



KEMENTERIAN ALAM SEKITAR
DAN AIR (KASA)

STRATEGIC COLLABORATION MEETING ON SABO DAM TECHNOLOGY IN GUNUNG JERAI, KEDAH

1 OCTOBER 2021

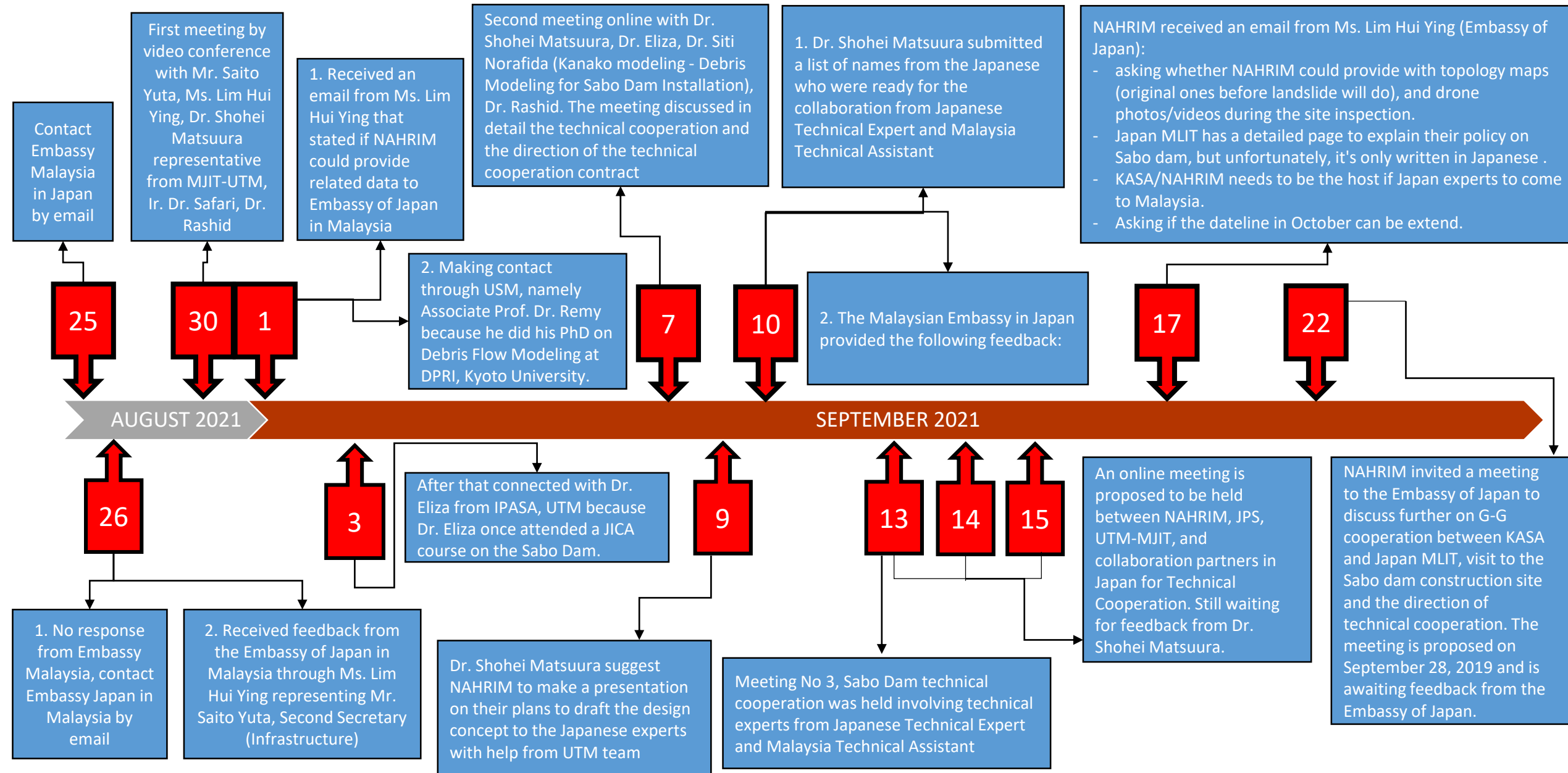
TABLE OF CONTENT

1. Communication with expert from Japan
2. Physical findings at site
3. Hydrological findings
4. Geological findings
5. Sabo Dam conceptual design
6. Future plans (timeline and output)
7. Type of support needed
8. Points of concern



COMMUNICATION WITH EXPERT FROM JAPAN

CHRONOLOGY EVENT

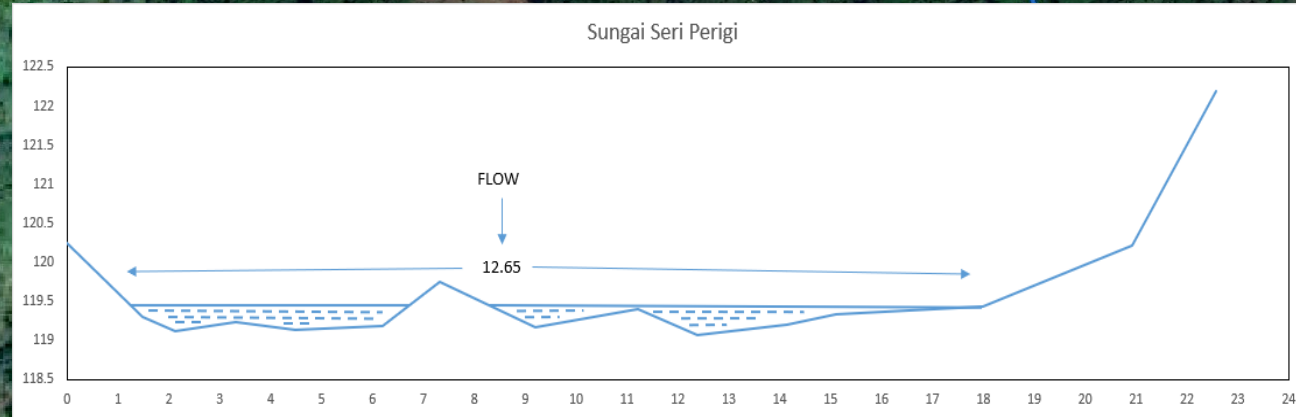


PHYSICAL FINDINGS AT SITE

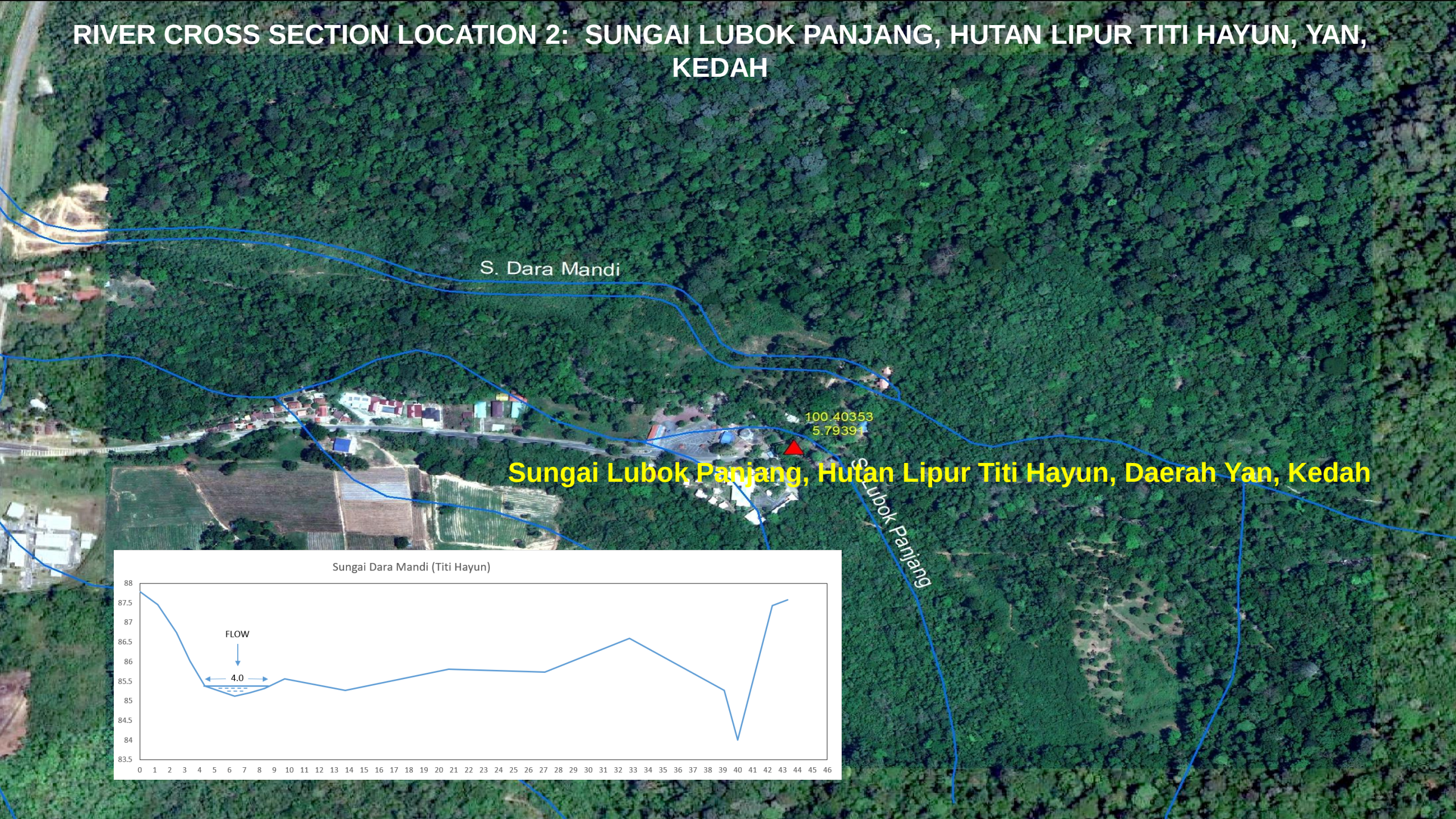


RIVER CROSS SECTION AT LOCATION 1: SUNGAI SERI PERIGI, YAN, KEDAH

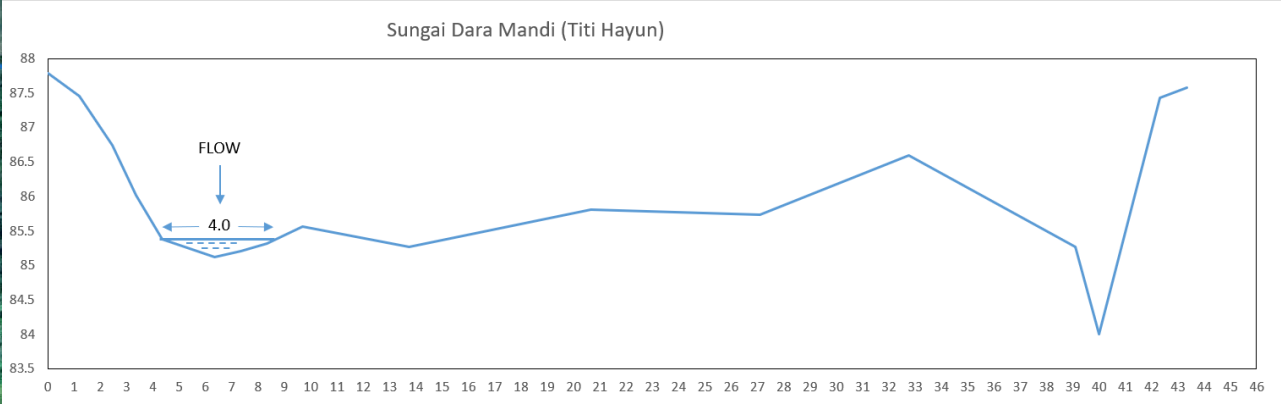
100.40757
5.8097
Sungai Seri Perigi, Yan, Kedah



RIVER CROSS SECTION LOCATION 2: SUNGAI LUBOK PANJANG, HUTAN LIPUR TITI HAYUN, YAN, KEDAH



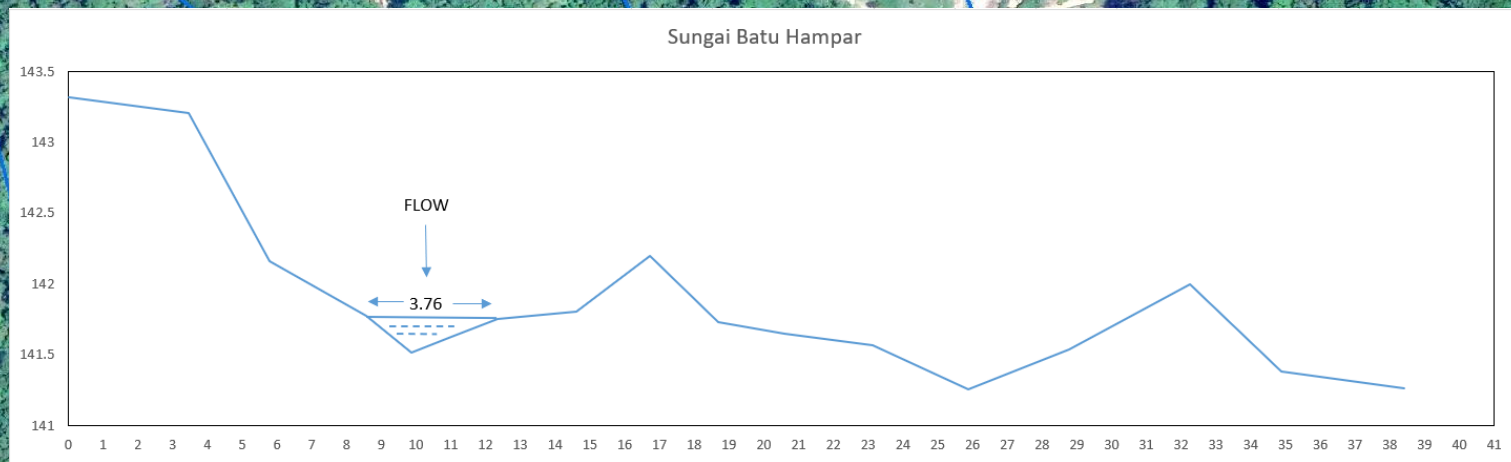
Sungai Lubok Panjang, Hutan Lipur Titi Hayun, Daerah Yan, Kedah



RIVER CROSS SECTION LOCATION 3: SUNGAI BATU HAMPAR, YAN, KEDAH

Sungai Batu Hampar, Daerah Yan, Kedah

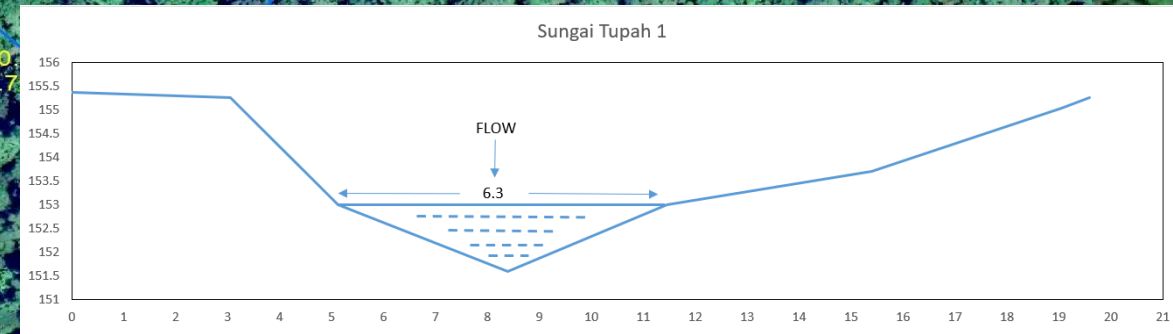
S. Batu Hampar



RIVER CROSS SECTION LOCATION 4 UNTIL 6: SUNGAI BUJANG, KUALA MODA, KEDAH

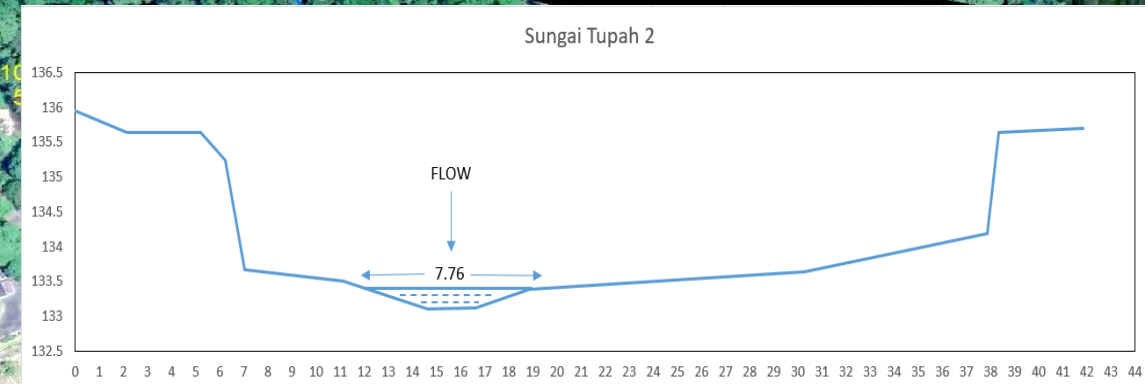
Upstream 1 Sungai Bujang (Tupah) intake SADA

100.57



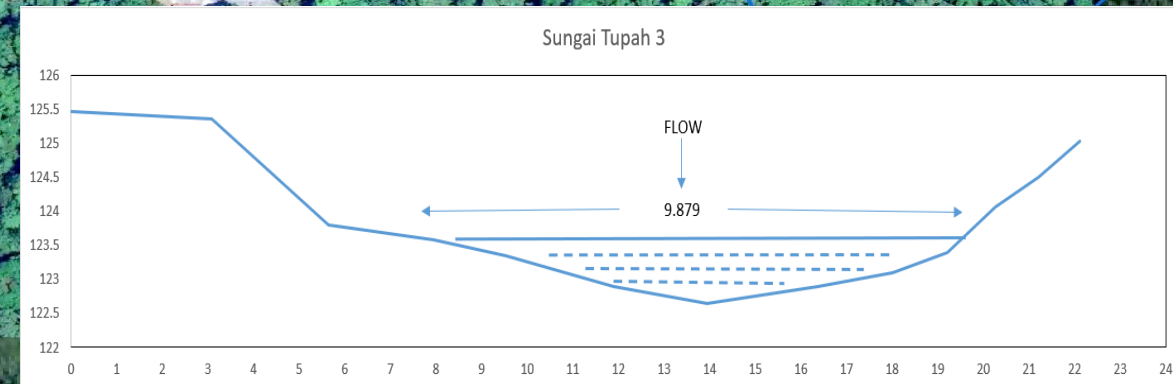
Upstream 1 Sungai Bujang (Tupah) intake SADA

100.57



Downstream Sungai Bujang (Tupah) intake SADA

5.74899





FIELD DATA COLLECTION
ON 6-8 SEPTEMBER 2021-SADA WATER TREATMENT PLANT (TUPAH 1)



FIELD DATA COLLECTION
ON 6-8 SEPTEMBER 2021-SADA WATER TREATMENT PLANT(TUPAH 2)



SITE VISIT WITH USM, UTM, UUM, UKM, JICA-EXPERT AND JMG
ON 24 SEPTEMBER 2021



DRONE IMAGE ON 24 SEPTEMBER 2021
AT TUPAH



DRONE IMAGE ON 24 SEPTEMBER 2021
AT BATU HAMPAR



DRONE IMAGE ON 24 SEPTEMBER 2021
AT SERI PERIGI



HYDROLOGICAL FINDINGS

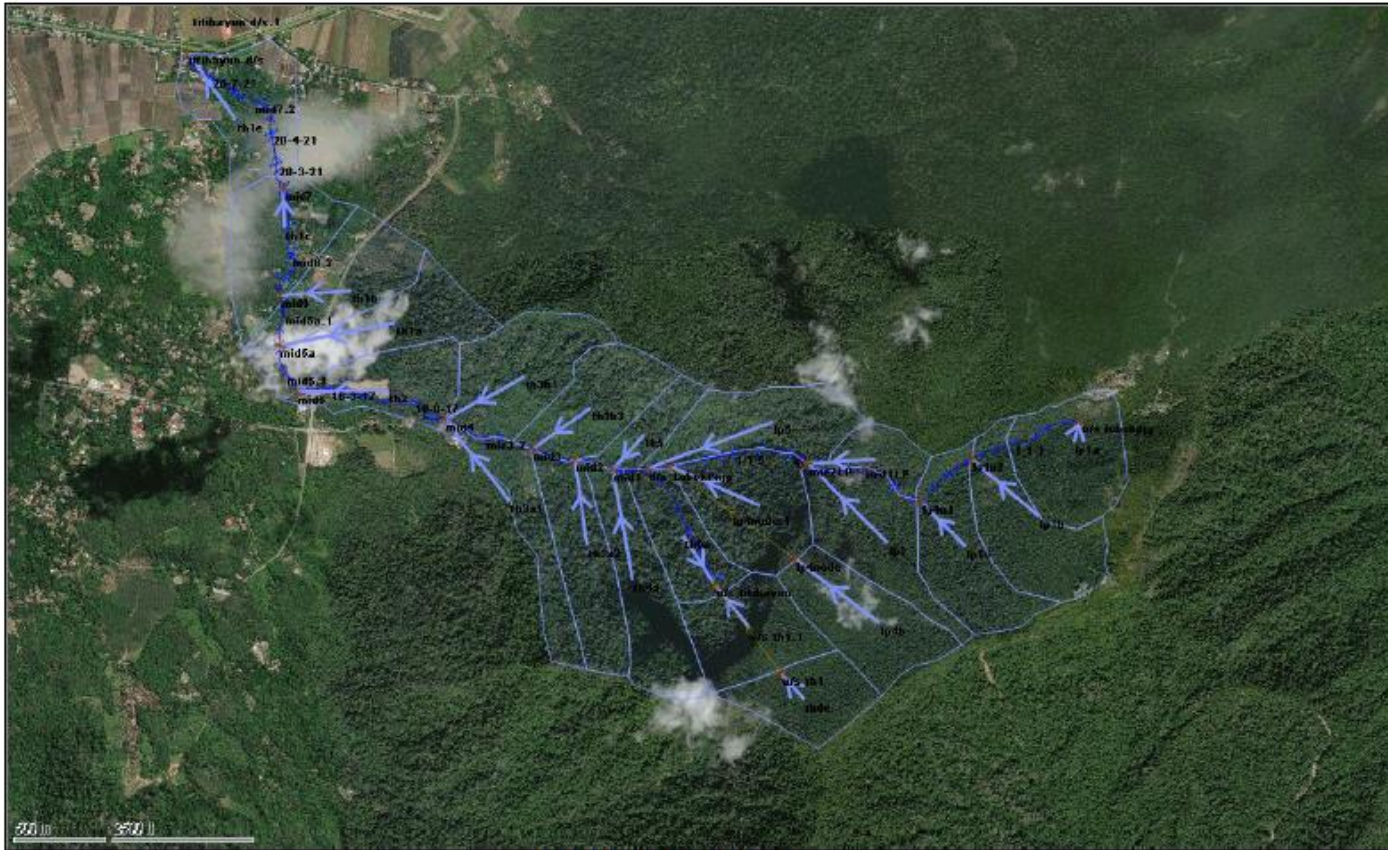
Average Recurrence Interval (ARI) curve at Gunung Jerai Rainfall Station and Singkir Genting

Station Name	Basin	Maximum Rainfall (mm)						
		1 hour	2 hour	3 hour	4 hour	5 hour	6 hour	7 hour
Gunung Jerai	Sg. Merbok	91.0	166.5	212.0	237.0	270.5	277.0	280.0
Singkir Genting	Sg. Singkir	55.5	83.0	118.5	142.0	155.5	164.5	165.0

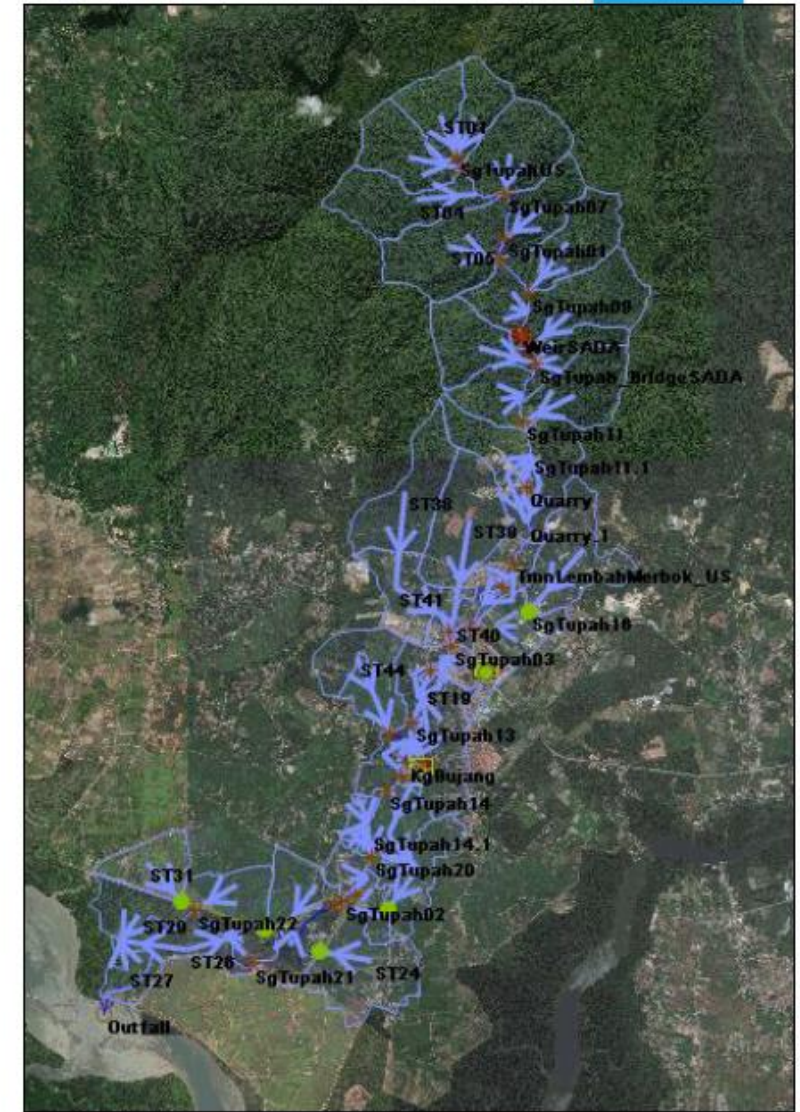
Station Name	Basin	Average Recurrence Interval (ARI)						
		1 hour	2 hour	3 hour	4 hour	5 hour	6 hour	7 hour
Gunung Jerai	Sg. Merbok	8	33	51	53	71	59	49
Singkir Genting	Sg. Singkir	< 2	2	5	8	9	10	8

HYDROLOGIC MODELING

- STUDY AREA



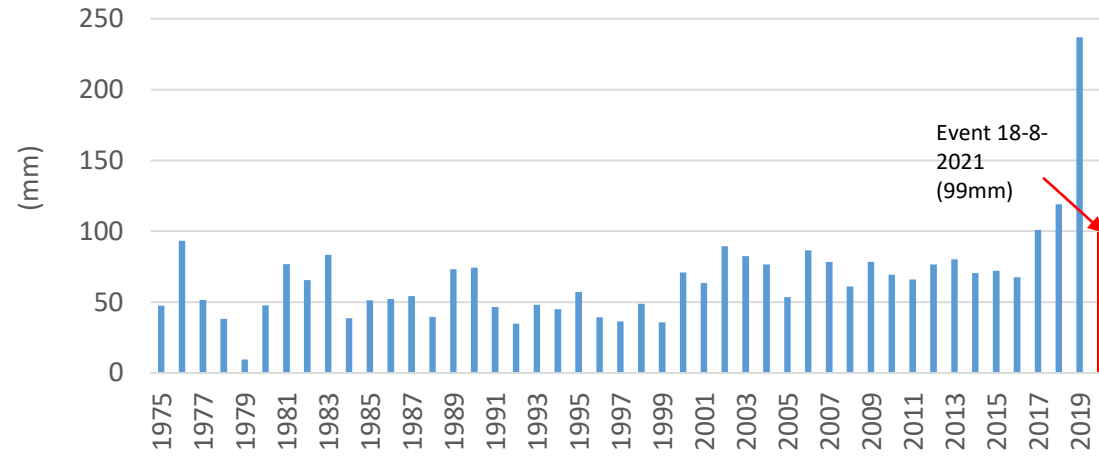
Titi Hayun
(Sg.Lubok Panjang&Sg.Dara Mandi)
Basin Area = 6.7 km²



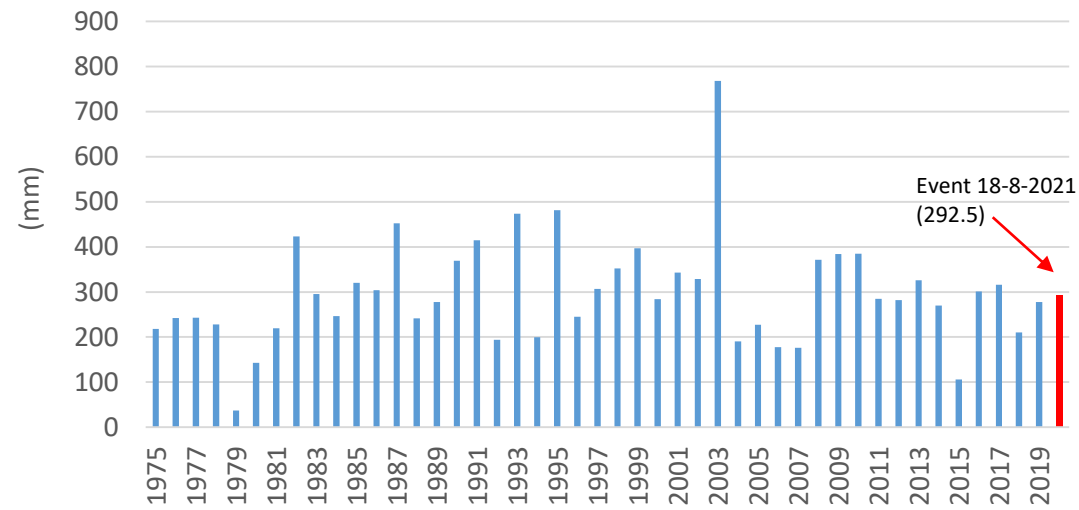
Sungai Tupah (Sg.Bujang)
Basin Area = 39.0 km²

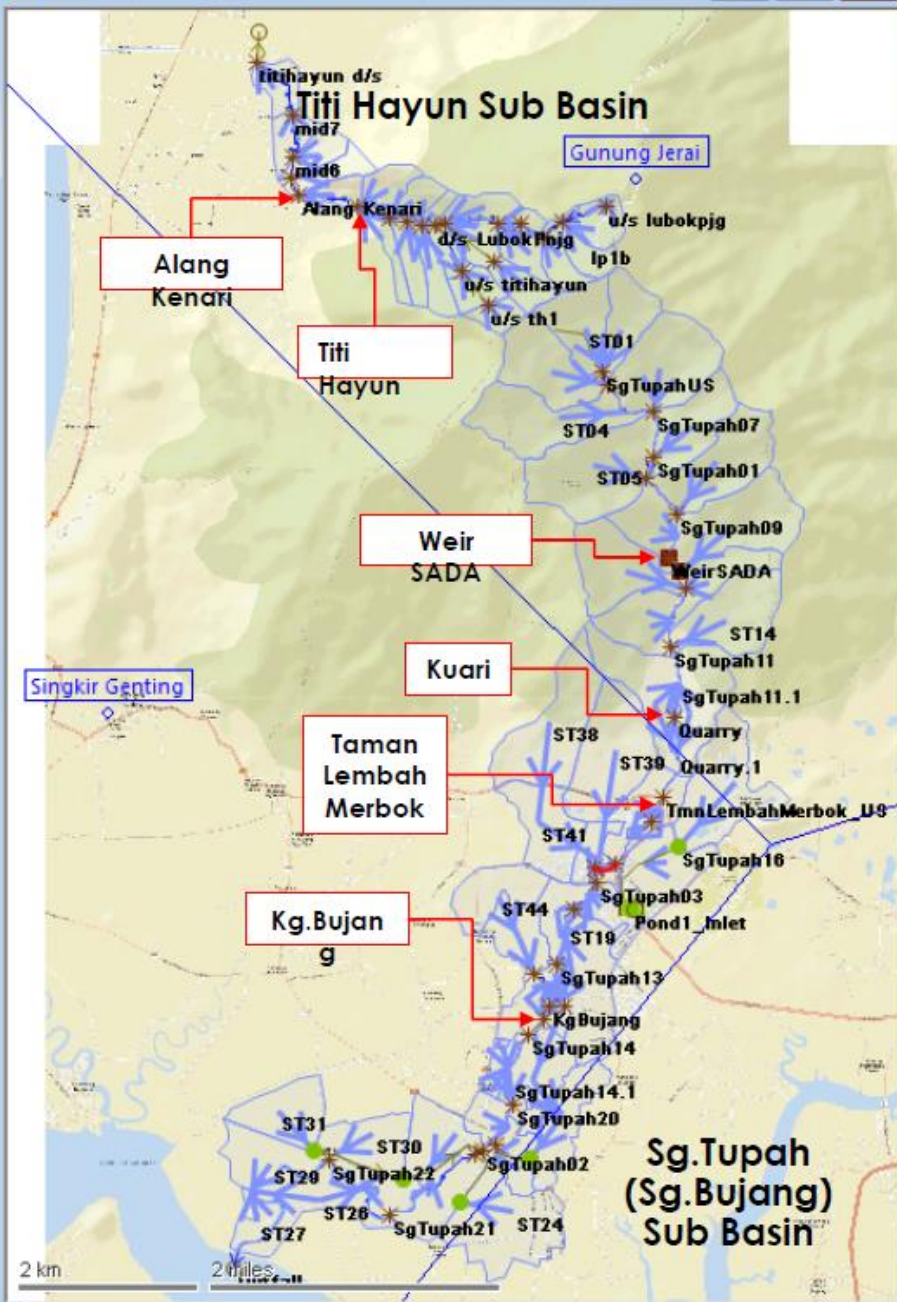
Stesen Gunung Jerai (5704055)

Annual Max Hourly (1975-2019)

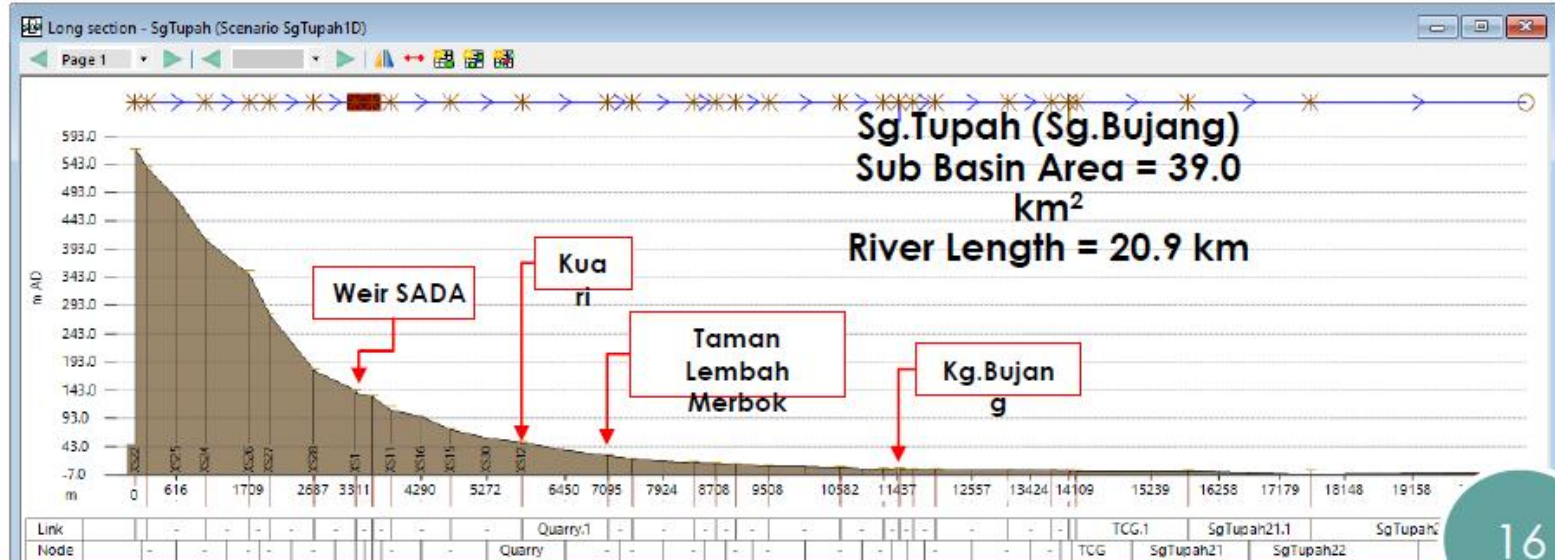
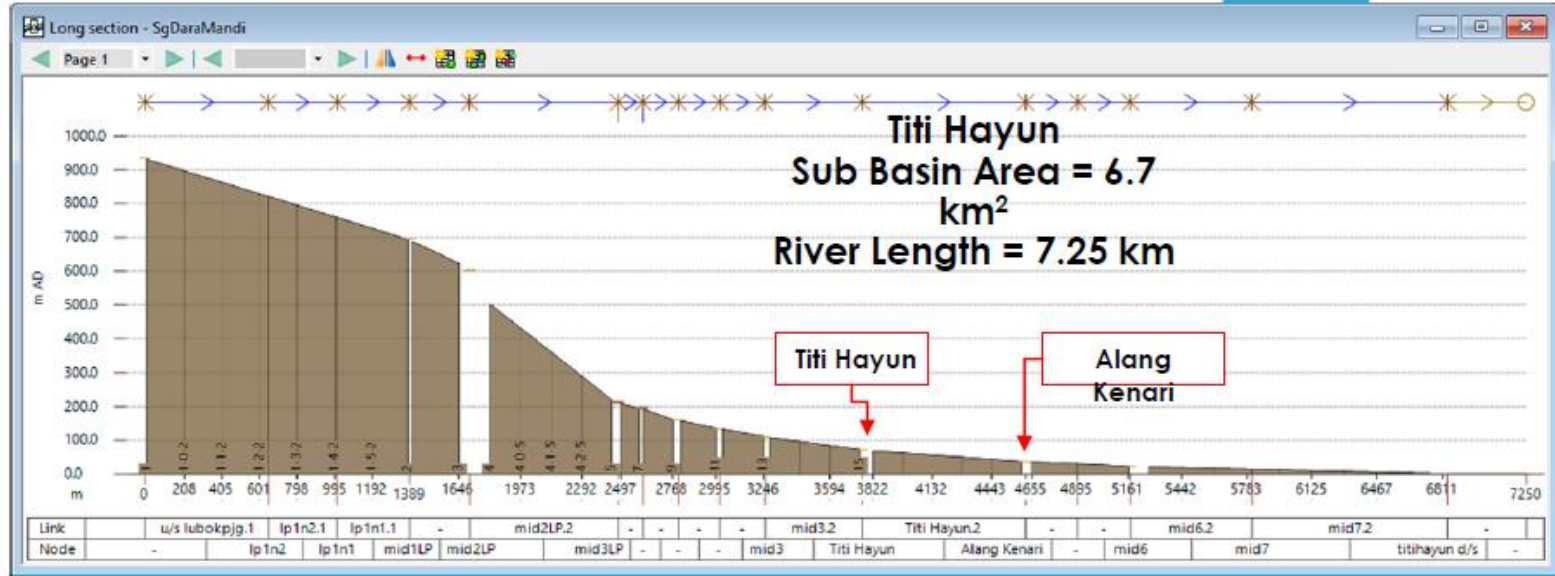


Annual Max 4-day consecutive rainfall (1975-2019)





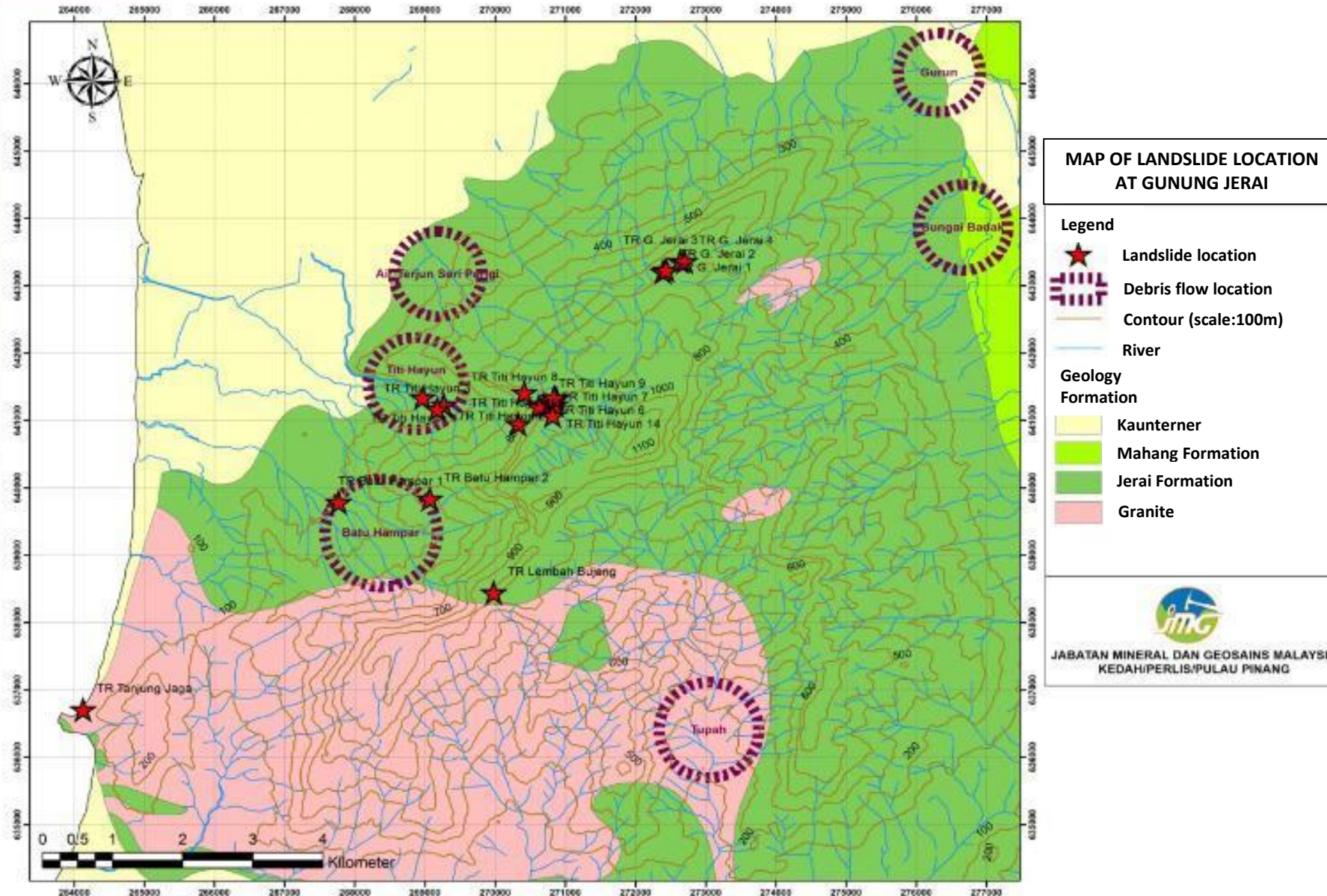
Longitudinal Profile of Sg.Dara Mandi/Sg.Lubok Panjang (Titi Hayun) and Sg.Tupah (Sg.Bujang)



A photograph of a river with a small waterfall and a large splash of water, with a dense forest in the background. The text "GEOLOGICAL FINDINGS" is overlaid on the right side of the image.

GEOLOGICAL FINDINGS

GENERAL GEOLOGY, LANDSLIDE LOCATIONS AND DEBRIS FLOW



Until 31 August 2021:

There were **69 locations of geological landslides** and **5 major locations of the debris flow** have been identified throughout Gunung Jerai.

Investigation Area

Divided into 5 specific zones.

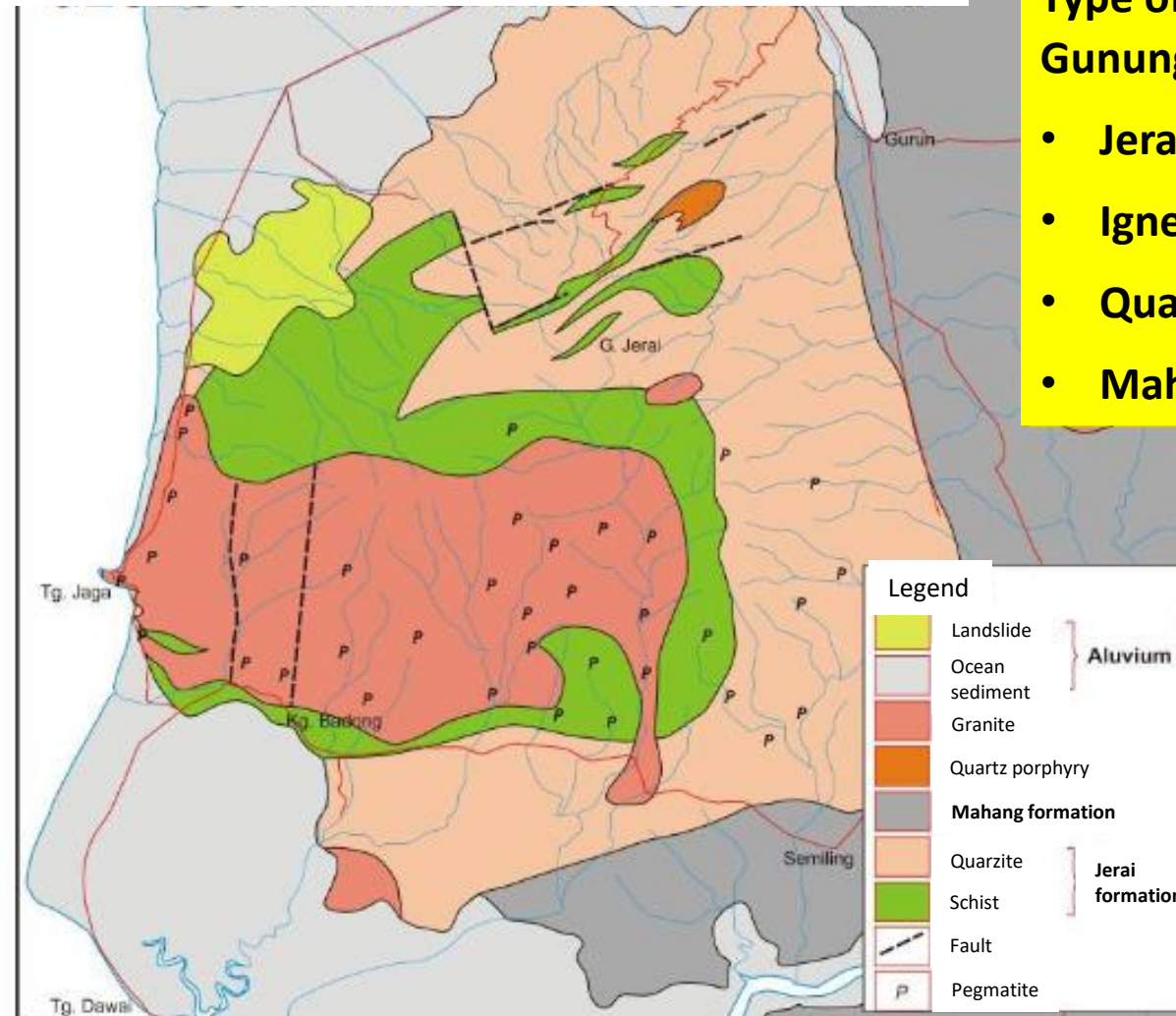
Zone 1 Titi Hayun Area
Zone 2 Batu Hampar Area
Zone 3 Seri Perigi Area
Zone 4 Gurun Area
Zone 5 Tupah Area

GEOLOGY GUNUNG JERAI AREA

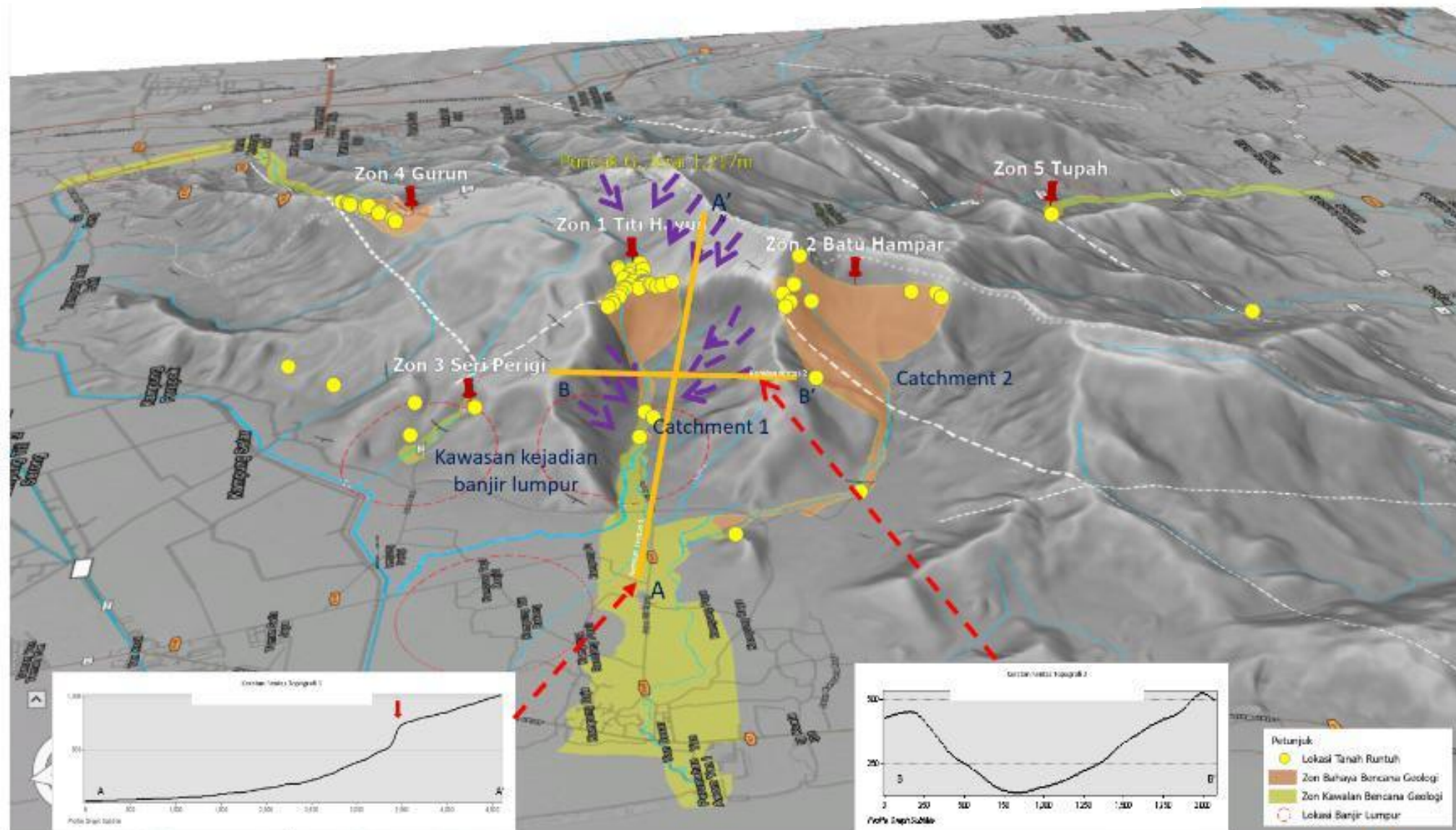
GEOLOGY GUNUNG JERAI AREA

Type of rocks at
Gunung Jerai;

- Jerai formation
- Igneous granite
- Quartz porphyry
- Mahang formation



LANDSLIDE AND DEBRIS FLOW EVENT AT GUNUNG JERAI, YAN, KEDAH 18 AUGUST 2021



Digital Terrain Model Analysis At Event Location

SABO DAM CONCEPTUAL DESIGN





Figure 1: Open Sabo Dam in Indonesia



Figure 2: Open Sabo Dam (Kitazato River dam) in Japan



Figure 3: Open Sabo Dam in Kabupaten Magelang, Middle Java, Indonesia



Example of Sabo dam in Japan

A scenic view of a river with a small waterfall and a large tree in the background. The river is brown and rocky, with a concrete structure on the left. The waterfall is in the foreground, and a large tree is in the background. The text is overlaid on the right side of the image.

FUTURE PLANS (TIMELINE AND OUTPUT)

Activities/ Works	Agencies involved	Aug-21		Sep-21					Oct-21				
		23-29	30-31	1-5	6-12	13-19	20-26	27-30	1-3	4-10	11-17	18-24	25-31
1) DATA COLLECTION													
i) Hydraulic Data													
-Water Level and Discharge - Normal Flow- At 6 proposed locations for Sabo Dam	NAHRIM/ DID												
-River Cross-sections and River Profile (Datum MSL)-At 6 proposed locations for Sabo Dam	NAHRIM/ DID												
ii) Hydrologic Data													
-Rainfall	NAHRIM/ DID												
iii) Topographical Data													
-Image Drone	NAHRIM/JMG/SADA/JPN												
-Image LiDAR/ Spothights (Ilsar 5 m- 2018 from Department of Survey and Mapping, Malaysia)	JUPEM												
iv) Geological Data													
-Analisis Geologi/ Seismic resistivity survey -At 6 proposed locations for Sabo Dam	NAHRIM/ JMG												
-Geological Data/ Soil Mechanics/ Soil Investigation	NAHRIM/ JMG/ DID												
2) DELIVERABLES/ REPORTS													
-Proposed Sabo Dam Technology in Yan and Kuala Muda, Kedah	NAHRIM												
-Data collation and collection/ Geological Analysis/Results of resistivity survey	NAHRIM												
-Proposed concept design of Sabo Dam	NAHRIM/ DID/ Japan												
3) DESIGN CONCEPT FOR SABO DAM													
i) Technical advice and assistance of Sabo Dam Concept Design and Feasibility of Sabo Dam Technology	NAHRIM												
- Technical advice and assistance of Sabp Dam Concept Design	NAHRIM/ DID/ Japan												
(MJIT, UTM, USM, Embassy of Japan/ DPR/ National Research Institute for Earth Science and Disaster Resilience (NIED)/University Kyoto/University of Tsukuba)													
ii) Preparation of Sabo Dam Concept Design	NAHRIM												
-Design requirement/ Data requirements for Sabo Dam Design Concept	NAHRIM/ DID/ Japan												
-Calculation of design parameters such as volume/ Flow of Debris Flow/ Forces for Concept Design purpose	NAHRIM/ DID/ Japan												
-Review and technical advice on the proposed location for Sabo Dam													
	NAHRIM/ DID/ Japan												
4) PHYSICAL MODELLING (*Optional/To be carried out after Detailed Design is done)													
-Development of physical model testing on the impact of kinematic and dynamic forces on Sabo Dam structures	NAHRIM												
*validation on kinematic and dynamic similarity testing													
5) MEETINGS													
-Progress status and reporting in Committee/ Coordination Meeting with other agencies	All Agencies involved												
*Concept Design input for detailed design by consultant through DID													

Abbreviation:

*NAHRIM- National Water Research Institute of Malaysia

DID- Department of Irrigation and Drainage Malaysia

JMG= Department of Mineral dan Geoscience Malaysia

JUPEM- Department of Survey and Mapping Malaysia

SADA=Syarikat Air Darul Aman Sdn. Bhd. (Kedah water operator)

JPN= Jabatan Perhutanan Negeri Kedah (Kedah Forestry Agency)

Legend:

 Planned

Actual



TYPE OF SUPPORT NEEDED

Technical advices, support assistance from Japanese as follow:

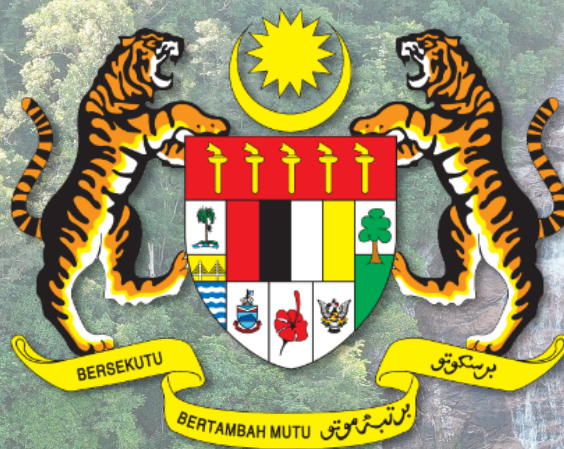
No.	Type of technical support/ advice	Time line	Mechanisms
1.	In terms of “Concept Design“- Review the Proposed Locations by NAHRIM, suggest suitable or new locations if necessary, propose type of Sabo Dam for each locations, propose and suggest main structures and appurtenant structures (spillway/apron/outlet protections and etc) for each locations >> Aim: To minimize the impact of future Debris Flow at Gunung Jerai area Responsible Agency: NAHRIM	Short-term (1- 2 month)	Online advice through video sharing pertaining to site location, condition and initial site observation data collected and Onsite if needed
2.	Data requirements and design requirements for Sabo Dam Design Concept including determination of suitable sizing (Width and Height of Sabo Dam), geological requirements, foundations and constructions methods, dam materials required, determination of dam strength and limitations Responsible Agency: NAHRIM	Short-term (1- 2 month)	Online advice through training/ sharing and provision of design notes and training materials
3.	Calculation of design parameters such as volume/ Discharge of Debris Flow/ Forces/ Determination of Alluvial Fan for each proposed locations Responsible Agency: NAHRIM	Short-term (1- 2 month)	Online advice through training/ sharing and provision of design notes and training materials
4.	Testing of dam in terms of strength and durability – through Numerical and Physical Modeling (Assisting in development and Testing Procedures/ Scenarios) Responsible Agency: DID/ NAHRIM	Medium Term (1 to 3 years)	Online/ Onsite
5.	Construction Methods/Site Inspections during Construction Responsible Agency: DID	Medium Term (1 to 3 years)	Onsite
6.	Site Maintenance/ Monitoring Responsible Agency: DID	Medium to Long Term (3 years to 10 years)	Onsite



POINTS OF CONCERN

The procedures needed if Japanese expert would enter Malaysia:

- Through the official arrangement by Ministry of Environment and Water Resources, Malaysia and Embassy of Japan in Malaysia
- MOU between Government of Malaysia-Japan



KEMENTERIAN ALAM SEKITAR
DAN AIR (KASA)

THANK YOU