



Single-Tunnel Accelerator Configuration Of Asian Region

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- *Applicability of RDR Design to Other Sites*
- *Preliminary Study By TDP2 Concepts*
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Development of TDP2 design concepts

Keypoints for *TDP2 Design Concepts*

Cost Reduction from RDR

- *(Deep) Single-Tunnel Accelerator Configuration*



Should be harmonized (balanced) with



Applicability to Site and Environmental Conservation

- *Less surface facilities and plants*

Life Safety / Accessibility to Underground Accelerator

- *Enough evacuation / access passages*

Risk reduction for tunnel excavation

- *Heading for the main accelerator tunnel*

Advantage of Topology

- *Spontaneous drainage of sump water*

Contents of the TDP2 Design Concepts

Single-Tunnel Accelerator Configuration

- **Focus on the DRFS scheme**

Less surface plants and facilities

- **Avoid large-scale site developments**
- **Reduce access shafts/tunnels from the ground**

Enough Access / Evacuation Passages

- **Keep a sub-tunnel along the accelerator**
- **Connection to the accelerator every ~600 m (4 Cryostrings)**
- **Limit the use for only transport and non-active utilities**

Heading

- **Keep sub-tunnel excavation 500~2000 m ahead**

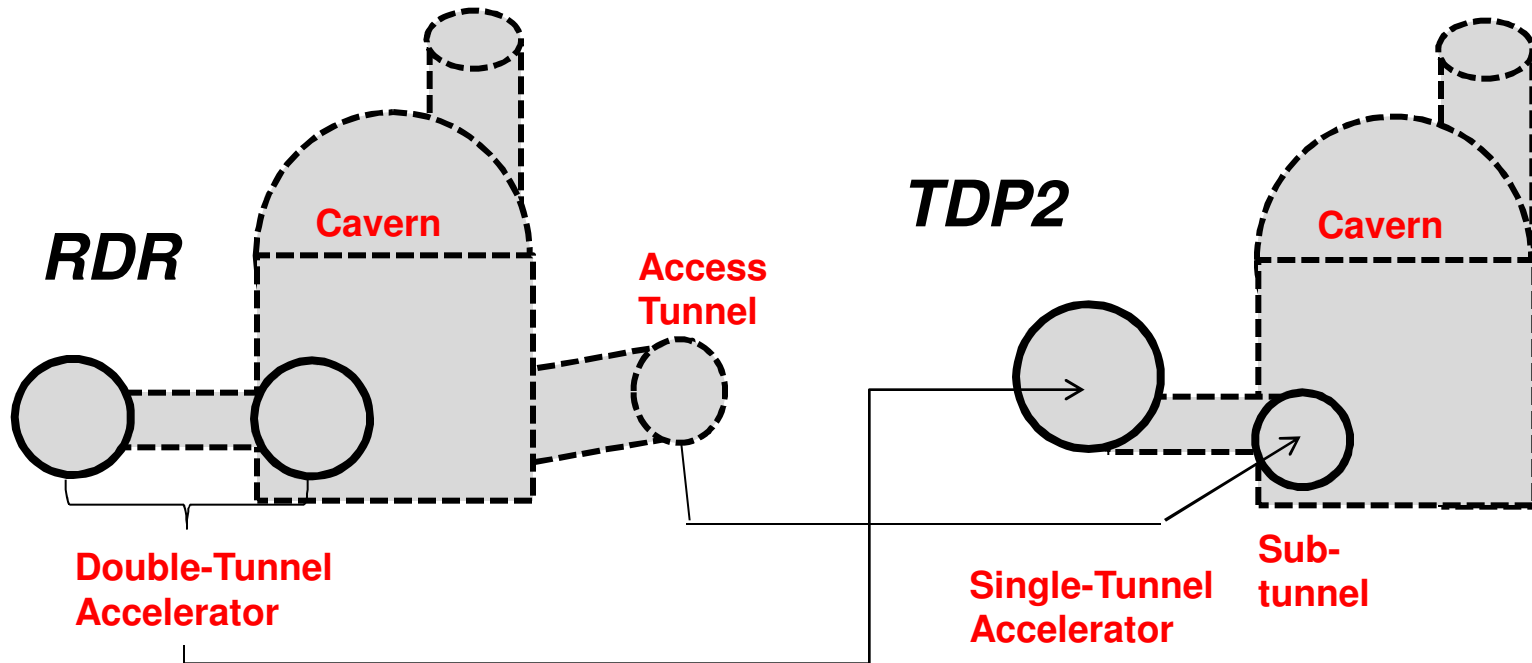
Spontaneous Drainage of Sump Water

- **Raise tunnel elevation to/above valley bottom**
- **(The accelerator partly appears near/above the surface ground.)**

Change of Tunnel Configuration in TDP2

RDR: Beam Tunnel + Service Tunnel + Access/Utility Tunnels

TDP2: Accelerator Tunnel + Access/Utility Tunnels/Shafts





Applicability of RDR Design to Other Sites

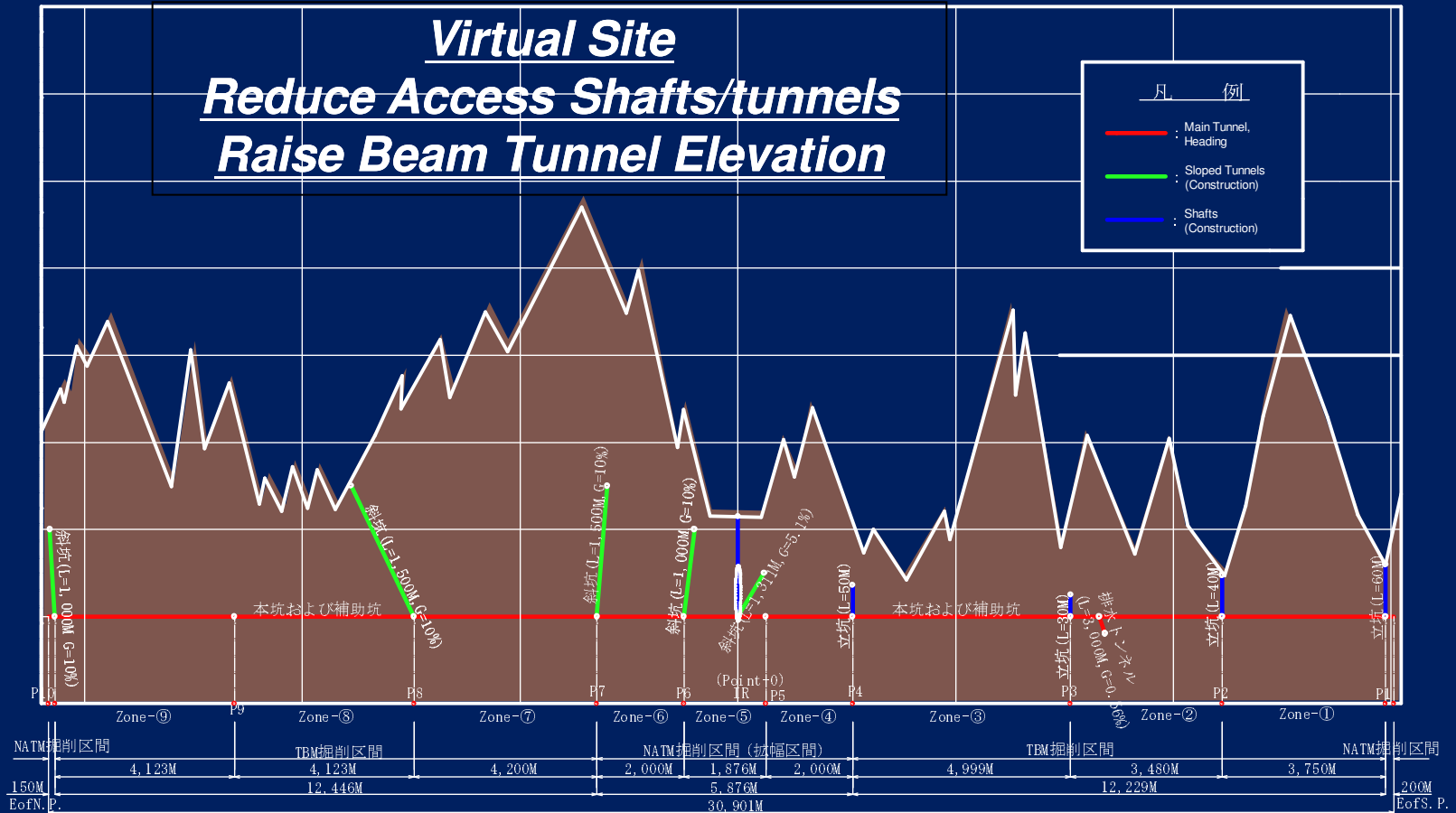


Preliminary Study By TDP2 Concepts

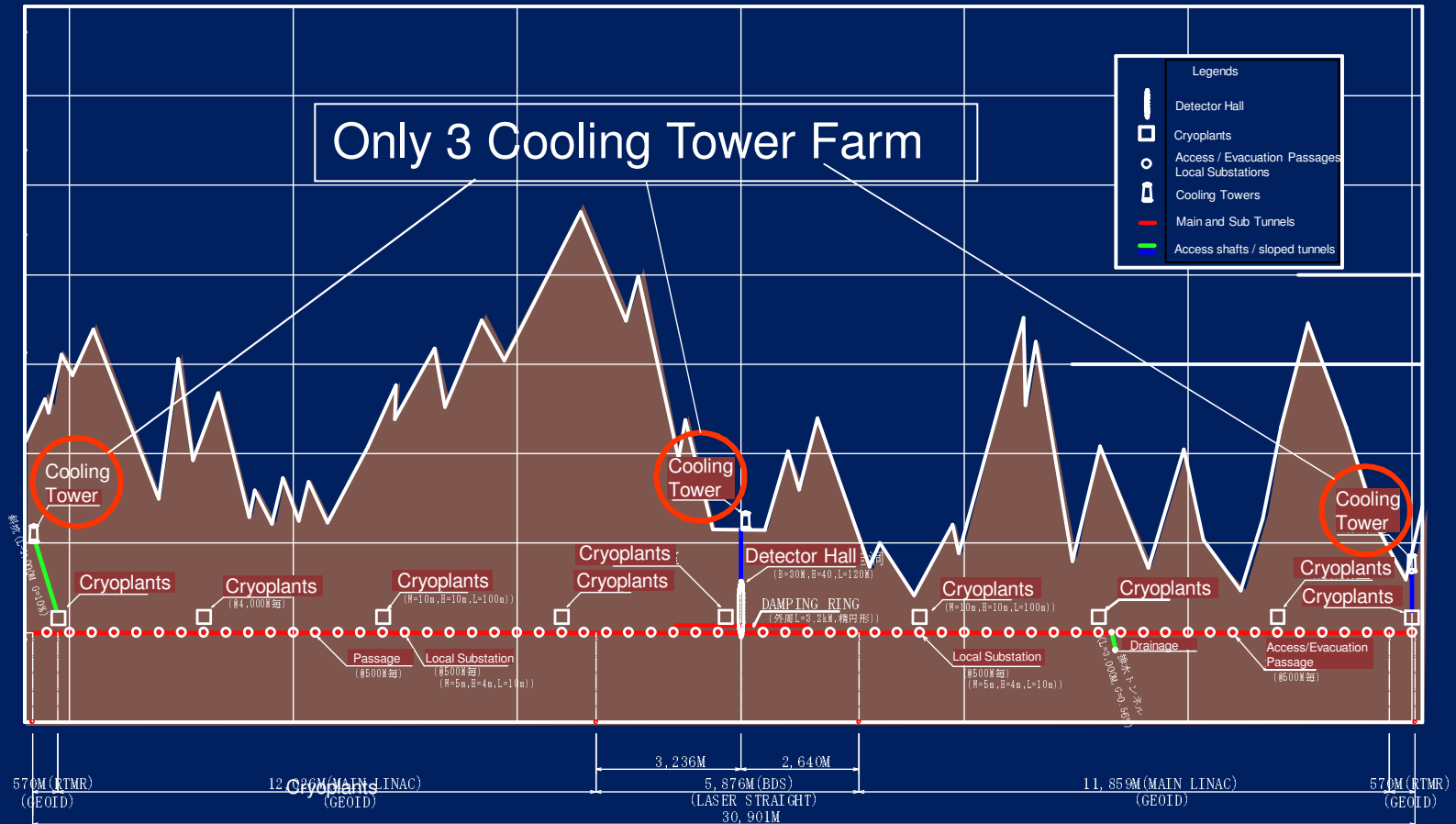
CFS Working Group,

Advanced Accelerator Technology Promotion Association (AAA)

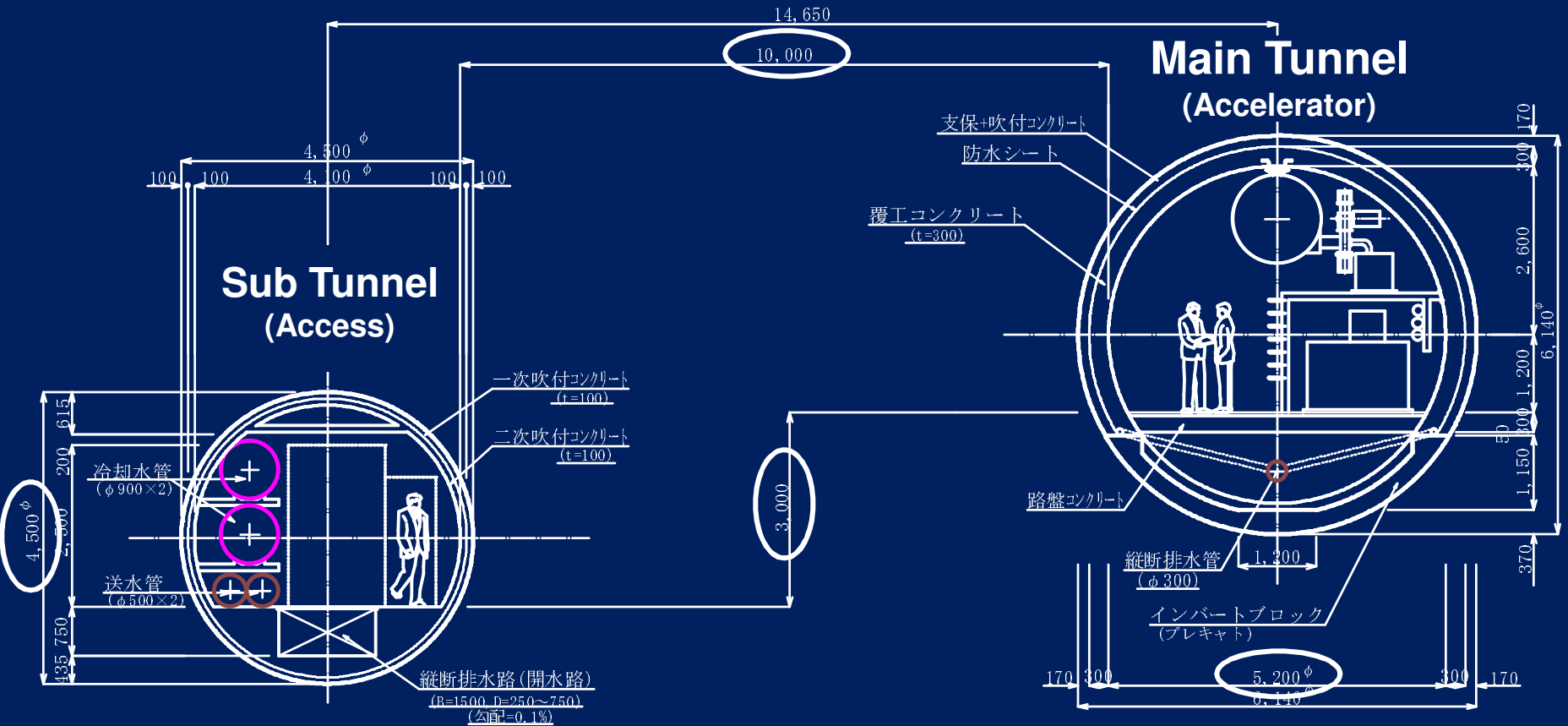
Overall Civil Layout (Construction Phase)

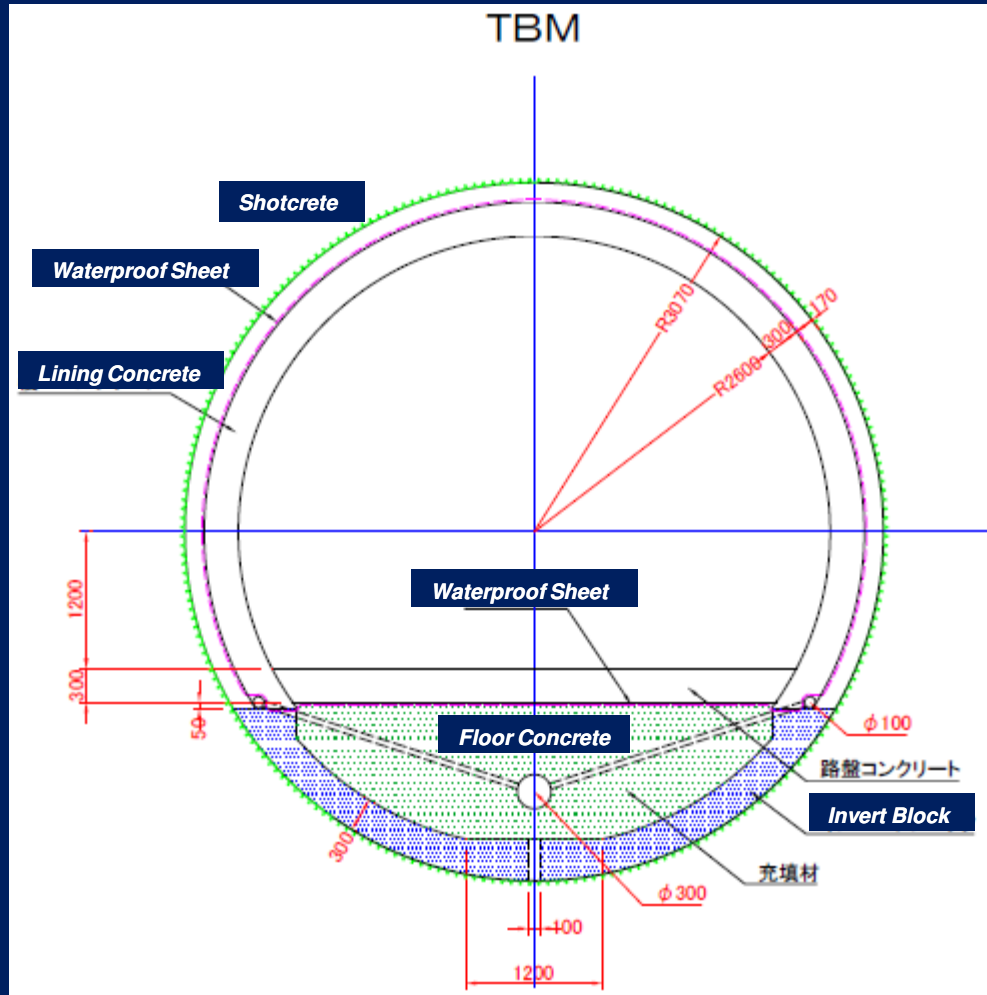


Overall Civil Layout (Final)



Tunnel Configuration





Main Tunnel

(Spec.)

φ6.58 m TBM, φ5.2 m finished I.D.

Lining concrete ~30 cm

Waterproofing (waterproof sheet)

Drainage tunnel

(Construction)

TBM assembled under the ground

~4 km /TBM,

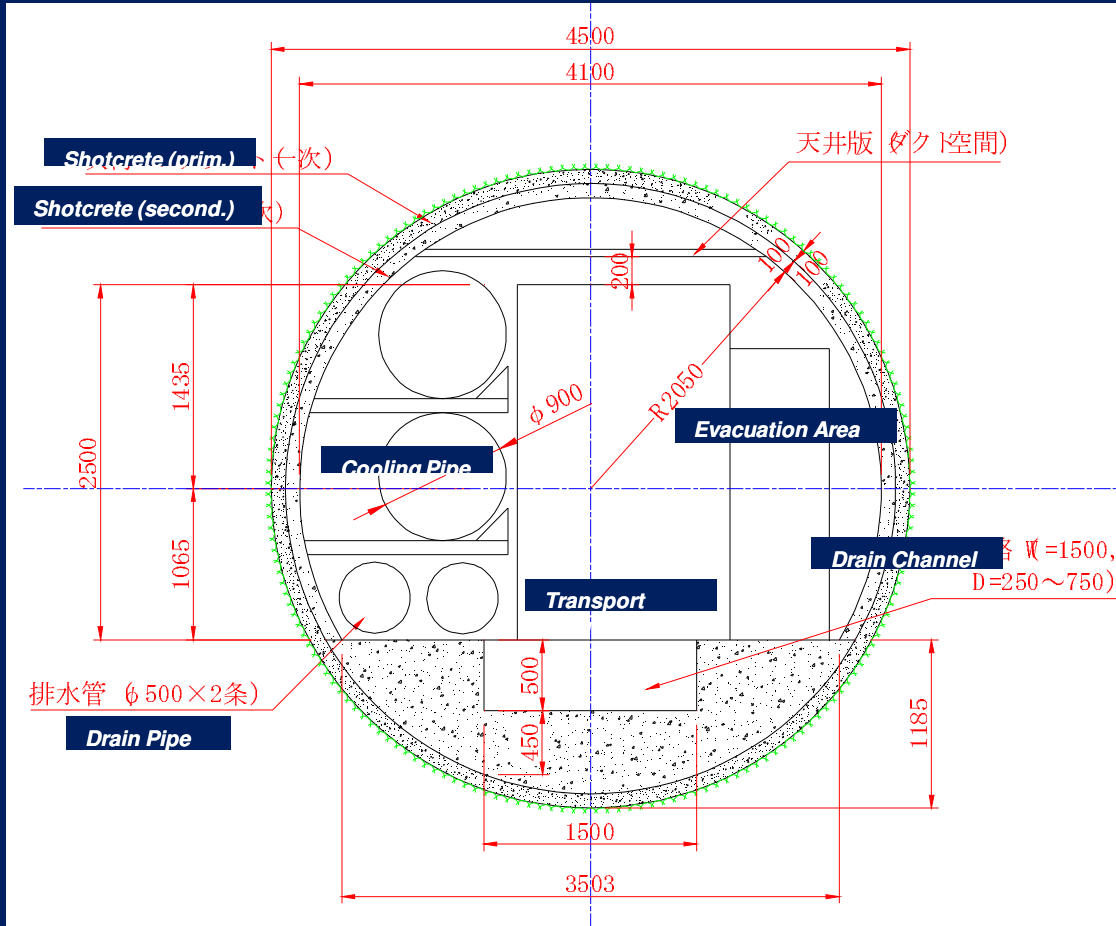
~350 m/month (with heading)

Drainage boring

Invert Liner

Concrete lining after excavation

(<->One-path lining with Precast segment)



Sub Tunnel

φ4.5 m TBM, φ4.1 m finished I.D.
(Construction)

TBM assembled under the ground
~4 km /TBM, ~250 m/month

“Shotcrete” finish

Heading for Main Tunnel

~500-2000 m ahead

Geological survey

Drainage of sump water

(Required Structure)

Cooling Water Pipe

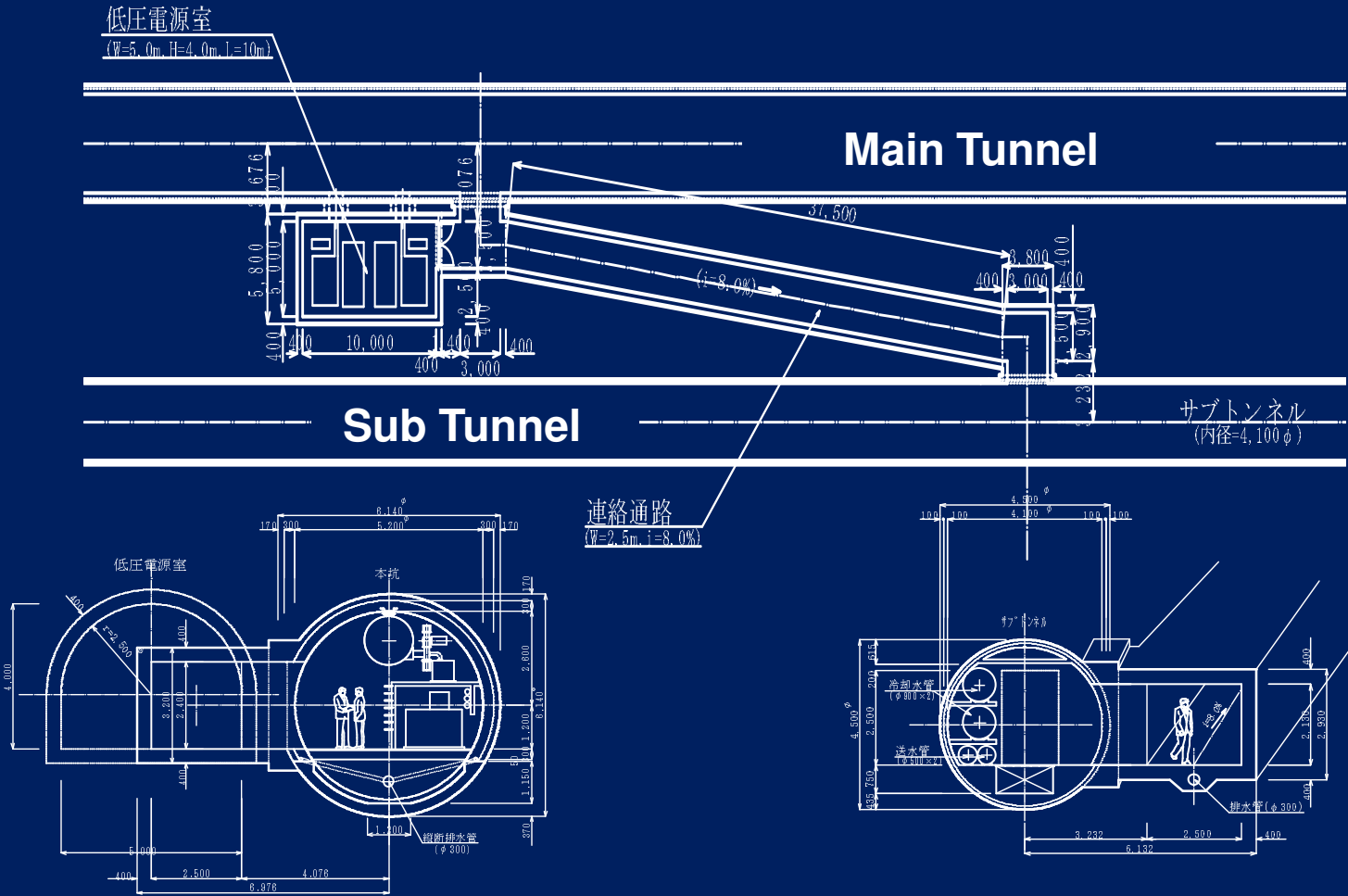
Drain Pipe

Drainage Channel

Transport Area

Human Evacuation Area

Passages

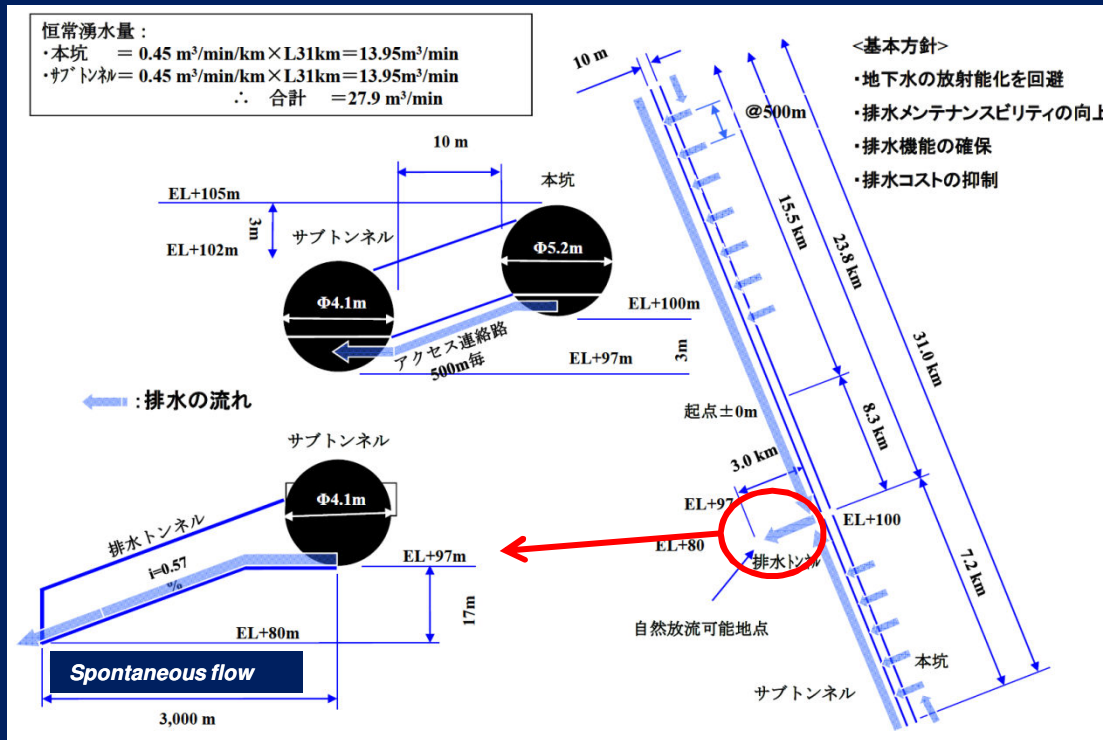


Drainage of Sump Water

No exact sump water data along the tunnel routes.

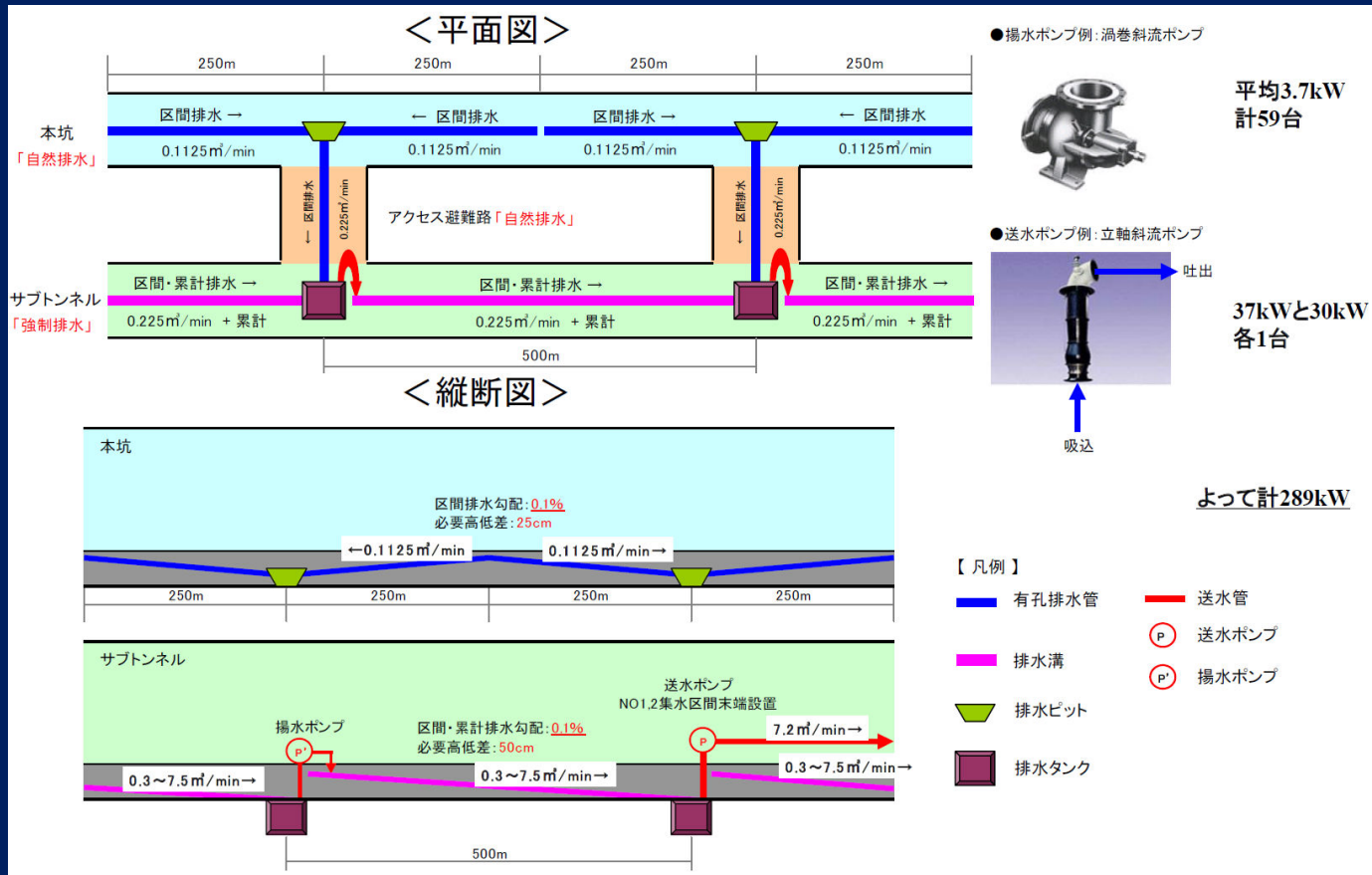
0.018-0.84 (av.~0.2) m³/min/km is the value for existing tunnels in similar geology (Japan Tunnelling Association, 1983).

Key points: Avoid radioactivation, High maintainability, Reliability, Low operation cost

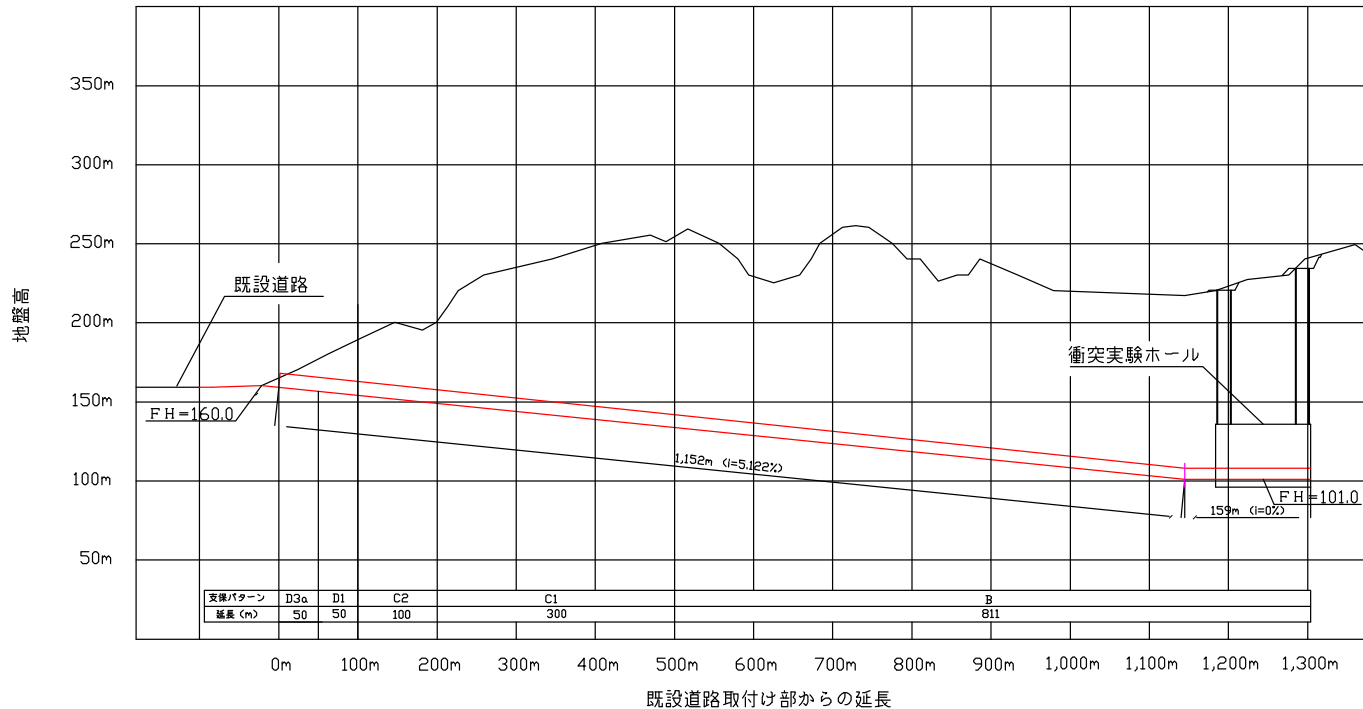


Transport of Sump Water

~300 kW is necessary electricity for the sump water treatment.



Detector Hall and Central Area



- ※1 アクセスタンネルは既設道路に接続できるように計画した。
- ※2 アクセスタンネルの延長は、直線部1,152m、曲線部39mおよび衝突実験ホール内120mの合計1,311mとする。
- ※3 アクセスタンネルの勾配は直接区間で5.12%とし、曲線部および衝突実験ホール内で0%とした。



***Cost Impacts
(Very preliminary)***



Civil Cost Reduction (preliminary estimates)

Asian Civil cost will still be reduced in TDP2 even if we take care more of environment, life safety, accessibility, excavation risk, sump water, etc. ...

Tunnel configurations and Cost impacts in Site A

Point ID	TDP2		TDP1		RDR	
	L (m)	L _V (m)	L (m)	L _V (m)	L (m)	L _V (m)
P11	1,000		1215		1215	
(P7)	1,500		1565		1565	
(P5)	1,500		1577		1577	
(P3)	1,000		1713		1713	
(P2)		50	1157		1157	
<P4>		30	653		653	
(P6)		40	938		938	
P10		60	771		771	
P1(16f)	1,300			115		115
P1.1(16f)		95		115		115
P1.2(9f)				115		115
P12			1501		1501	
P13			1403		1403	
Beam Tunnel	30,900		30900		30900	
Service Tunnel (BDS)	5,460		5460		30900	
Access Tunnel (excp't BDS)	25,440					
	68,100	275	48,853	345	74,293	345

Asian CFS Review

To start TDP2, the Asian CFS Team would invite reviewer (M. Ross, V. Kuchler, J. Osborne, and necessary experts) at an early date (in May or June). (under planning)



Summary



Summary

- (1) In TDP2, the Asian CFS team will make a regional activities based on the Single-Tunnel Accelerator Configuration, focusing on the DRFS high-level RF system.
- (2) The regional design will be developed taking account of not only cost reduction but also wider site applicability, life safety, environment conservation, risk management, etc.
- (3) Preliminary study by AAA CFS Working group helped us to find a direction by which the above goals will be achieved.