Progress of countermeasures for earthquakes and tsunami

Status of deliberation on seawall construction to protect against tsunami from a Kuril Trench earthquake

December 27, 2018

TEPCO

Tokyo Electric Power Company Holdings, Inc.

Objective of the seawall and precautions during construction

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<Objective of the seawall>

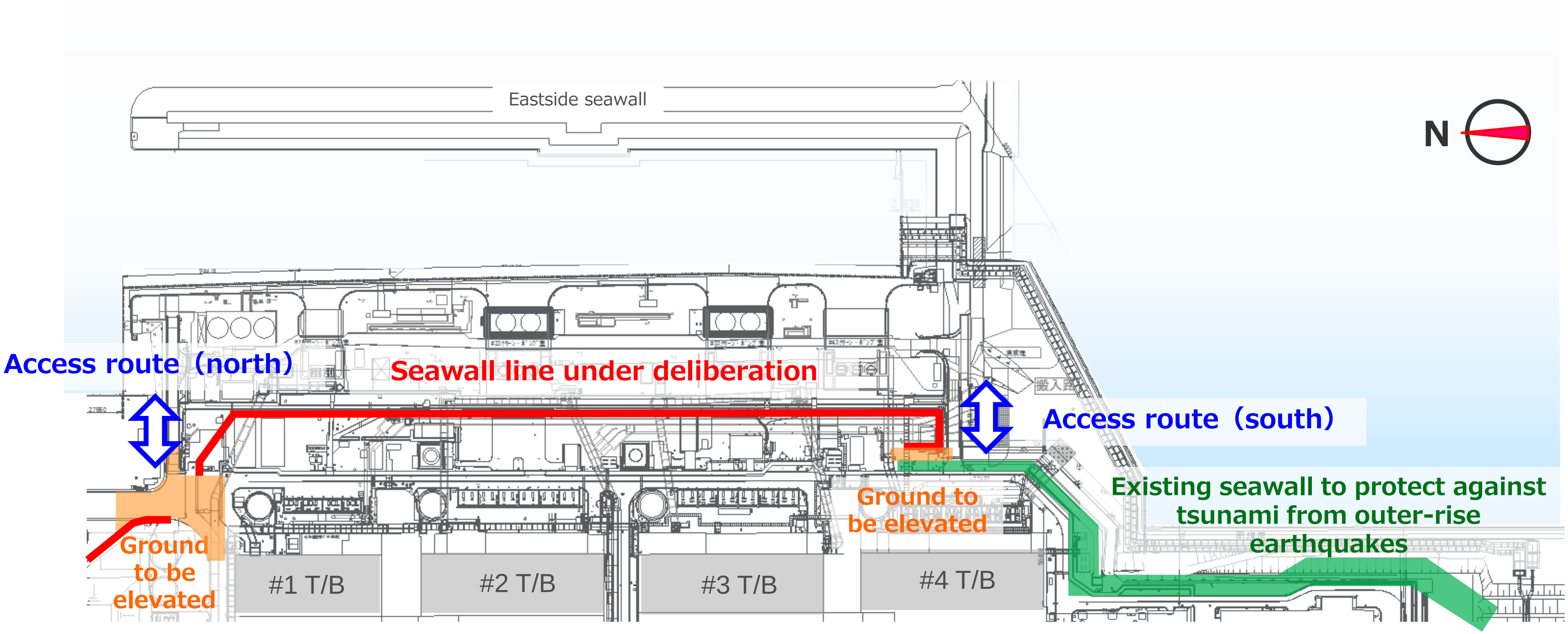
To act as an independent safety measure for tsunami produced by a Kuril Trench earthquake, which is considered to be imminent

① To help prevent groundwater from seeping into buildings at the T.P.+8.5m foundation thereby preventing the leakage and further accumulation of accumulated water

② To alleviate risks that may delay decommissioning work at 1F by mitigating damage to important facilities located on the T.P.+8.5m foundation that might be caused by a tsunami.

<Precautions during seawall construction>

1. Minimize the impact on decommissioning work underway or planned as much as possible.
2. Finish installation as quickly as possible.



Assumed origin of tsunami used for design

- The Headquarters for Earthquake Research Promotion predicts that the wave source from an earthquake off the coast between Tokachi and Nemuro (Kuril Trench earthquake) would be 8.8 Mw or greater .
- TEPCO has defined the wave source region to be used for design as the area stretching from the northern end of the area where a tsunami may by produced by an inter-plate earthquake as noted in the "Regulatory Guide for Reviewing Design Basis Tsunami and Tsunami-Resistant Design (Nuclear Regulation Authority, June, 2013)" to the northern area off the coast of Sanriku that was not destroyed by the 2011 Great East Japan Earthquake. (Fault length: Approx. 1,400km, Fault area: Approx. 260,000km², Magnitude: Mw9.4)
- Defining the wave source region in this manner matches the views of the Headquarters for Earthquake Research Promotion and also provides a large enough margin for error.

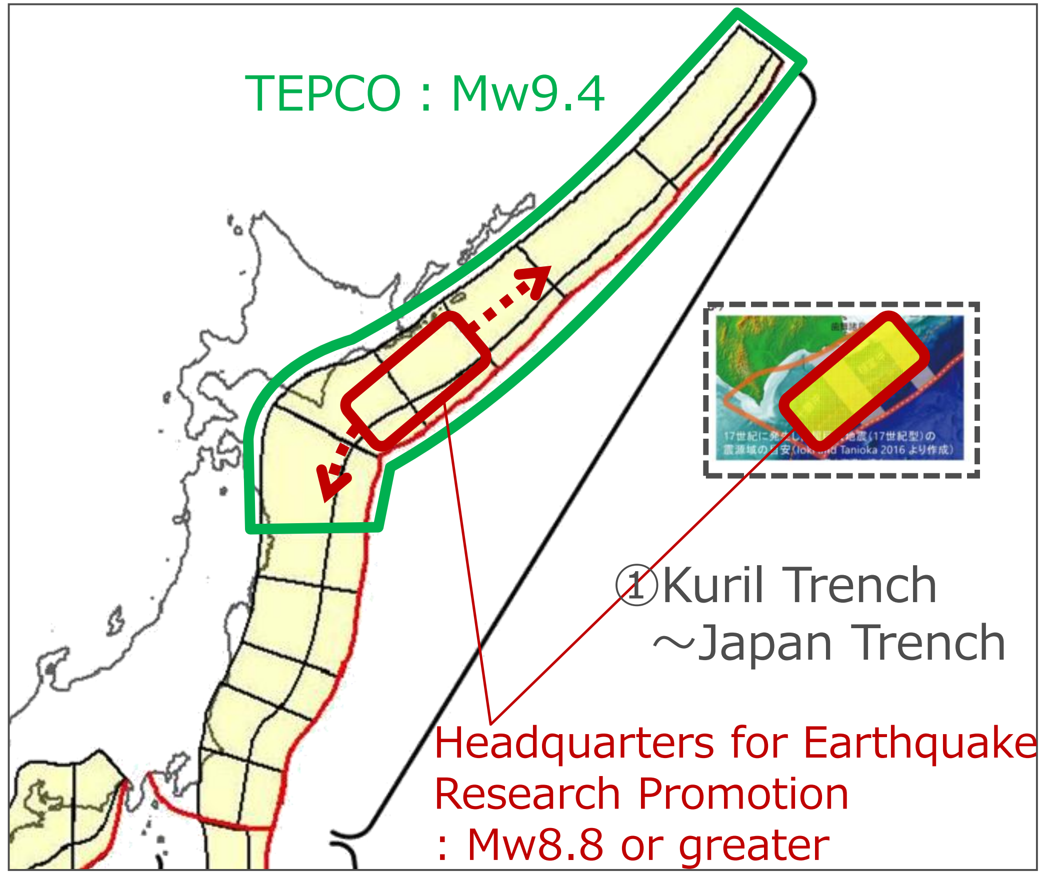


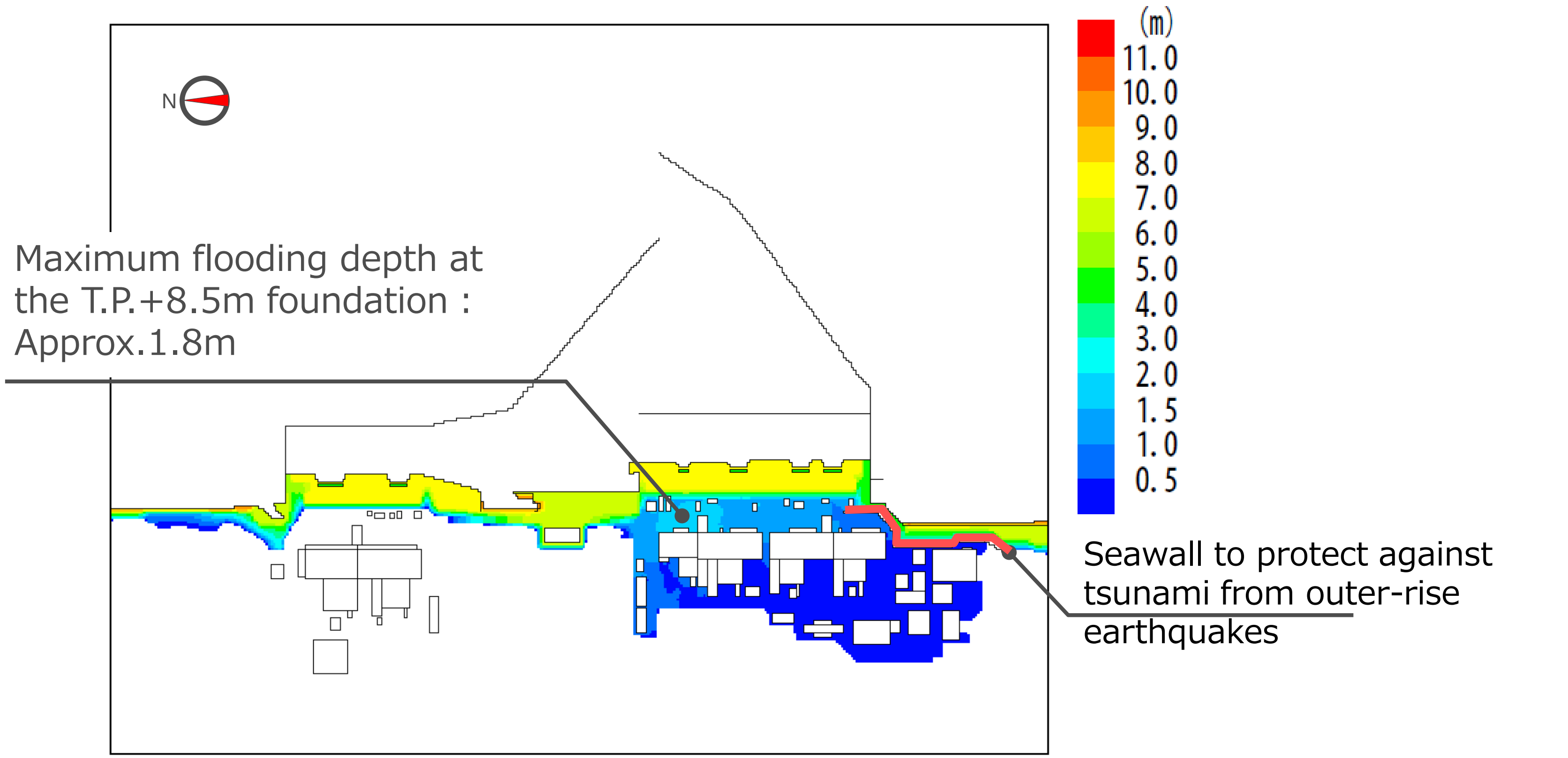
Fig. Possible area where a tsunami may be produced by an inter-plate earthquake

Note: Since a large landslide over 50m occurred offshore of Miyagi Prefecture near the Japan Trench during the 2011 Great East Japan Earthquake, the probability of a landslide on a similar scale occurring in this area during the next several centuries is lower than in other areas.

Excerpt from "Regulatory Guide for Reviewing Design Basis Tsunami and Tsunami-Resistant Design"
(Nuclear Regulation Authority, June, 2013)

If a seawall to protect against a tsunami from a Kuril Trench earthquake is not built···

- The site would be flooded through locations that the seawall to protect against tsunami from outer-rise earthquakes does not protect.
- Maximum flooding depth at the T.P.+8.5m foundation is estimated at approx. 1.8m on the sea-side of the Unit 1/2 turbine buildings.



Maximum flooding depth distribution at the plant site

Determining seawall height

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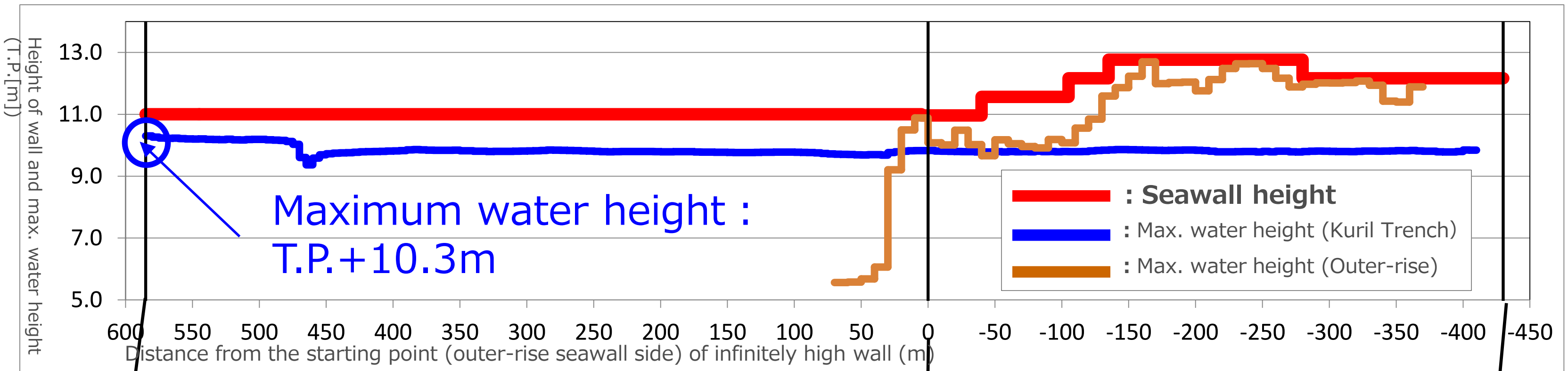
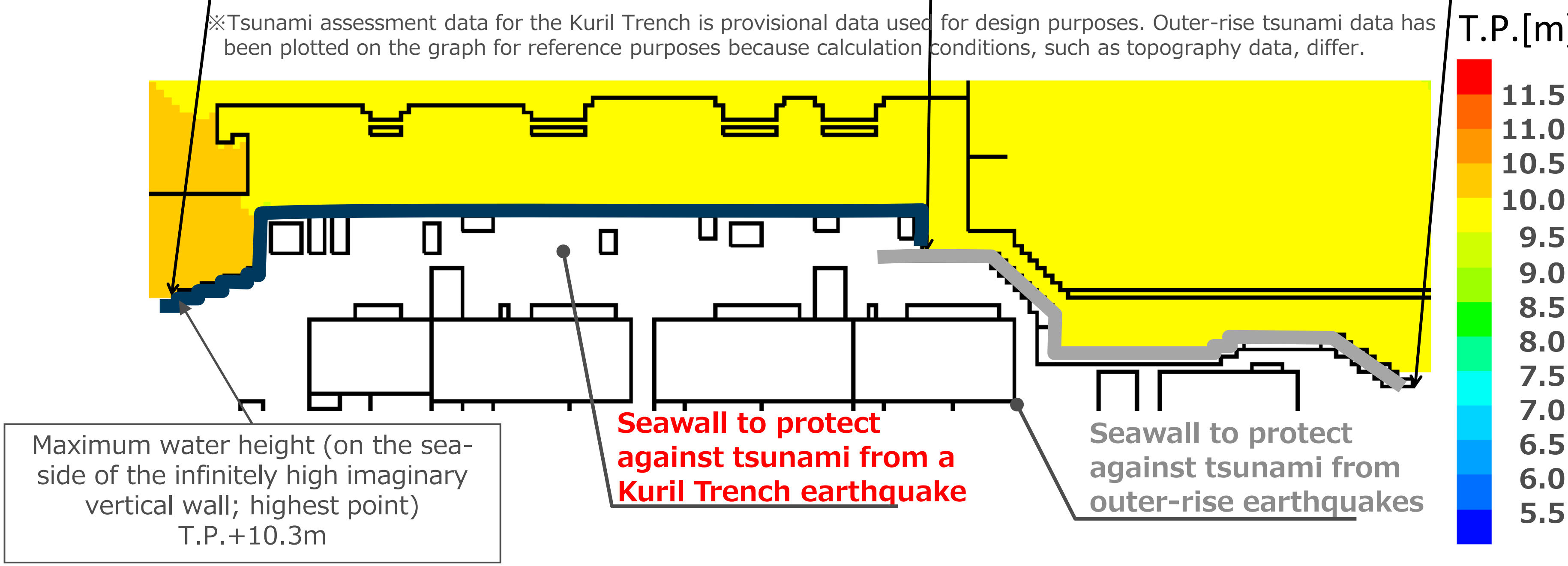
A tsunami simulation conducted with an infinitely high imaginary vertical wall on the planned seawall line concluded that the maximum water height on the sea-side of the simulated wall would be T.P.+10.3m.
⇒ Therefore, seawall height has been set at T.P.+11.0m to exceed simulation results.



※Tsunami assessment data for the Kuril Trench is provisional data used for design purposes. Outer-rise tsunami data has been plotted on the graph for reference purposes because calculation conditions, such as topography data, differ.



Basic structure of the seawall

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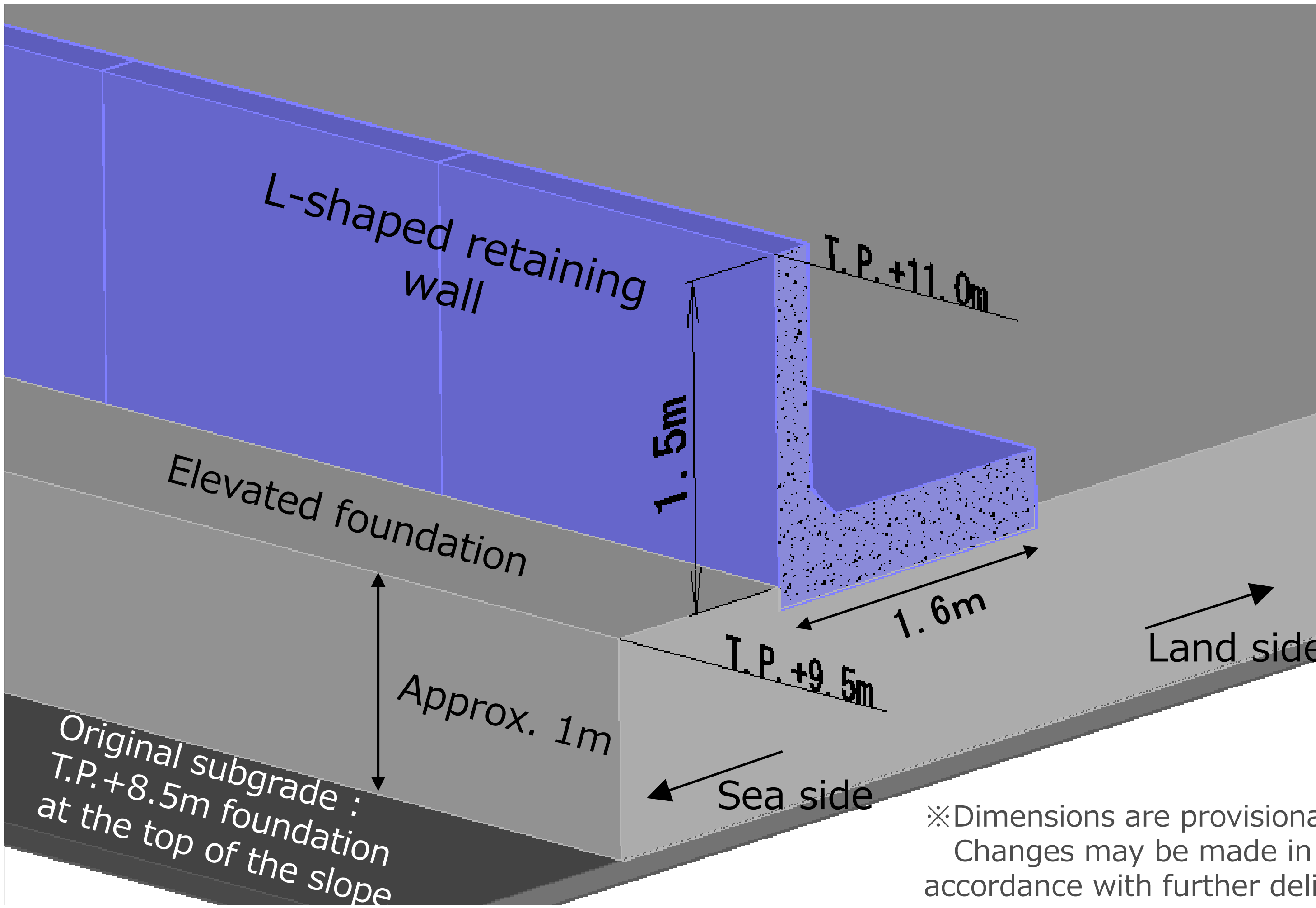
- T.P.+8.5m foundation will be elevated to T.P.+9.5m
- An L-shaped reinforced concrete retaining wall will be built on the elevated foundation to secure T.P.+11.0m of seawall height.



※Dimensions are provisional. Changes may be made in accordance with further deliberation.

Basic design policy

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Since the wall will function in conjunction with the existing seawall to protect against outer-rise earthquake tsunami, the design conditions for the new wall will be **equivalent to the existing wall**.

Item	Approach
Seawall height	The wall must prevent the tsunami used for design purposes from flowing over it and flooding the site.
Wave-resistance force	The wall must not collapse, fall or slide even when subjected to hydrostatic pressure created by water three times deeper than the flooding depth of the tsunami used for design purposes.
Preventing flooding from backflow	Backflow routes should be eliminated as much as possible.
Drainage performance	In the event that water flows over the seawall, it should be possible to drain the water immediately (by installing flap gates, etc.)

Location of the seawall

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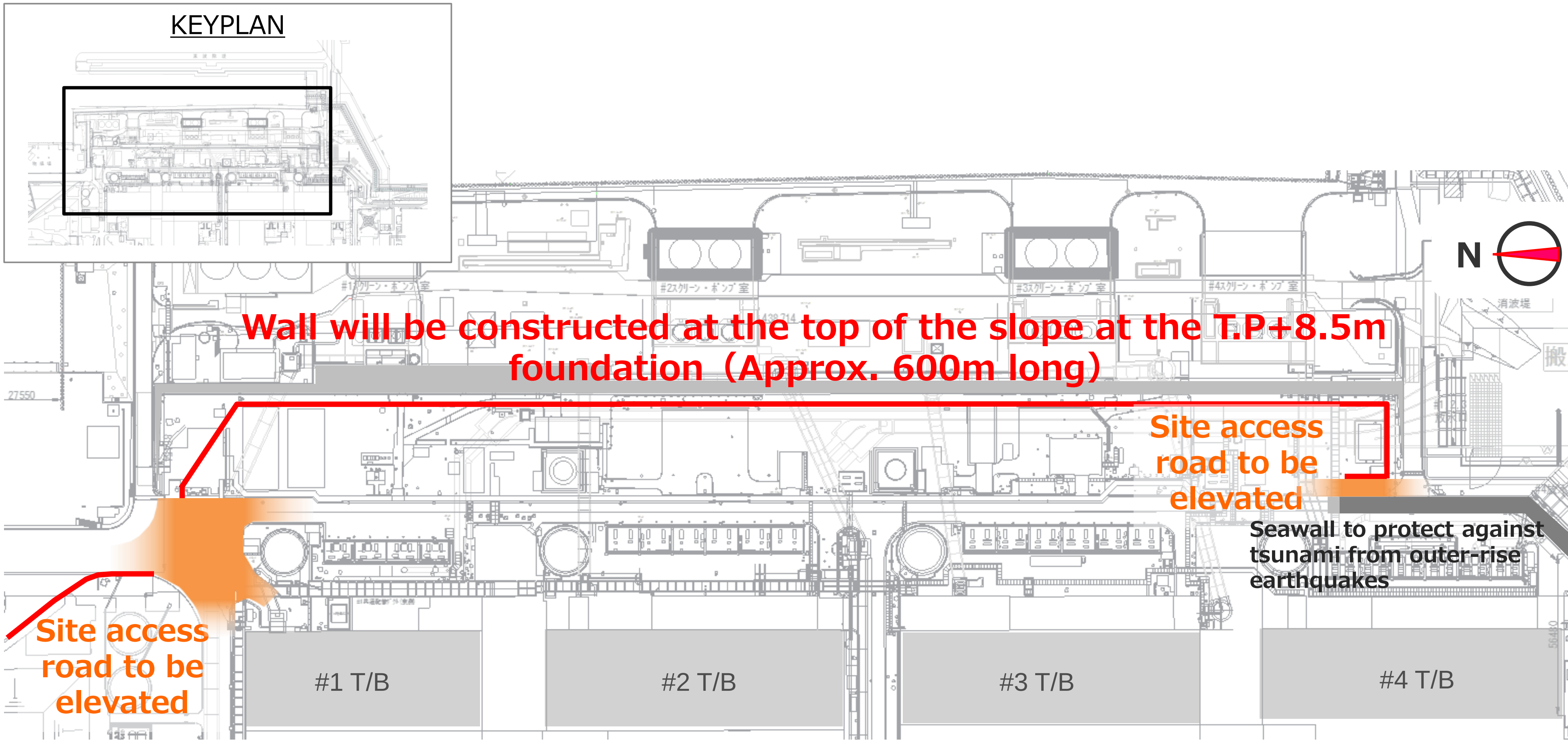
- After examining what facilities and decommissioning work seawall construction would interfere with it was concluded that construction of the wall on top of the slope at the T.P.+8.5m foundation would have the least impact on decommissioning work and could be completed the quickest.
- The site access road will be elevated at the southern and northern ends to enable vehicles to pass through.



Reference: 3-D Rendering of the seawall (Unit 3/4 side)

Photo looking to the southeast from the top of the condensate storage tank on the sea-side of the Unit 3 turbine building (taken on October 31, 2018)

3-D Rendering of the planned seawall

Reference: 3-D Rendering of the seawall (Unit 1/2 side)

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Photo looking to the northeast from the top of the condensate storage tank on the sea-side of the Unit 3 turbine building (taken on October 31, 2018)

3-D Rendering of the planned seawall

Target Schedule

We will move forward with deliberations/construction to enable the seawall to be functional during the first half of 2020.

	FY2018	FY2019		FY2020
	October	April	October	April
Design, Technical study	Basic design	Detailed design, formulation of detailed work plan		
Main Construction	Present	Main construction starts in the first half of FY2019	Main construction	Seawall functional in the first half of FY2020
Accompanying work		Equipment relocation and removal work		※We will strive to get the wall built and functioning as quickly as possible by coordinating with all parties engaged in competing projects to optimize schedules/yard usage

Including
- Three buildings along the sea-side of Unit 1 (Security office, etc.)
- Accumulated water clean up system in discharge channel
- Accumulated water clean up system in seawater piping trench, etc.