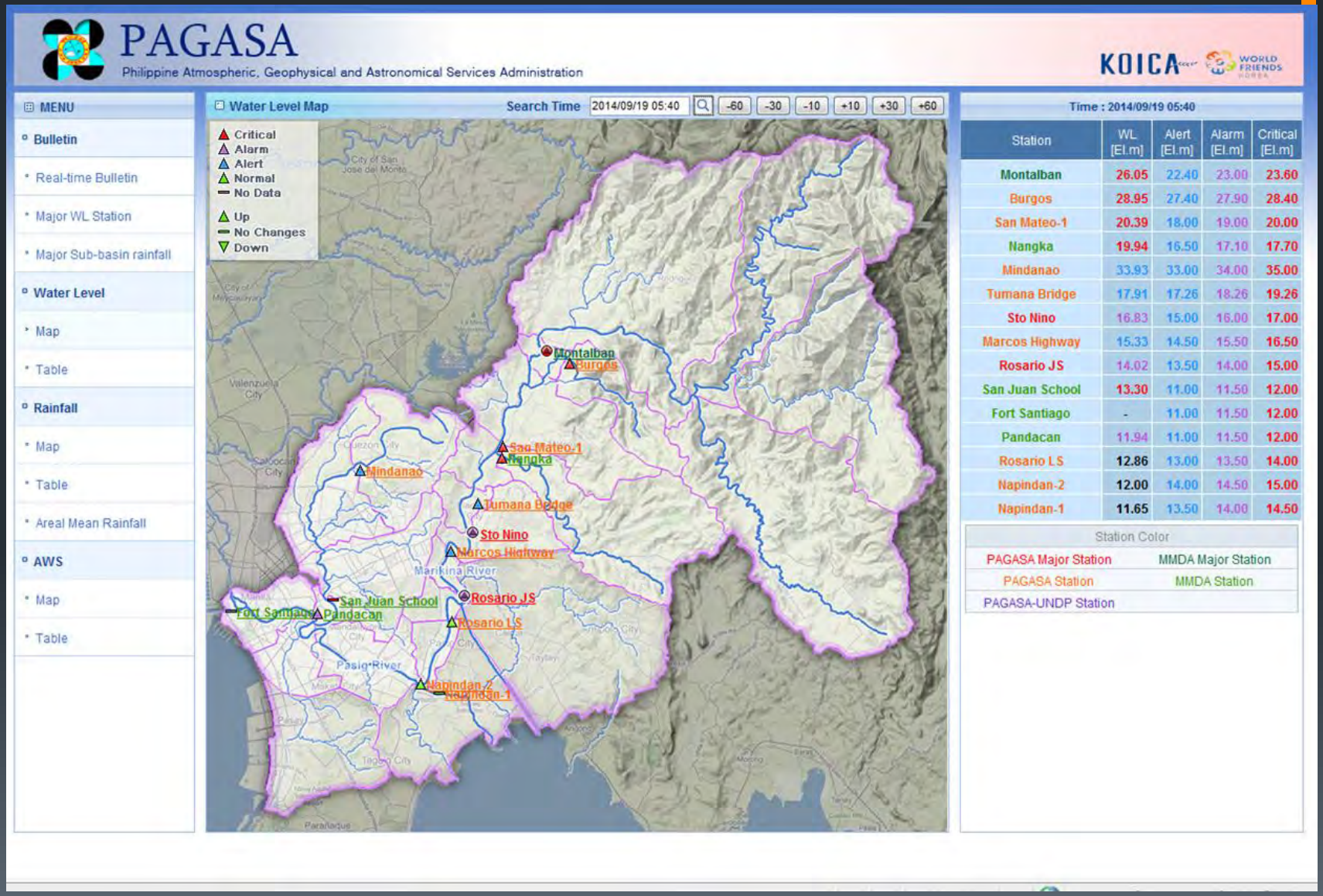
STATUS OF WATERLEVEL of PMRB as of 1:40 AM September 19, 2014

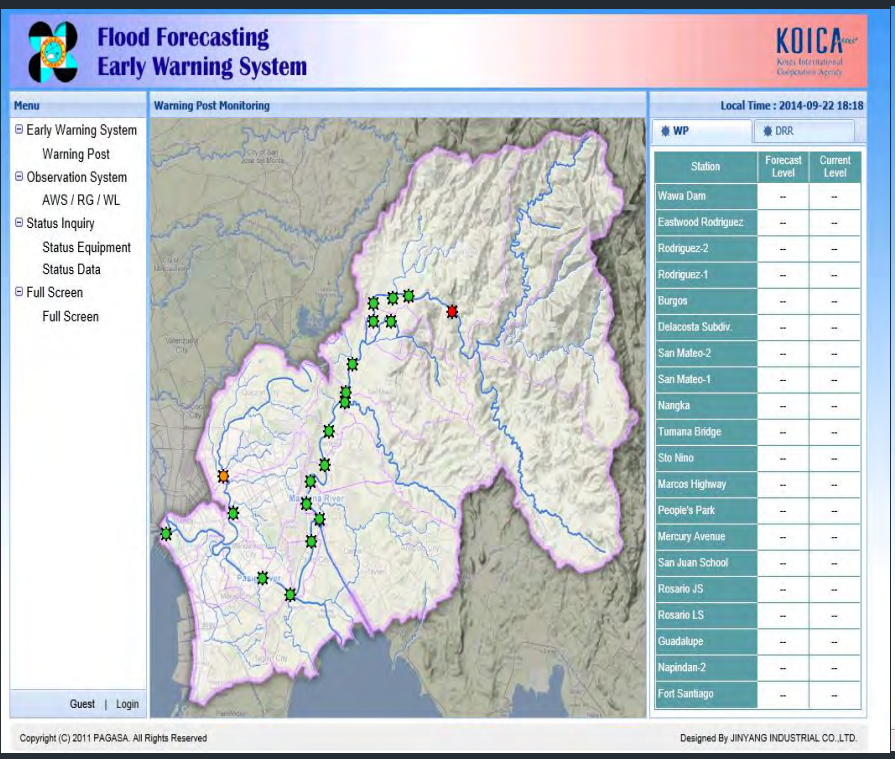


Rainfall Intensity of PMRB as of 5:40 AM



WATERLEVEL of PMRB as of 5:40 AM




Flood Forecasting
Early Warning System
KOICA
Menu
Early Warning System
Warning Post
Observation System
AWS / RG / WL
Status Inquiry
Status Equipment
Status Data
Full Screen
Full Screen
Guest | Login
Warning Post Monitoring
Local Time : 2014-09-22 18:18
WP
DRR
Station
Forecast Level
Current Level
Wawa Dam
Eastwood Rodriguez
Rodriguez-2
Rodriguez-1
Burgos
Delacosta Subdiv.
San Mateo-2
San Mateo-1
Nangka
Tumana Bridge
Sto Nino
Marcos Highway
People's Park
Mercury Avenue
San Juan School
Rosario JS
Rosario LS
Guadalupe
Napindan-2
Fort Santiago
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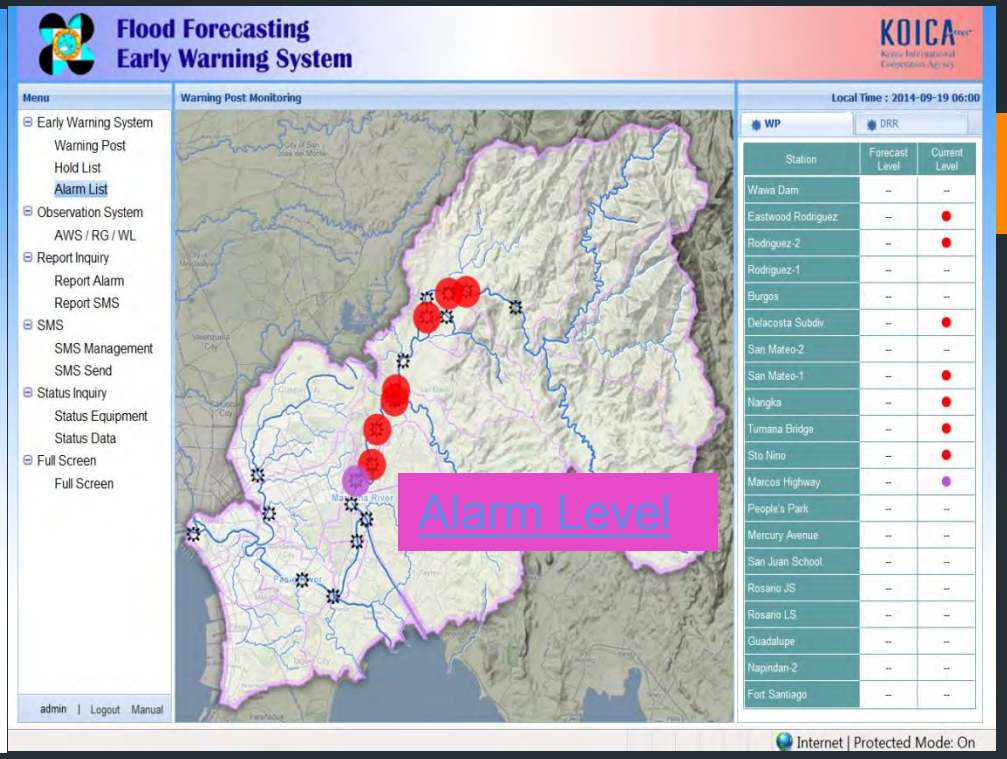
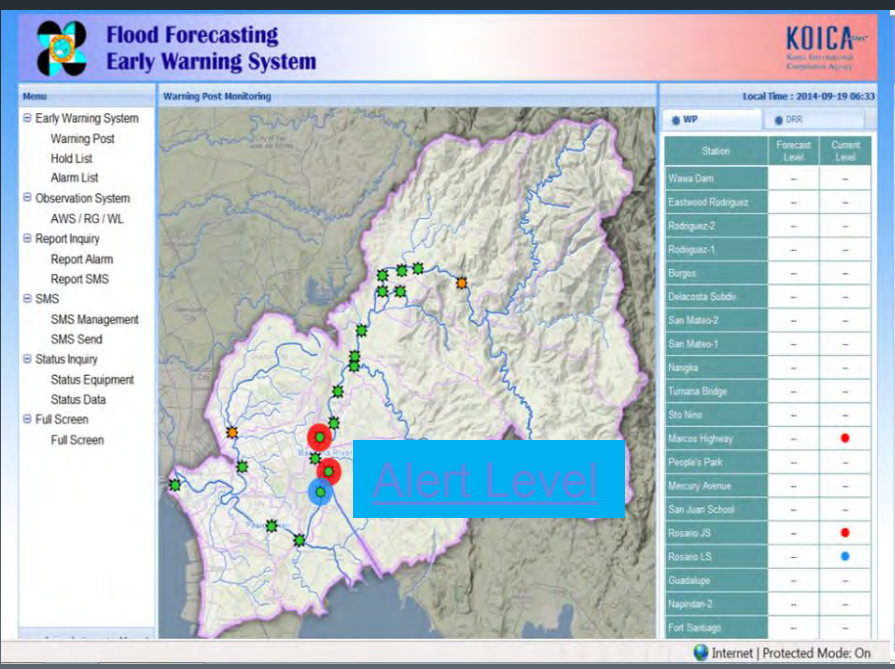
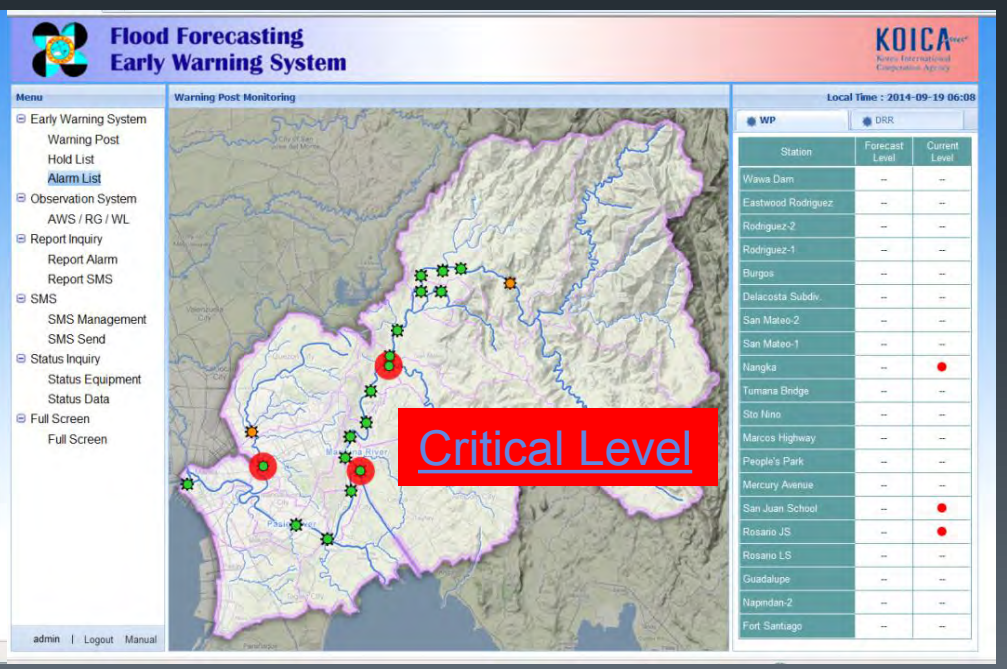

Flood Forecasting
Early Warning System
KOICA
Menu
Early Warning System
Warning Post
Hold List
Alarm List
Observation System
AWS / RG / WL
Report Inquiry
Report Alarm
Report SMS
SMS
SMS Management
SMS Send
Status Inquiry
Status Equipment
Status Data
Full Screen
Full Screen
admin | Logout Manual
Warning Post Monitoring
Local Time : 2014-09-19 06:00
WP
DRR
Station
Forecast Level
Current Level
Alarm Level
Internet | Protected Mode: On


Flood Forecasting
Early Warning System
KOICA
Menu
Early Warning System
Warning Post
Hold List
Alarm List
Observation System
AWS / RG / WL
Report Inquiry
Report Alarm
Report SMS
SMS
SMS Management
SMS Send
Status Inquiry
Status Equipment
Status Data
Full Screen
Full Screen
Warning Post Monitoring
Local Time : 2014-09-19 06:33
WP
DRR
Station
Forecast Level
Current Level
Alert Level
Internet | Protected Mode: On


Flood Forecasting
Early Warning System
KOICA
Menu
Early Warning System
Warning Post
Hold List
Alarm List
Observation System
AWS / RG / WL
Report Inquiry
Report Alarm
Report SMS
SMS
SMS Management
SMS Send
Status Inquiry
Status Equipment
Status Data
Full Screen
Full Screen
admin | Logout Manual
Warning Post Monitoring
Local Time : 2014-09-19 06:08
WP
DRR
Station
Forecast Level
Current Level
Critical Level

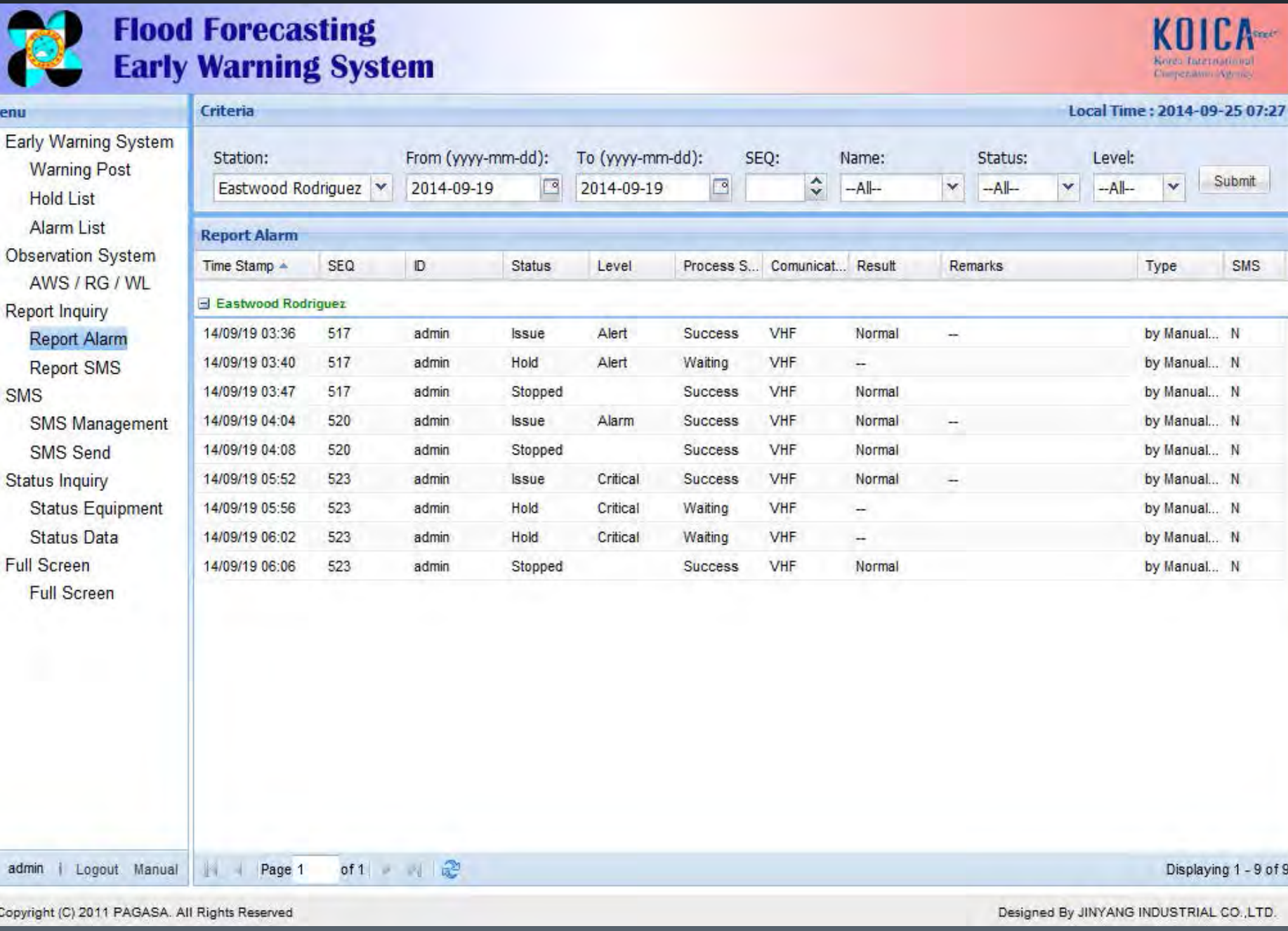
STATUS OF WATERLEVEL STATIONS

Station Name	Alert	Alarm	Critical
1. MONTALBAN	22.48 (12:40 AM-Sept 19)	23.17 (2:20 AM-Sept 19)	23.91 (2:40 AM-Sept 19)
2. BURGOS	27.44 (1:50 AM-Sept 19)	28.06 (2:40 AM-Sept 19)	28.52 (3:10 AM-Sept 19)
3. SAN MATEO 1	18.21 (3:00 AM-Sept 19)	19.08 (3:50 AM-Sept 19)	20.06 (5:20 AM-Sept 19)
4. NANGKA	16.50 (2:00 AM-Sept 19)	17.40 (2:40 AM-Sept 19)	17.88 (3:00 AM-Sept 19)
5. TUMANA	17.22 (4:30 AM Sept 19)	18.25 (6:00 AM-Sept 19)	19.26 (6:50 AM-Sept 19)
6. STO.NIÑO	15.14 (3:10 AM Sept 19)	16.02 (4:20 AM-Sept 19)	17.11 (6:00 AM Sept 19)
7. MARCOS HIGHWAY	14.55 (4:10 AM Sept 19)	15.56 (6:00 AM Sept 19)	16.59 (7:00 AM Sept 19)
8. ROSARIO JS	13.54 (2:00AM Sept 19)	14.02 (5:40 AM Sept 19)	15.01 (7:30 AM Sept 19)
9. ROSARIO LS	13.07 (6:10 AM Sept 19)	13.51 (7:00 AM Sept 19)	14.03 (8:50 AM Sept 19)
10. NAPINDAN 2			
11. NAPINDAN 1			
12. MINDANAO	33.83 (2:50 AM)	34.46 (3:00 AM)	35.01 (6:00 AM)
13. SAN JUAN SCHOOL	11.12 (6:40 PM – Sept 18)	11.58 (2:40 AM – Sept 19)	12.18 (3:00 AM – Sept 19)
14. PANDACAN	11.02 (6:20 PM-Sept 18)	11.54 (2:50 AM-Sept 19)	12.00 (6:20 AM-Sept 19)

DID NOT REACHED FLOOD WARNING LEVELS

Summary of Warning Post Activation

Station Name	Alert	Alarm	Critical	REMARKS
1. Eastwood Rodriguez	3:36 AM	4:04 AM	5:52 AM	
2. Rodriguez 2	3:36 AM	4:04 AM	5:52 AM	
3. Rodriguez 1	3:40 AM	4:04 AM	5:52 AM	
4. De la Costa Subdivision	1:35 AM	2:31 AM	4:19 AM	
5. Burgos Station	1:45 AM	2:37 AM	3:16 AM	
6. San Mateo 2	1:36 AM	2:31 AM	4:19 AM	
7. San Mateo 1	3:07 AM	4:01 AM	5:52 AM	
8. Nangka	3:10 AM	4:08 AM	5:52 AM	
9. Tumana Bridge	3:10 AM	4:08 AM	5:52 AM	
10. Sto. Niño	3:10 AM	4:09 AM	5:52 AM	
11. Marcos Highway	4:08 AM	5:56 AM	6:27 AM	
12. Rosario J.S.	2:11 AM		6:06 AM	
13. Rosario L.S.	6:29 AM		10:17 AM	
14. People's Park	2:41 AM	3:23 AM	6:02 AM	Failure of the Amplifier at the Station caused the unsuccessful sounding of the warning post during the actual operation.
15. San Juan (Pumping	3:06 AM	3:23 AM	6:02 AM	


Flood Forecasting
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KOICA
Menu
Early Warning System
Warning Post
Hold List
Alarm List
Observation System
AWS / RG / WL
Report Inquiry
Report Alarm
Report SMS
SMS
SMS Management
SMS Send
Status Inquiry
Status Equipment
Status Data
Full Screen
Full Screen
admin | Logout Manual
Criteria
Local Time : 2014-09-25 07:27
Station:
Eastwood Rodriguez
From (yyyy-mm-dd):
2014-09-19
To (yyyy-mm-dd):
2014-09-19
SEQ:
Name:
--All--
Status:
--All--
Level:
--All--
Submit
Report Alarm
Time Stamp
SEQ
ID
Status
Level
Process S...
Comunicat...
Result
Remarks
Type
SMS
Eastwood Rodriguez
14/09/19 03:36 517 admin Issue Alert Success VHF Normal -- by Manual... N
14/09/19 03:40 517 admin Hold Alert Waiting VHF -- by Manual... N
14/09/19 03:47 517 admin Stopped Success VHF Normal by Manual... N
14/09/19 04:04 520 admin Issue Alarm Success VHF Normal -- by Manual... N
14/09/19 04:08 520 admin Stopped Success VHF Normal by Manual... N
14/09/19 05:52 523 admin Issue Critical Success VHF Normal -- by Manual... N
14/09/19 05:56 523 admin Hold Critical Waiting VHF -- by Manual... N
14/09/19 06:02 523 admin Hold Critical Waiting VHF -- by Manual... N
14/09/19 06:06 523 admin Stopped Success VHF Normal by Manual... N
Page 1 of 1
Displaying 1 - 9 of 9
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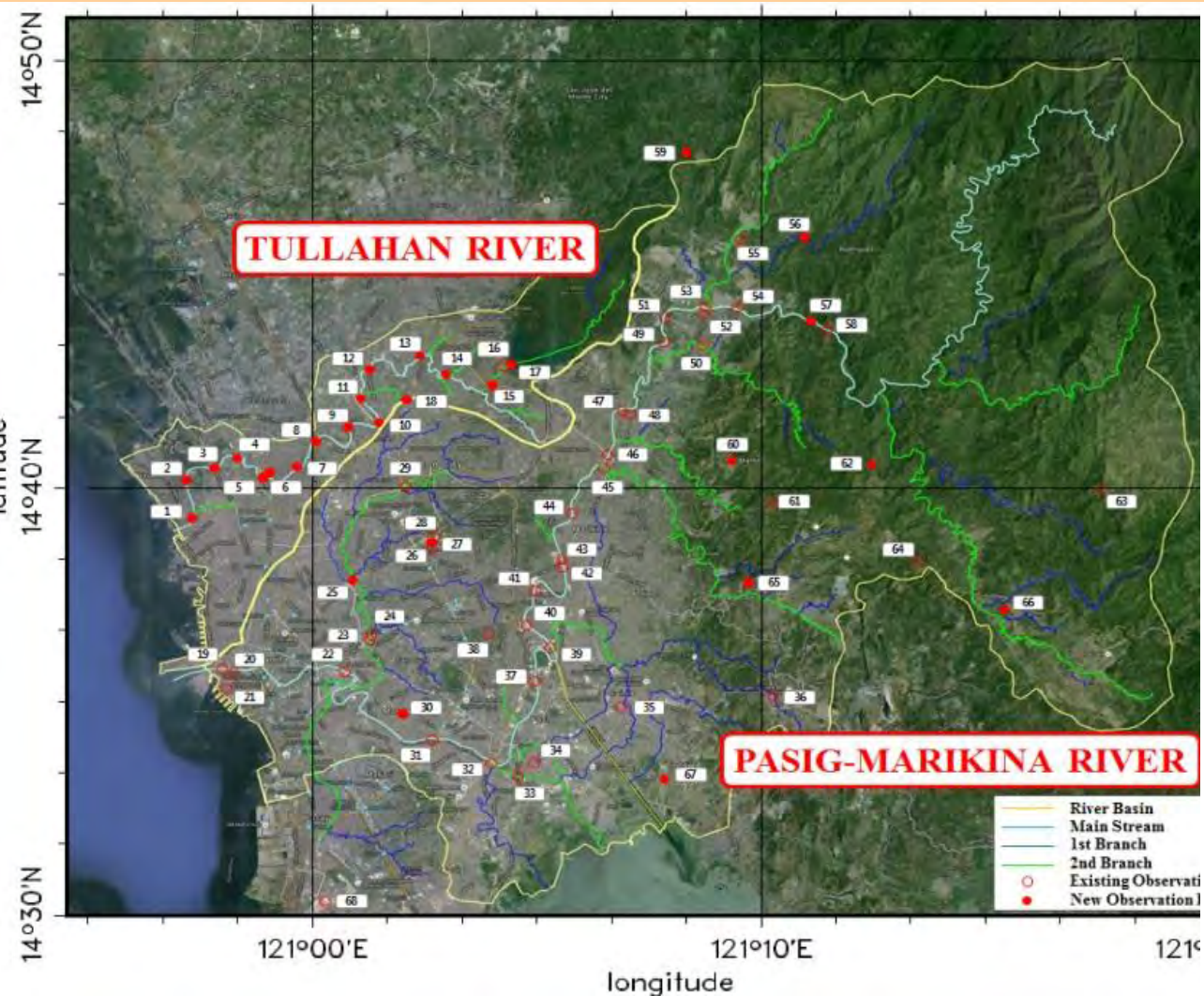
STRENGTHENING OF EWS2 :

"AUTOMATION OF FLOOD EARLY WARNING SYSTEM FOR DISASTER MITIGATION IN GREATER METRO MANILA OR EWS 3 PROJECT "

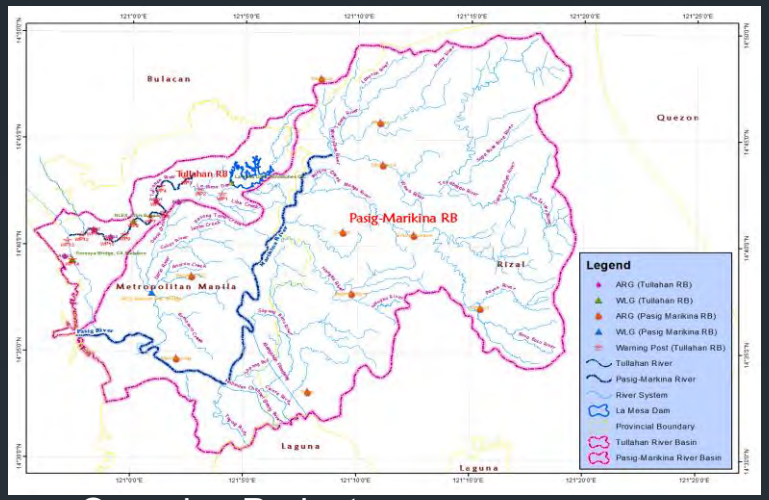


No.	NAME	EXISTING	NEW	Longitude	Latitude
1	Tonsoya Bridge, C4, Malabon		WP, WLG	120°57'23.33"E	14°39'17.60"N
2	Gov. W. Pascual Avenue		WP	120°57'9.29"E	14°40'10.39"N
3	Tinajeros Bridge, Marcelo H. del Pilar Street		WP	120°57'47.12"E	14°40'26.17"N
4	Philippine National Railways Equipment Depot		WP, ARG	120°58'18.44"E	14°40'42.06"N
5	Tullahan Bridge, MacArthur Highway		WP	120°58'50.64"E	14°40'13.54"N
6	Valenzuela National HS		ARG	120°59'5.28"E	14°40'22.06"N
7	Brgy 161 Zone 14 Libis Reparo, Caloocan		WP	120°59'41.19"E	14°40'28.35"N
8	NLEX, Libis Bassa		WP,WLG	121° 0'3.30"E	14°41'5.06"N
9	Brgy 164 Zone 14, Talipapa, Novaliches		WP	121° 0'49.05"E	14°41'18.41"N
10	Tullahan Bridge, Mindanao NLEX		WP	121° 1'20.72"E	14°41'32.56"N
11	San Pedro 9 Subdivision		WP, ARG	121° 1'3.87"E	14°42'5.67"N
12	San Bartolome Delta Bridge, Katipunan Avenue		WP	121° 1'15.48"E	14°42'44.73"N
13	Tullahan Bridge, Quirino Highway, Novaliches		WP	121° 2'24.28"E	14°43'7.27"N
14	Sitio 6, Brgy. Sto. Lucia		WP	121° 3'1.70"E	14°42'57.80"N
15	Commonwealth Avenue, North Fairview		WP	121° 3'59.86"E	14°42'23.74"N
16	La Mesa Dam	AWS		121° 4'14.30"E	14°42'51.91"N
17	La Mesa Dam, Novaliches Q.C.		WLG	121° 4'23.23"E	14°42'55.85"N
18	Barangay Hall San Bartolome QC		ARG	121° 2'4.45"E	14°42'2.32"N
19	Fort Santiago	WLG		120°58'1.63"E	14°35'48.20"N
20	Fort Santiago	WP		120°58'12.53"E	14°35'41.99"N
21	Fort Area Synop	AWS		120°58'4.30"E	14°35'17.98"N
22	Pandacan	ARG		121° 0'44.72"E	14°35'39.68"N
23	San Juan School	ARG		121° 1'19.80"E	14°36'25.18"N
24	San Juan School	ARG		121° 1'19.32"E	14°36'31.72"N
25	People's Park		ARG	121° 0'53.70"E	14°37'46.00"N
26	PAGASA-WFFC	DRR		121° 2'39.53"E	14°38'29.40"N
27	PAGASA DIC		ARG	121° 2'39.80"E	14°38'32.32"N
28	PAGASA Science	AWS		121° 2'39.08"E	14°38'42.31"N
29	Mindanao	ARG,WLG		121° 2'5.13"E	14°40'2.23"N
30	Mandaluyong		ARG	121° 2'1.28"E	14°34'40.63"N
31	Guadalupe	WP		121° 2'41.53"E	14°34'5.68"N
32	Napindan-2	WP, ARG, WLG		121° 3'59.57"E	14°33'30.53"N
33	Napindan-1	WLG		121° 4'33.70"E	14°33'13.69"N
34	Pasig City Hall	DRR, AWS		121° 4'53.84"E	14°33'34.28"N
35	Cainta	DRR, ARG		121° 6'51.61"E	14°34'49.49"N
36	Antipolo	AWS		121°10'10.10"E	14°35'9.81"N
37	Rosario LS	WP, WLG		121° 4'58.75"E	14°35'24.9"N
38	NDCC-OCD	DRR		121° 3'55.70"E	14°36'36.58"N
39	Rosario JS	WP, WLG		121° 5'20.81"E	14°36'13.60"N
40	Mercury Avenue	WP		121° 4'45.00"E	14°36'45.58"N
41	Marcos Highway	WP, WLG		121° 4'50.26"E	14°37'35.12"N
42	Sto Nino	WP, WLG		121° 5'35.24"E	14°38'9.30"N
43	Marikina (Youth Camp)	ARG		121° 5'29.57"E	14°38'19.98"N
44	Tumana Bridge	WP, WLG		121° 5'47.45"E	14°39'23.14"N
45	Nangka	WP, ARG, WLG		121° 6'31.00"E	14°40'25.00"N
46	San Mateo-1	WP, WLG		121° 6'35.04"E	14°40'46.57"N
47	San Mateo-2	WP, ARG		121° 6'52.70"E	14°41'47.41"N
48	San Mateo Mun. Hall	DRR		121° 7'4.27"E	14°41'42.28"N
49	Delacosta Subdiv.	WP		121° 7'51.60"E	14°45'19.29"N
50	Burgos	WP, WLG		121° 8'40.52"E	14°45'18.96"N
51	Rodriguez-1	WP, WLG		121° 7'49.23"E	14°45'59.49"N
52	Rodriguez Mun. Hall	DRR		121° 8'44.18"E	14°45'56.33"N
53	Rodriguez-2	WP		121° 8'46.26"E	14°44'9.50"N
54	Eastwood Rodriguez	WP		121° 9'30.09"E	14°44'14.27"N
55	Mt. Oro	ARG		121° 9'35.40"E	14°45'48.00"N
56	Mascap		ARG	121°10'59.20"E	14°45'48.61"N
57	Sitio Wawa		ARG	121°11'7.50"E	14°45'48.84"N
58	Wawa Dam	WP, WLG		121°11'29.86"E	14°45'38.73"N
59	Macabud		ARG	121° 8'21.08"E	14°47'51.08"N
60	Calawis		ARG	121° 9'21.46"E	14°40'38.58"N
61	Mt. Aries	ARG		121°10'15.55"E	14°39'38.56"N
62	Pintong Bukawe		ARG	121°12'29.41"E	14°40'31.05"N
63	Mt. Campana	ARG		121°17'32.76"E	14°39'56.56"N
64	Boso Boso	ARG		121°13'27.94"E	14°38'15.89"N
65	Bagong Nayon		ARG	121° 9'45.94"E	14°37'46.03"N
66	MGMHS		ARG	121°15'27.86"E	14°37'9.90"N
67	TESDA Building		ARG	121° 7'48.81"E	14°33'9.95"N
68	Airport (PAGASA)	ARG		121° 0'16.82"E	14°30'20.89"N

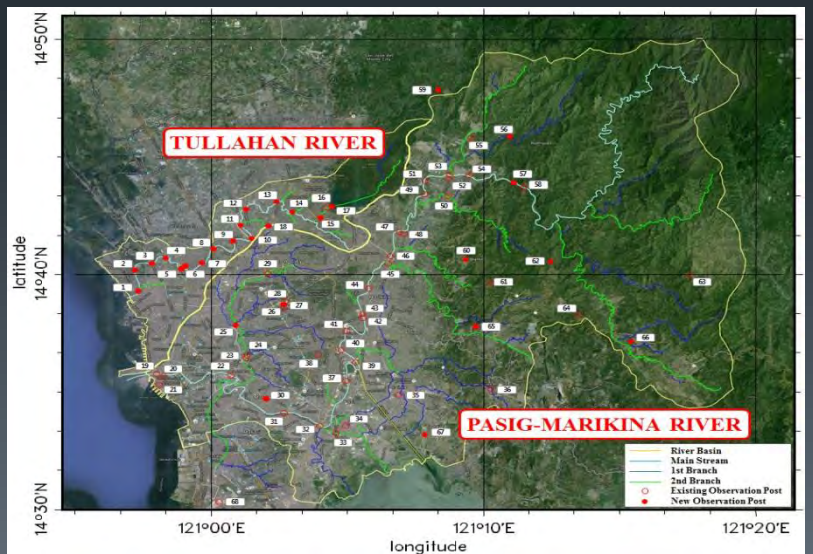
Automation of Flood Early Warning System for Disaster Mitigation in Greater Metro Manila or EWS 3 Project

Target Areas:

- Pasig-Marikina-Tullahan River



- On-going Project
- Target Date of Completion : 2017



Expected Outcomes:

LEVEL-I Infrastructure development in the Tullahan river basin (TRB) and reinforcement of basis for growth in the Pasig- Marikina river basin (PMRB)

- to establish additional (15) rainfall gauging station and 4 waterlevel gauging stations for PMTRB
- To establish 14 warning post and flood monitoring facilities such as CCTV at Tullahan RB
- To integrate a flood forecasting and warning system for TRB with the existing system of PMRB

LEVEL-II Human resource training : Ensuring sustainable growth engine

- To introduce professional education and training in flood management including workshop, training course
- To build a PAGASA centered integrated watershed flood management system

LEVEL-III **Flood damage mitigation : Building the safety network of infrastructures**

- To mitigate flood damage by developing a highly advance flood forecasting and warning system
- To ensure sufficient time to evacuate through systematic flood management.

THANK YOU!