



**26 - 28 January 2022**



**09.00 - 16.30 hrs.** (GMT+7 Bangkok)

# The Calibration Curve for Irrigation Reservoirs by Survey Tool Innovation

Somyot Kaewmora<sup>1st</sup>, Thisana Sereekhodchahiran<sup>2nd</sup>,  
Narongsak Sopawararat<sup>3rd</sup>, Nipon Yupa<sup>4th</sup>, and Porntipa Pinthong<sup>5th</sup>

<sup>1234</sup>Ground Survey Division and <sup>5</sup>Geoinformatic Technology Division  
Bureau of Engineering topographical and Geotechnical Survey  
Royal Irrigation Department (RID)  
Bangkok, Thailand



# Contents



- Introduction
- Objectives
- Methodology
- Results
- Conclusions and Suggestions



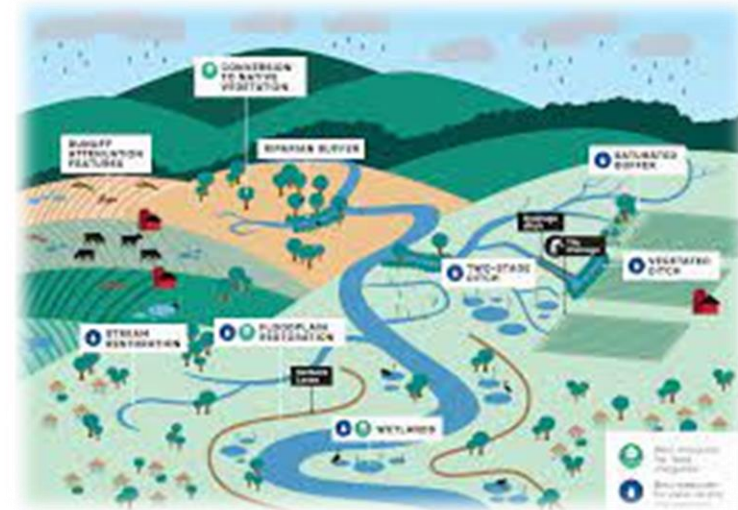
# Introduction

## RID's mission



- To develop water resources and to increase irrigation area according to their potential and natural balance
- To manage water resources in adequate, thorough and equitable manners

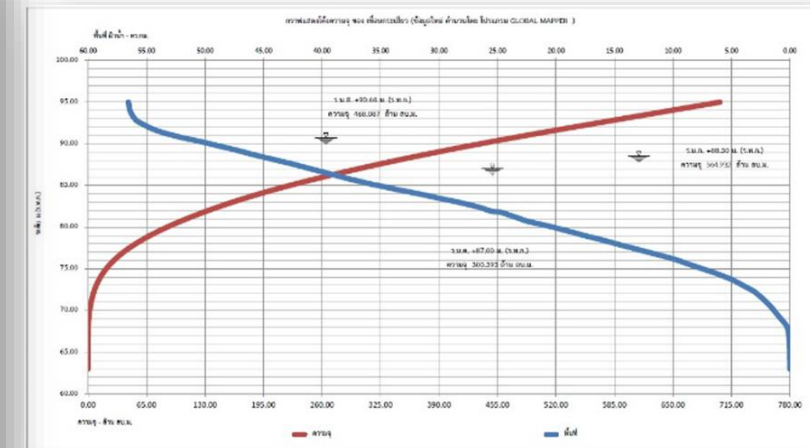
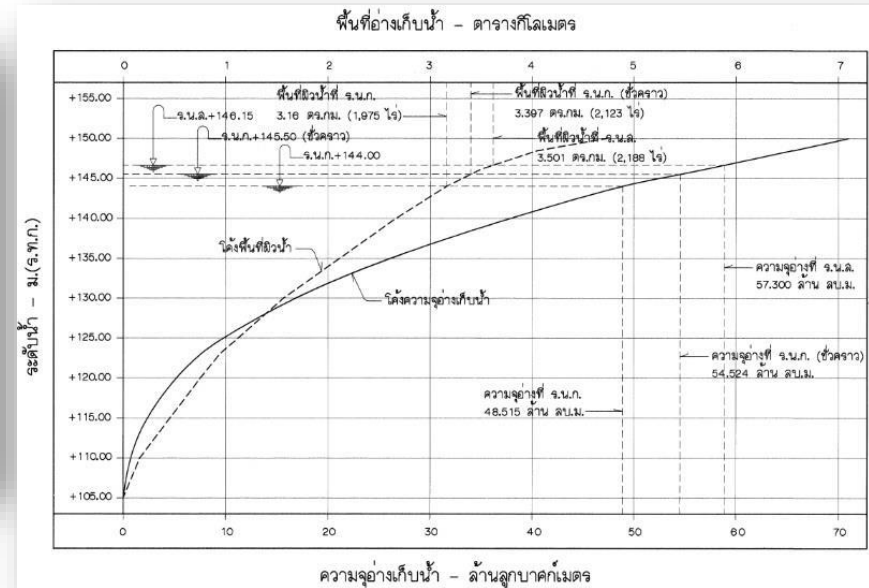
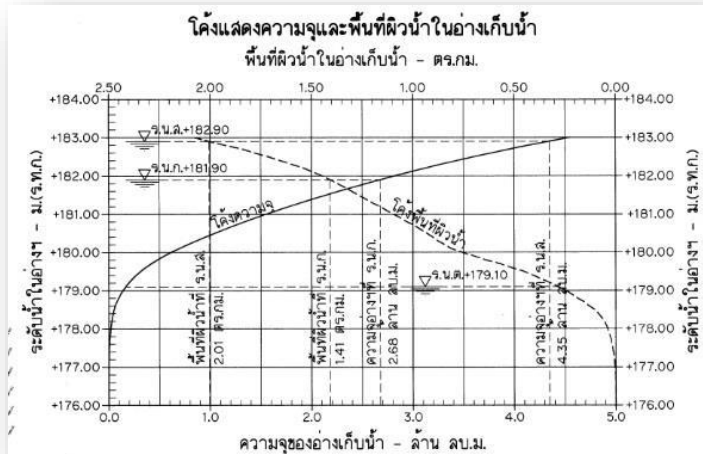
- To appropriately prevent and mitigate water hazards
- To encourage people participation in water resources management and development





- RID is particularly responsible for operating and managing irrigation water efficiency to water use objectives



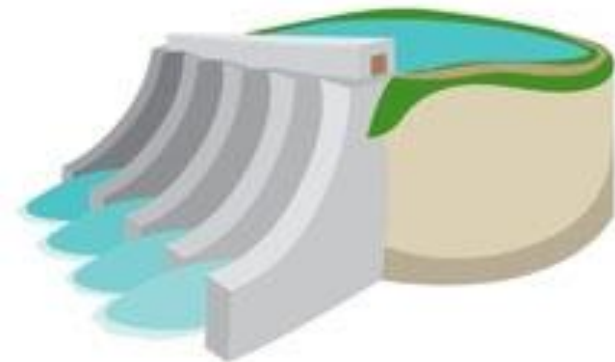


- Several of dams and reservoirs in responsibility of RID have been used for very long time
- The traditional surveying methods in the past is obsolete



# Objectives

- To improve the accuracy of area-capacity curves which can be used for operating and managing water in the reservoirs or dams efficiently.
- To apply the result of engineering survey information for increasing a storage capacity of the irrigation reservoirs or dams.





# Specific Objectives

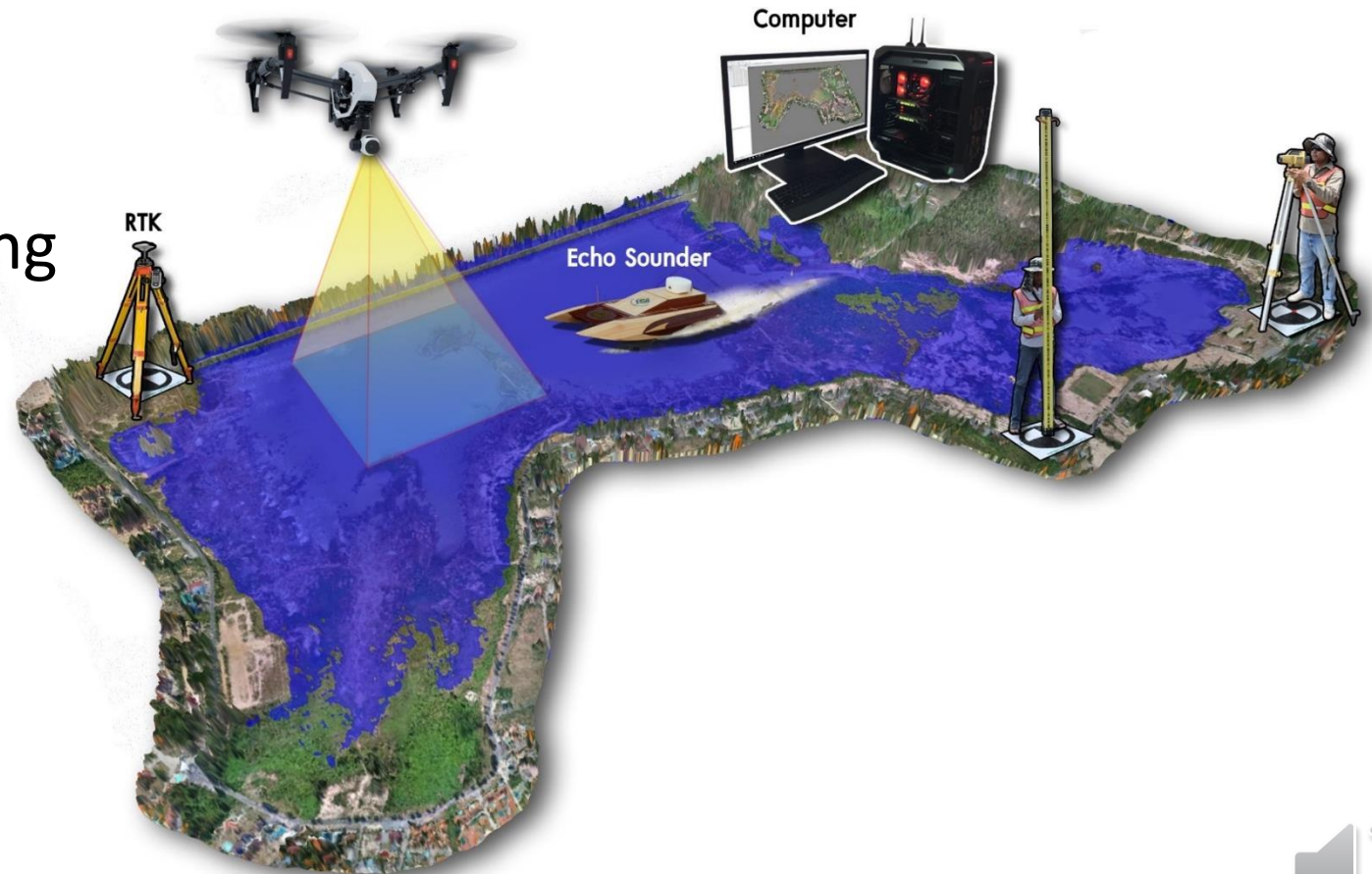
- To find out the new surveying methods or tools that can be obtained the accurate spatial data or more information for engineering works.
- To encourage staffs to learning and applying new technologies to their jobs.
- To response the policy of intelligent organization of RID by using new technology and serving a digital data for digital platform of RID.



# Methodology

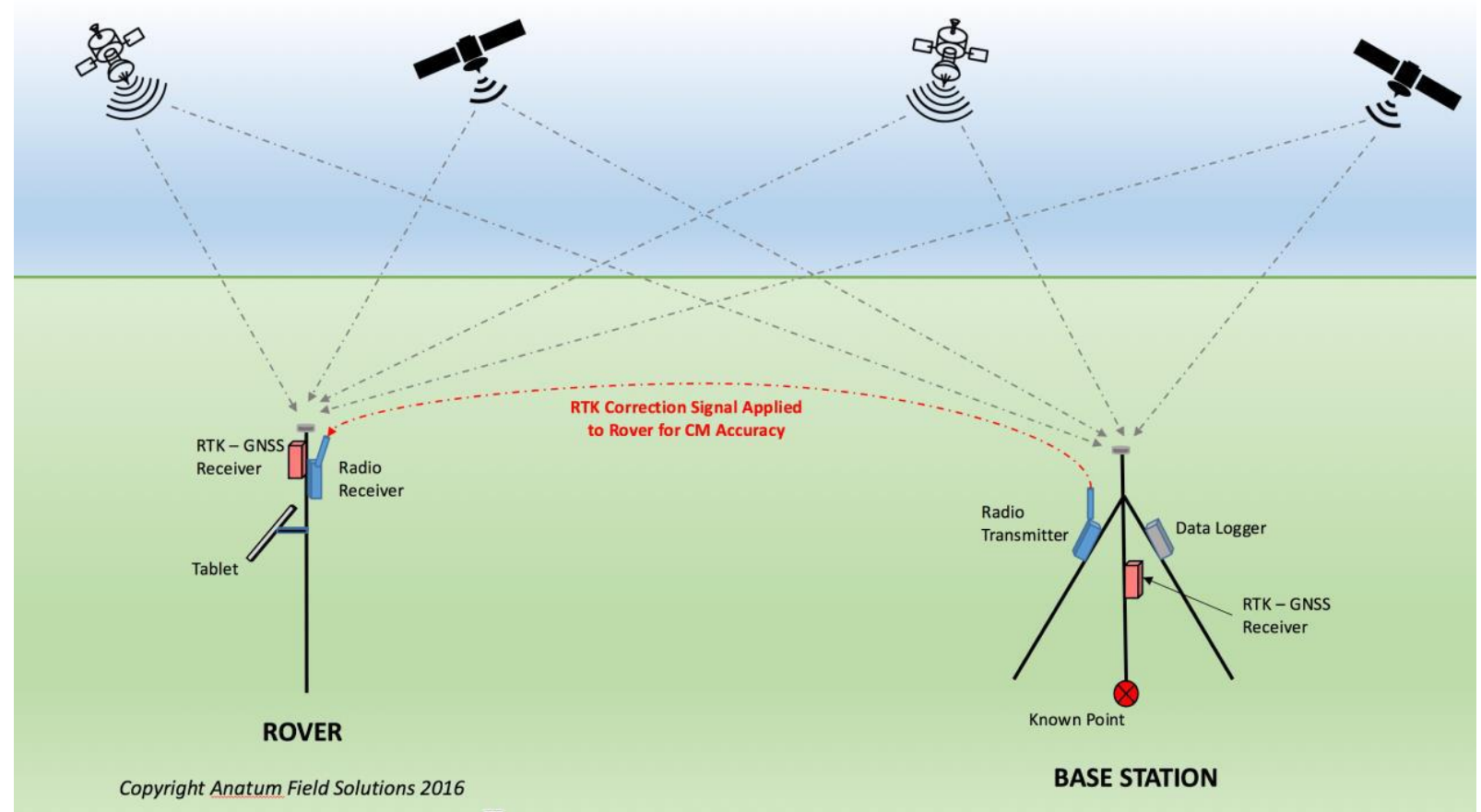
## Surveying tools Innovation

- Ground Surveying
- Underwater surveying
- Aerial surveying

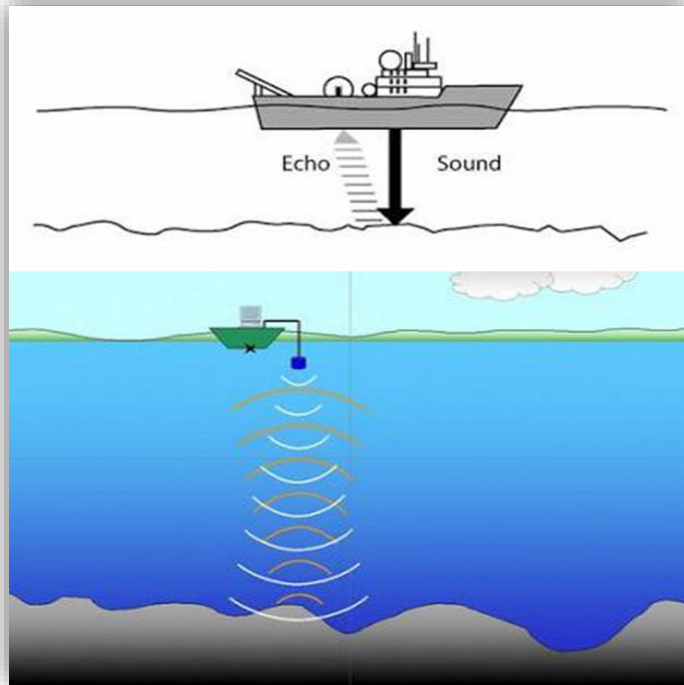




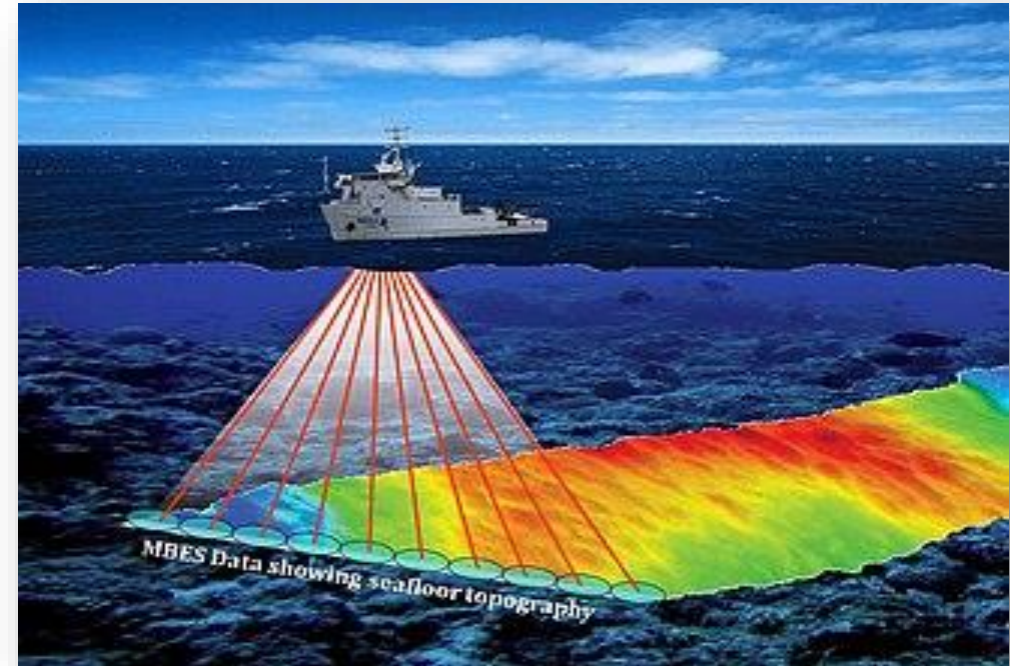
- Ground surveying -> Total Stations, Digital levels, RTK-GNSS



- Underwater surveying -> Echo Sounder with RTK-GNSS



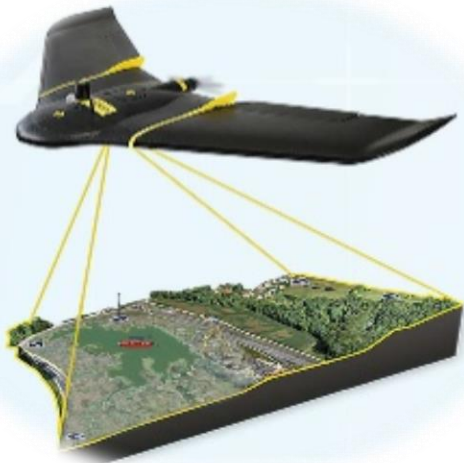
Single-beam Echo Sounder



Multi-beam Echo Sounder



- Aerial surveying -> Drone or UAV with RTK-GNSS





# Methodology (Cont.)

- Field Survey working
- Data processing
  - > Digital Elevation Model (DEM)
  - > Contour Line
  - > Orthophotograph products
- The area-capacity curve performing
- Reports and surveying information handling
- Results of the calibration curve applying



# Results

## Yang Chum Reservoir, Prachuap Khiri Khan

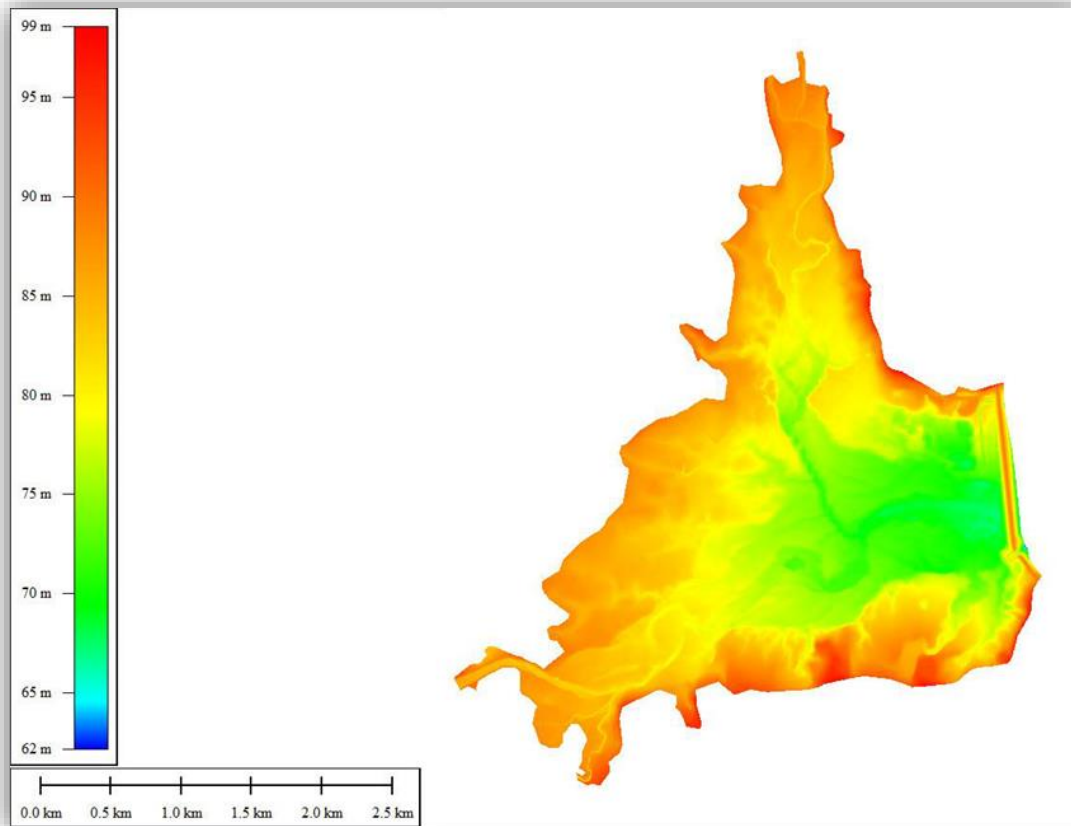


- Topographical Information from the survey tools innovation

## Orthophoto production

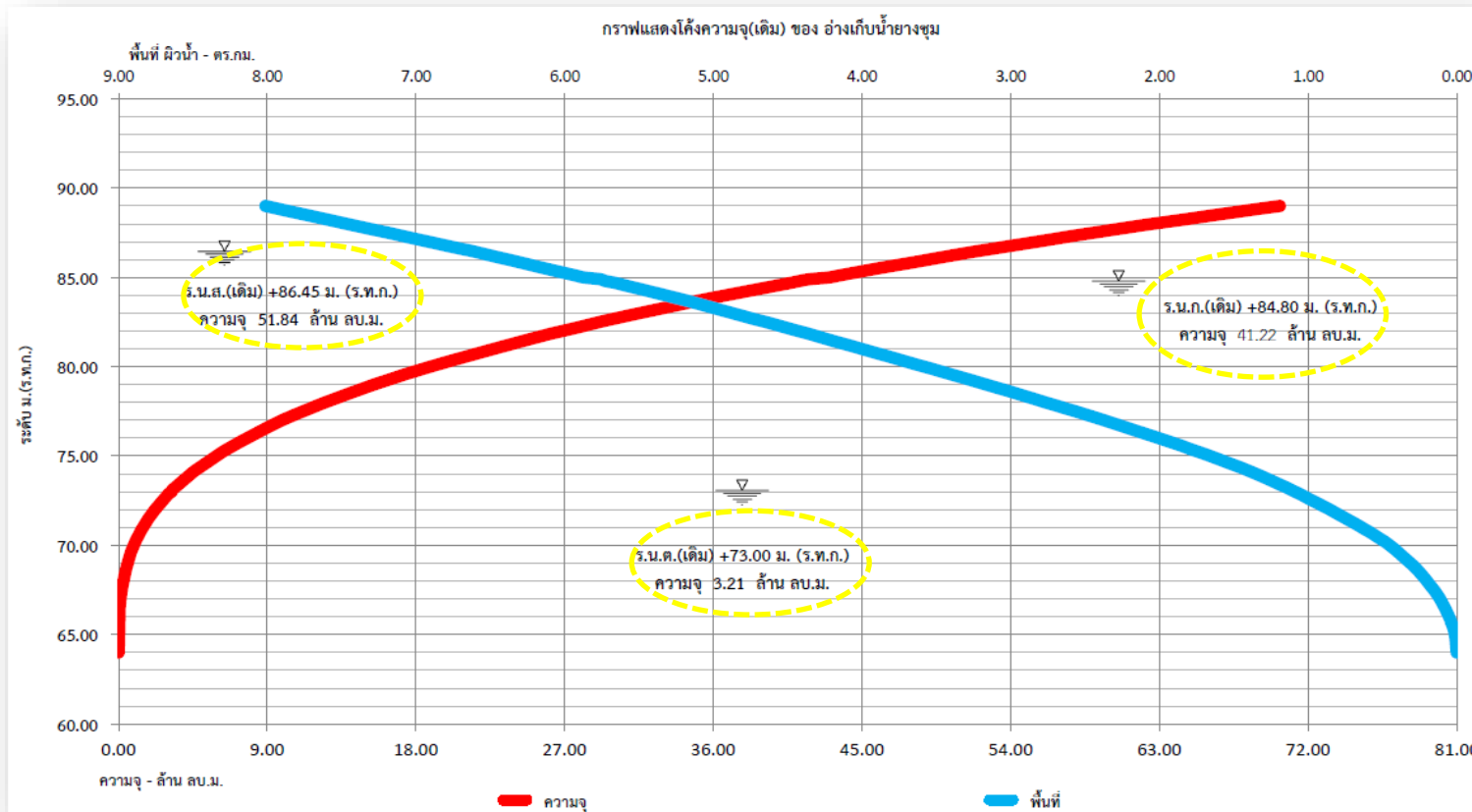
DEM -> 1 cm. Contour Line

-> 1:2,000, 1:1,000, 1:500 Orthophoto Map





# The area-capacity curves of Yang-Chum reservoir by using data from 1:10,000 topographic map



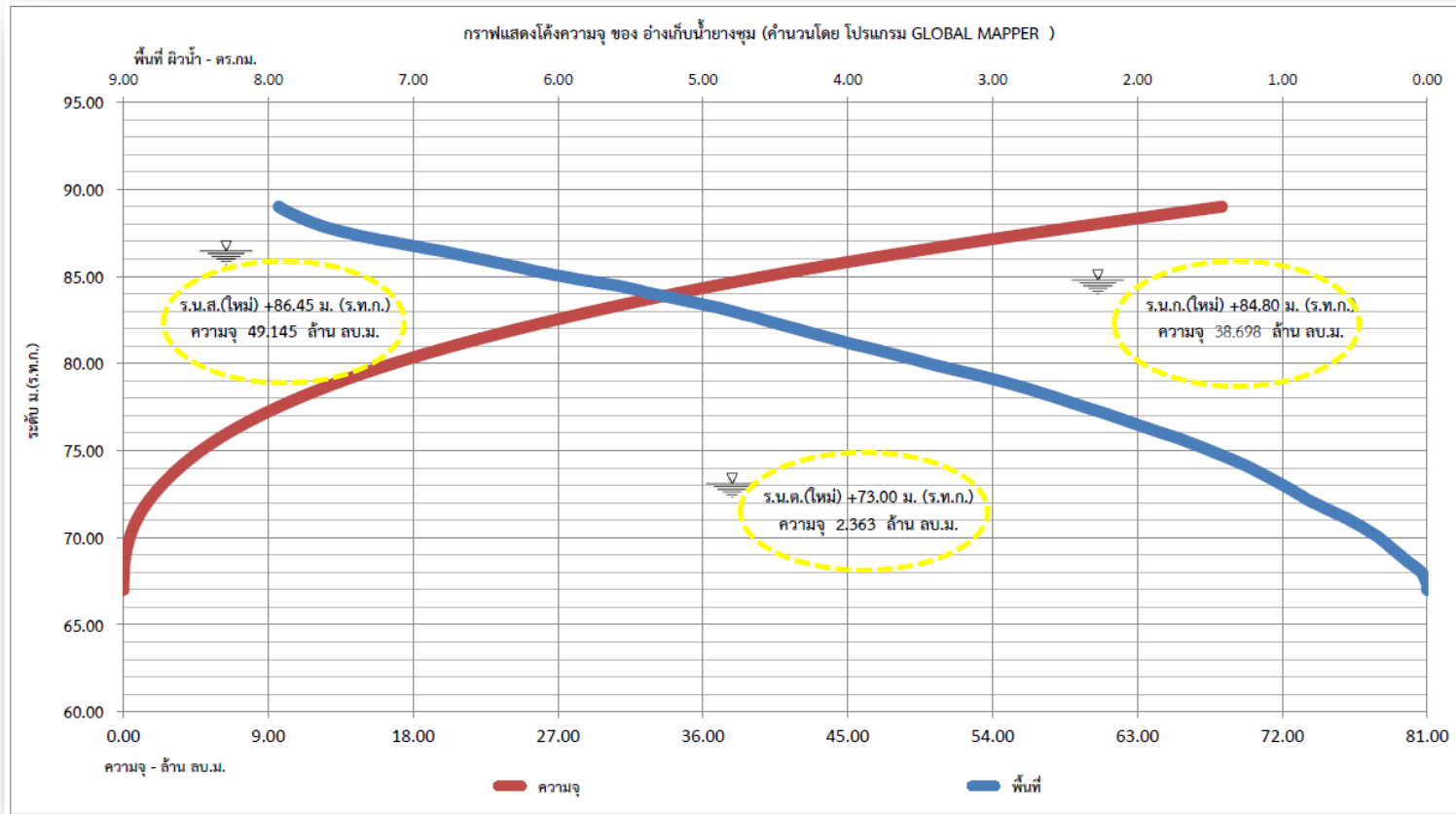
ระดับ (ม. ร.ท.ก.)	พื้นที่ (ตร.กม.)	ความจุ (ล้าน ลบ.ม.)	ระดับ (ม. ร.ท.ก.)	พื้นที่ (ตร.กม.)	ความจุ (ล้าน ลบ.ม.)
83.20	4.9594000	32.5560000	86.40	6.5832000	51.5100000
83.30	5.0041000	33.0650000	86.45	6.6090000	51.8400000

ระดับ (ม. ร.ท.ก.)	พื้นที่ (ตร.กม.)	ความจุ (ล้าน ลบ.ม.)	ระดับ (ม. ร.ท.ก.)	พื้นที่ (ตร.กม.)	ความจุ (ล้าน ลบ.ม.)
64.00	0.0000000	0.0000000	67.20	0.1278000	0.1450000
64.10	0.0010000	0.0030000	67.30	0.1359000	0.1610000
64.20	0.0020000	0.0060000	67.40	0.1442000	0.1780000
64.30	0.0030000	0.0090000	67.50	0.1533000	0.1940000
64.40	0.0041000	0.0120000	67.60	0.1628000	0.2100000
64.50	0.0052000	0.0150000	67.70	0.1724000	0.2270000
64.60	0.0063000	0.0180000	67.80	0.1819000	0.2460000
64.70	0.0074000	0.0200000	67.90	0.1912000	0.2700000
64.80	0.0087000	0.0230000	68.00	0.2004000	0.2940000
64.90	0.0104000	0.0260000	68.10	0.2101000	0.3180000
65.00	0.0123000	0.0290000	68.20	0.2200000	0.3420000
65.10	0.0147000	0.0320000	68.30	0.2300000	0.3650000
65.20	0.0174000	0.0350000	68.40	0.2402000	0.3890000
65.30	0.0207000	0.0380000	68.50	0.2507000	0.4130000
65.40	0.0244000	0.0410000	68.60	0.2615000	0.4370000
65.50	0.0283000	0.0440000	68.70	0.2729000	0.4610000
65.60	0.0325000	0.0460000	68.80	0.2846000	0.4900000
65.70	0.0386000	0.0480000	68.90	0.2974000	0.5210000
65.80	0.0410000	0.0500000	69.00	0.3107000	0.5530000

86.00	6.3798000	49.0490000
86.10	6.4330000	49.6520000
86.20	6.4839000	50.2630000
86.30	6.5336000	50.8860000

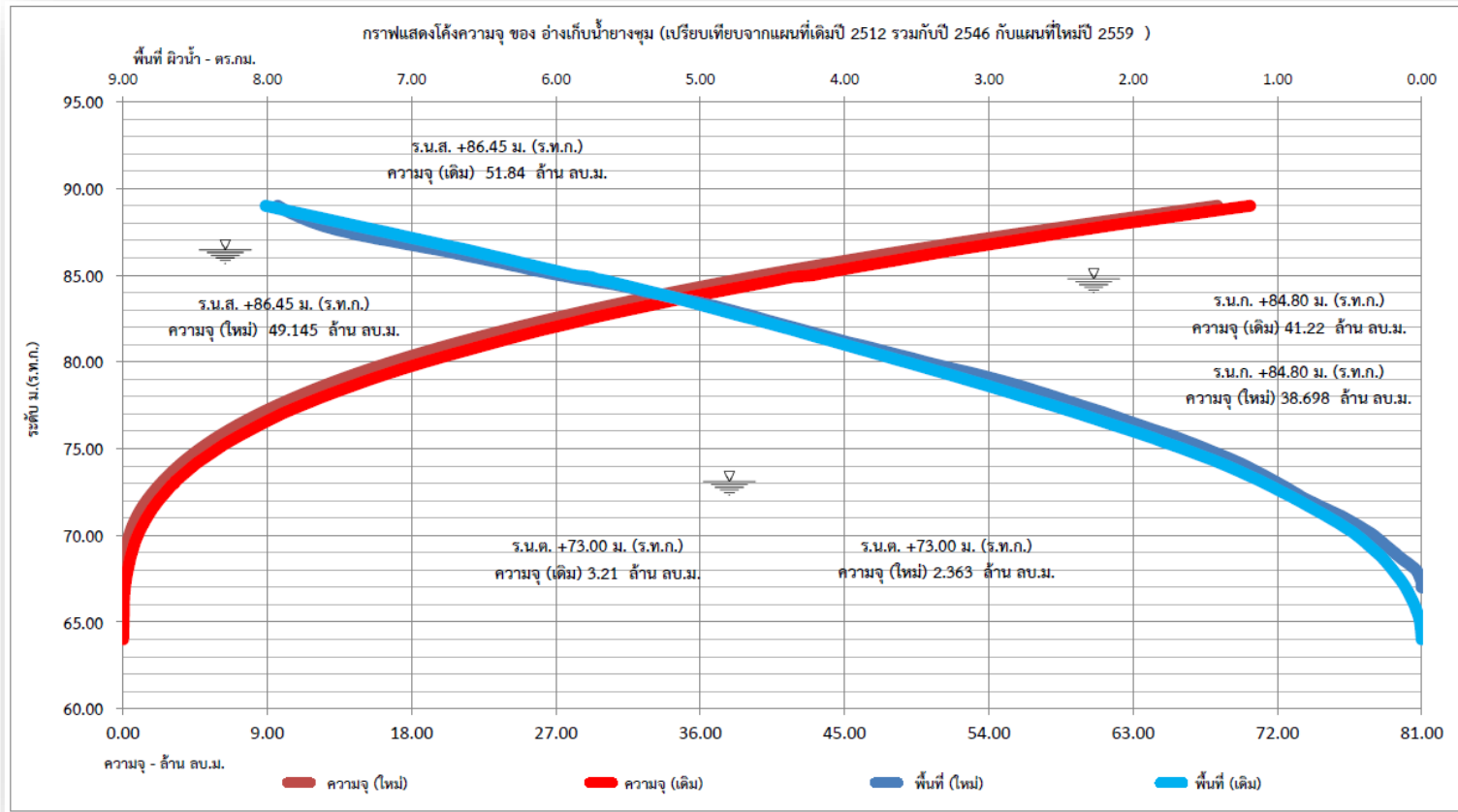


# The area-capacity curves of Yang-Chum reservoir by using data from Surveying Tools Innovation



ระดับ (ม. ร.ท.ก.)	พื้นที่ (ตร.กม.)	ความจุ (ล้าน ลบ.ม.)	ระดับ (ม. ร.ท.ก.)	พื้นที่ (ตร.กม.)	ความจุ (ล้าน ลบ.ม.)		
67.00	0.0000	0.0000	67.30	0.0012	0.0001		
67.01	0.0000	0.0000	67.31	0.0014	0.0001		
67.02	0.0000	0.0000	67.32	0.0016	0.0001		
67.03	0.0000	0.0000	67.33	0.0017	0.0001		
67.04	0.0000	0.0000	67.34	0.0020	0.0001		
67.05	0.0000	0.0000	67.35	0.0024	0.0002		
67.06	0.0000	0.0000	67.36	0.0028	0.0002		
67.07	0.0000	0.0000	67.37	0.0031	0.0002		
67.08	0.0000	0.0000	67.38	0.0039	0.0002		
67.09	0.0000	0.0000	67.39	0.0043	0.0003		
67.10	0.0000	0.0000	67.40	0.0047	0.0003		
67.11	0.0000	0.0000	67.41	0.0051	0.0004		
67.12	0.0000	0.0000	67.42	0.0055	0.0004		
67.13	0.0000	0.0000	67.43	0.0060	0.0005		
67.14	0.0000	0.0000	67.44	0.0064	0.0006		
67.15	0.0000	0.0000	67.45	0.0068	0.0006		
67.16	0.0001	0.0000	67.46	0.0072	0.0007		
67.17	0.0001	0.0000	67.47	0.0077	0.0008		
67.18	0.0001	0.0000	67.48	0.0082	0.0008		
67.19	0.0002	0.0000	67.49	0.0087	0.0009		
67.20	0.0002	0.0000	67.50	0.0091	0.0010		
		88.79	7.8860	66.5802	89.00	7.9280	68.2407
		88.80	7.8880	66.6591			

# Data Comparison



	Retention Water Level (m. msl.)	Water Capacity (mcm.)	Water Surface Area (km <sup>2</sup> )
Before Calibration	+84.80	41.2200	5.7250
After Calibration	+84.80	38.6981	5.8440
Differential	-	-2.5219	0.119
% of Differential	-	-6.12%	2.08%





# Conclusions and suggestions

- The calibration curves by the surveying tools innovation are significantly different from the area-capacity curves by the traditional surveying information.
- The causes of the difference are
  - > Resolution of topographical information
  - > Sediment deposition in the reservoir



# Conclusions and suggestions

- The calibration curve from the surveying tools innovation is highly accurate
  - > Responsible organizations should use the calibration information for the operation rule curve adjustment
- The topographical terrain underwater changes
  - > Responsible organization should use the calibration curve for the future works



Q & A

THANK YOU

FOR YOUR ATTENTIONS

Q & A

Q & A

Q & A

