The **Stormwater Management And Road Tunnel** (**SMART Tunnel**), E38, is a storm drainage and road structure in Kuala Lumpur, Malaysia, and a major national project in the country. The 9.7 km (6.0 mi) tunnel is the longest stormwater drainage tunnel in Southeast Asia and second longest in Asia.

The main objective of this tunnel is to solve the problem of flash floods in Kuala Lumpur and to reduce traffic jams along Jalan Sungai Besi and Loke Yew flyover at Pudu during rush hour. There are two components of this tunnel, the *stormwater tunnel* and *motorway tunnel*. It is the longest multi-purpose tunnel in the world.

In 2011, the SMART tunnel received the UN Habitat Scroll of Honour Award for its innovative and unique management of storm water and peak hour traffic.

It begins at Kampung Berembang lake near Klang River at Ampang and ends at Taman Desa lake near Kerayong River at Salak South. The project is led by the government, including Malaysian Highway Authority *(Lembaga Lebuhraya Malaysia, LLM)* and the Department of Irrigation and Drainage Malaysia *(Jabatan Pengairan dan Saliran, JPS)* and also a company joint venture pact between Gamuda Berhad and MMC Corporation Berhad (MMC).

Route background

The Kilometre Zero of the tunnel is located at Salak Interchange.[*citation needed*]

History

In 2001 the Government sought proposals for a solution that would allow a typical flood of three to six hours' duration to occur without flooding the city centre.[1] A tunnel that would allow floods to bypass the centre was one way of achieving this, providing it was coupled with temporary storage facilities to keep flows downstream of Kuala Lumpur within the capacity of the river channel. A group led by Gamuda engaged SSP, a large Malaysian consultant engineering firm, and Mott MacDonald UK to develop proposals for a tunnel with holding ponds at upstream and downstream ends of the tunnel.[*citation needed*]

Construction of the tunnel began on 25 November 2003. Two Herrenknecht Tunnel Boring Machines (TBM) from Germany were used, including *Tuah* on north side and *Gemilang* on south side. Gusztáv Klados was the senior project manager of the project.[2]

On 11 December 2003, the 13.2-m diameter Mixshield TBM, Tuah, completed a 737-m section after 24 weeks of excavation. By the end of January 2004, Tuah would start a second drive covering a distance of 4.5 km to Kampung Berembang lake. The motorway sections on the SMART system was officially opened at 3:00PM, 14 May 2007, after multiple delays.[3][4]

Meanwhile, the stormwater sections on the SMART system began operations at the end of January 2007.[citation needed]

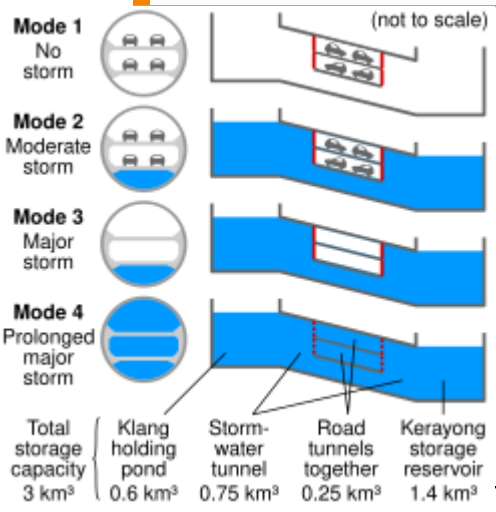
By 18 July 2010 the SMART system had prevented seven potentially disastrous flash floods in the city centre,[5] having entered its first mode 3 operation only weeks after the opening of the motorway.[6]

As of September 2020, the tunnel had activated its fourth mode for the seventh time. During the flash flood on 10 September 2020, the tunnel diverted three million cubic metres of water.[7][8]

In December 2021, SMART entered Mode 4 for an eighth time, due to the massive flooding caused by heavy rainfall lasting from 16 to 18 December. Things would have been much worse in Kuala Lumpur had it not been for the tunnel, which successfully diverted 5 million cubic metres of flood water during the 22 hours it was on full activation.[9]

In 2022, the government was considering the proposal to build another tunnel, briefly known as SMART 2, to cater for high density flood-prone area such as Shah Alam.[10]

Functioning



The four modes of operation and storage capacity.

The first mode, under normal conditions where there is no storm, no flood water will be diverted into the system. When the second mode is activated, flood water is diverted into the bypass tunnel underneath the motorway tunnel. The motorway section is still

open to traffic at this stage. When the third mode is in operation, the motorway will be closed to all traffic. After making sure all vehicles have exited the motorway, automated water-tight gates will be opened to allow flood waters to pass through. After the flood has ended, the tunnel is verified and cleaned via pressure-washing, and the motorway will be reopened to traffic within 48 hours of closure.[11]

Technical specifications

SMART tunnel entrance along Jalan Sungai Besi, Kuala Lumpur, Malaysia.

Stormwater tunnel

- **Construction cost:** RM1,887 million (US$514.6 million)
- **Stormwater tunnel length:** 9.7 km (6.0 mi)
- **Diameter:** 13.2 m (43.3 ft) (outer diameter)
- **Tunnelling method:** tunnel boring machine (TBM)
- **TBM type:** slurry shield

Motorway tunnel

- **Motorway tunnel length:** 4 km (2.5 mi)
- **Structure type:** double deck
- **Ingress and egress:** 1.5 km (0.93 mi) at Jalan Sultan Ismail and Jalan Imbi
- **Length:** 1.4 km (0.87 mi) at Jalan Tun Razak

- **Links:** 1.6 km (0.99 mi) at Kuala Lumpur–Seremban Expressway Links: City Centre near Kg. Pandan Roundabout KL–Seremban Expressway near Sungai Besi Airport

Features

 The north bound entrance of SMART Tunnel on the Kuala Lumpur–Seremban Expressway.

- World's first dual-function tunnel (stormwater management & road)
- Longest tunnel in Malaysia
- 9.7 km (6.03 miles) stormwater by-pass tunnel
- 4 km (2.49 miles) double-deck motorway within stormwater tunnel
- The motorway tunnel is suitable for light vehicles only. Motorcycles and heavy vehicles are not allowed
- Ingress and egress connections to the motorway tunnel linking the southern gateway to the city centre
- Holding basin complete with diversion and tunnel intake structures
- Storage reservoir and a twin-box culvert to release flood discharge
- State-of-the-art operations control room equipped with the latest systems in operations management, surveillance and maintenance of the SMART system.
- Custom-made fire engine units consisting of two modified Toyota Hilux pickup trucks, parked at two different locations for quick access to the tunnel in case of fire on both carriageways.[12]

Tolls

The SMART Tunnel utilizes an open toll system. Ever since its operation, all toll transactions at this toll plaza are carried out using Touch 'n Go cards, MyRFIDs or SmartTAGs. Cash payments are not accepted.

Toll rates

Class	Type of vehicles	Rate (in Malaysian ringgit (RM))	Notes
1	Private Cars (Vehicles with two axles and three or four wheels and not exceeding 2.4 metres in height)	3.00	—
2	Vans and other small goods vehicles (Vehicles with two axles and three or four wheels and not exceeding 2.4 metres in height)		
4	Taxis (Vehicles with two axles and three or four wheels and not exceeding 2.4 metres in height)		Toll charges are paid by passengers using Touch 'n Go cards only.

FM radio channels available

Radio	Frequencies
Nasional FM	87.7 MHz
BFM 89.9	89.9 MHz
TraXX FM	100.1 MHz[13]
IKIMfm	91.5 MHz
Hitz	92.9 MHz
Bernama Radio	93.9 MHz
Radio Klasik	95.3 MHz
Fly FM	95.8 MHz

KL FM	97.2 MHz
Hot FM	97.6 MHz
988 FM	98.8 MHz
Kool 101	101.3 MHz
Era	103.3 MHz
Suria	105.3 MHz

List of interchanges

> This article contains a bulleted list or table of intersections which **should be presented in a properly formatted junction table.** Please consult this guideline for information on how to create one. Please improve this article if you can. *(November 2021)*

The entire expressway had its speed limit of 60 km/h.

Legend:

- I/C - interchange, I/S - intersection, RSA - Rest and service area, OBR - overhead bridge restaurant, L/B - layby, V/P - vista point, TN - tunnel, T/P - toll plaza, BR - bridge

From/to E37 East–West Link Expressway

km	Exit	Interchange	To	Remarks
E38 SMART Tunnel **0**			E37 East–West Link Expressway **East–West Link Expressway** **Southeast** Cheras **Northwest**	Direction Y junctions

			Petaling Jaya Shah Alam	
E37 East–West Link Expressway Kuala Lumpur–Seremban Expressway **ANIH Berhad border limit**				
E38 SMART Tunnel SMART Tunnel ***(Touch 'n Go and SmartTAG ETC only)*** **SMART border limit**				
		SMART Tunnel operation office	**TnG TAG** **Customer Service Centre** SMART Tunnel operation office	South bound on Cheras, Petaling Jaya and Shah Alam stretches only
SMART toll plaza				Accepts electronic toll payment (***Touch 'n Go*** and ***SmartTAG*** only)
Motorway Tunnel Dry sections Start/end of tunnel Maximum height 2 m Speed limit 60 km/h				
				From/to Motorway tunnel

From/to E37 Kuala Lumpur–Seremban Expressway

km	Exit	Interchange	To	Remarks
			South E37 East–West Link Expressway **Kuala Lumpur–Seremban Expressway** E37 East–West Link	

			Expressway Kompleks Sukan Negara E5 Shah Alam Expressway Klang E2 North–South Expressway Southern Route **North–South Expressway Southern Route** E6 North–South Expressway Central Link AH2 AH2 Kuala Lumpur International Airport (KLIA) E2 North–South Expressway Southern Route AH2 AH2 Seremban E2 North–South Expressway Southern Route AH2 AH2 Melaka E2 North–South Expressway Southern Route AH2 AH2 Johor Bahru	
E37 East–West Link Expressway **Kuala Lumpur–Seremban Expressway ANIH Berhad border limit**				
E38 **SMART Tunnel** **SMART Tunnel** ***(Touch 'n Go and SmartTAG ETC only)*** **SMART border limit**				

E38 SMART Tunnel **0**				
SMART toll plaza				Accepts electronic toll payment (***Touch 'n Go*** and ***SmartTAG*** only)
Motorway Tunnel Dry sections Start/end of tunnel Maximum height 2 m Speed limit 60 km/h				
				From/to Motorway tunnel

Motorway tunnel

km	Exit	Interchange	To	Remarks
Motorway Tunnel Dry sections Start/end of tunnel Maximum height 2 m Speed limit 60 km/h				
	3801	**Motorway Tunnel** Dry sections Tunnel exit south bound	3801A SMART Tunnel Operation Office E37 East–West Link Expressway **East–West Link Expressway** E37 East–West Link Expressway Cheras E37 East–West Link Expressway Petaling Jaya E37 East–West Link Expressway Shah Alam 3801B	Tunnel Interchange

			E37 East–West Link Expressway **Kuala Lumpur–Seremban Expressway** E37 East–West Link Expressway Kompleks Sukan Negara E5 Shah Alam Expressway Klang E2 North–South Expressway Southern Route **North–South Expressway Southern Route** E6 North–South Expressway Central Link AH2 AH2 Kuala Lumpur International Airport (KLIA) E2 North–South Expressway Southern Route AH2 AH2 Seremban E2 North–South Expressway Southern Route AH2 AH2 Melaka E2 North–South Expressway Southern Route AH2 AH2 Johor Bahru	
Motorway Tunnel Conversion from dry to wet				
		Motorway Tunnel Wet sections		
Motorway Tunnel Conversion from wet to dry				
	3802	**Motorway Tunnel** Dry sections Tunnel exit north bound	3802A **Sultan Ismail Link Tunnel** **Jalan Davis** **Kuala Lumpur Inner Ring Road** Jalan Imbi Jalan Sultan Ismail Jalan Bukit Bintang	Tunnel Interchange Lower floor

			3802B Kuala Lumpur Middle Ring Road 1 **Jalan Tun Razak (Jalan Pekeliling)** Kuala Lumpur City Centre (KLCC) Ampang	
Motorway Tunnel **Dry sections** **Start/end of tunnel** **Maximum height 2 m** **Speed limit 60 km/h**				
E38 SMART Tunnel SMART Tunnel **Start/end of expressway** ***(Touch 'n Go and SmartTAG ETC only)*** **SMART border limit**				
Kuala Lumpur Middle Ring Road 1 **DBKL border limit**				
			North Kuala Lumpur Middle Ring Road 1 **Jalan Tun Razak (Jalan Pekeliling)** Kuala Lumpur City Centre (KLCC) Ampang	

Sultan Ismail link tunnel

km	Exit	Interchange	To	Remarks
	3802	**Sultan Ismail link tunnel** Dry sections Tunnel entry south bound	**Motorway Tunnel** E37 East–West Link Expressway Cheras E37 East–West Link Expressway Petaling Jaya E37 East–West Link Expressway Kompleks Sukan Negara E6 North–South Expressway Central Link AH2 AH2 Kuala Lumpur International Airport (KLIA)	Tunnel Interchange Upper floor

			E2 North–South Expressway Southern Route AH2 AH2 Seremban E2 North–South Expressway Southern Route AH2 AH2 Melaka E2 North–South Expressway Southern Route AH2 AH2 Johor Bahru	
Motorway Tunnel **Dry sections** **Start/end of tunnel** **Maximum height 2 m** **Speed limit 60 km/h**				
E38 **SMART Tunnel** **SMART Tunnel** **Start/end of expressway** ***(Touch 'n Go and SmartTAG ETC only)*** **SMART border limit**				
Jalan Davis **DBKL border limit**				
			NorthWest **Sultan Ismail–Kampung Pandan Link (Jalan Davis)** **Kuala Lumpur Inner Ring Road** Jalan Imbi Jalan Sultan Ismail Jalan Bukit Bintang	

In popular culture

The tunnel was featured in the below series:

- Season 4, Episode 2, of *Extreme Engineering*, titled "MegaTunnel", on the Discovery Channel.
- An episode of *Truly Malaysia* on the National Geographic Channel and TV1.
- Season 2, Episode 3, of Man Made Marvels, titled "Kuala Lumpur: Flood Control", on the Science Channel.

- Season 4, Episode 2, of *Megastructures* on the National Geographic Channel and TV1.
- Season 1, Episode 2 of *Build It Bigger* on the Science Channel.

See also

- List of long tunnels by type

References

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4. Malaysian National News Agency :: BERNAMA Archived 19 May 2007 at the Wayback Machine
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6. MegaStructures SMART tunnel episode
7. *YING, VEENA BABULAL and TEOH PEI (12 September 2020). "KL flash flood: 'Smart Tunnel mitigated situation' | New Straits Times". NST Online. Retrieved 15 September 2020.*
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9. *"SMART tunnel diverted five million cubic metres of flood water, says environment sec-gen | Malay Mail". 19 December 2021.*
10. *"Finding a SMART solution to floods". The Star. Retrieved 14 November 2024.*
11. Success of Kuala Lumpur's dual purpose tunnel. ITS International. Online at http://www.itsinternational.com/categories/detection-monitoring-machine-vision/features/success-of-kuala-lumpurs-dual-purpose-tunnel/[full citation needed]
12. Custom-Built Fire Engines for SMART Highway Delivered to the Malaysian Fire and Rescue Department Archived 4 January 2008 at the Wayback Machine - from SMART Tunnel official website
13. *"Radio – SMART Motorway Tunnel".*

External links

- SMART Tunnel
- Map of the SMART tunnel
- MMC Corporation Berhad
- Department of Irrigation and Drainage Malaysia
- SMART Tunnel - Mott MacDonald Project Page

- v
- t
- e

Malaysian Expressway System

Toll-free	Central	• FT 1 Kuala Lumpur–Rawang Highway (incl. Rawang Bypass) • FT 2 Federal Highway • FT 29 Putrajaya–Cyberjaya Expressway • FT 30 Putrajaya Ring Road • Tuanku Abdul Halim Road • Kuala Lumpur Middle Ring Road 1 • Kuala Lumpur Middle Ring Road 2

	East Coast	• FT 34
		  • Central Spine Road
		  • Kota Bharu–Kuala Krai Expressway
		• Bukit Payung–Telemung Highway
		• Gebeng Bypass

	Northern	• FT 194 Changlun–Kuala Perlis Highway • FT 3113 Tun Dr Lim Chong Eu Expressway
	Southern	• FT 1 Skudai Highway • FT 3 Johor Bahru–Kota Tinggi Highway

		• FT 17 Pasir Gudang Highway • FT 34 Johor Bahru East Coast Parkway • FT 188 Johor Bahru Inner Ring Road • Teluk Kemang Bypass
	Malaysian Borneo (East Malaysia)	• FT 1 Pan Borneo Highway (Sarawak section) & (Sabah section) • FT 1-82 Miri–Baram Highway • FT 13 Sandakan-Tawau Highway • FT 22 Ranau-Sandakan Highway
Toll road	**Interstate**	• E1 North–South (northern) • E2 North–South (southern) • E6 ELITE • E8 • Kuala Lumpur–Karak • E21 Kajang–Seremban • E32 West Coast[1] • Paroi–Senawang–KLIA[2] • JELAS[2] • Port Dickson-Banting Expressway[2] • Perlis–Langkawi Bridge[2]

	Central	• E1 New Klang Valley
		• E5 KESAS
		• E7 Cheras–Kajang
		• E9
		  • Sungai Besi
		  • Besraya Extension

- E10
  - New Pantai
  - New Pantai Expressway Phase 2[2]
- E11 Damansara–Puchong (LDP)
- E12 AKLEH
- E13 Kemuning–Shah Alam (LKSA)
- E18 Kajang SILK
- E19 SUKE
- E20 MEX
- E23 SPRINT
- E25 LATAR
- E26 South Klang Valley
- E27 East Klang Valley[1]
- E30 New North Klang Straits Bypass
- E31 DASH
- E33
  - DUKE
  - DUKE Phase 2
  - DUKE 2A[2]
- E35 Guthrie Corridor
- E37
  - SALAK
  - Kuala Lumpur–Seremban
- E38 SMART Tunnel
- E39 Setiawangsa–Pantai
- Sungai Klang (SKL)[2]
- Bangi-Putrajaya (BPE)[2]

	• Kuala Lumpur North Dispersal (KL-NODE)[2] • Petaling Jaya Dispersal Link (PJD Link)[3] • Laluan Istana–Kiara Expressway (LIKE)[2]
East Coast	• E8 • East Coast Expressway
Northern	• E15 Butterworth–Kulim • E17 Butterworth Outer Ring • E28 Penang Second Bridge • E36 Penang Bridge • South Kedah[2] • West Ipoh Span[2] • Penang Outer Ring[3] • Penang Undersea Tunnel[3] • Juru–Sungai Dua Elevated Expressway[2]
Southern	• E3 LINKEDUA • E14 EDL • E22 Senai–Desaru • E29 Seremban–Port Dickson • Johor Bahru–Pasir Gudang[2]
Malaysian Borneo (East Malaysia)	• E24 Tun Salahuddin Bridge

- [1] under construction
- [2] planned
- [3] cancelled/postponed/on hold

Categories:

- 2007 establishments in Malaysia
- Expressways in Malaysia
- Expressways and highways in the Klang Valley
- Tunnels completed in 2007
- Toll tunnels in Malaysia
- Water tunnels
- Drainage tunnels
- Flood control in Malaysia
- Flood control projects