

Current status of Fukushima Daiichi NPS - Efforts for Contaminated Water Issue -

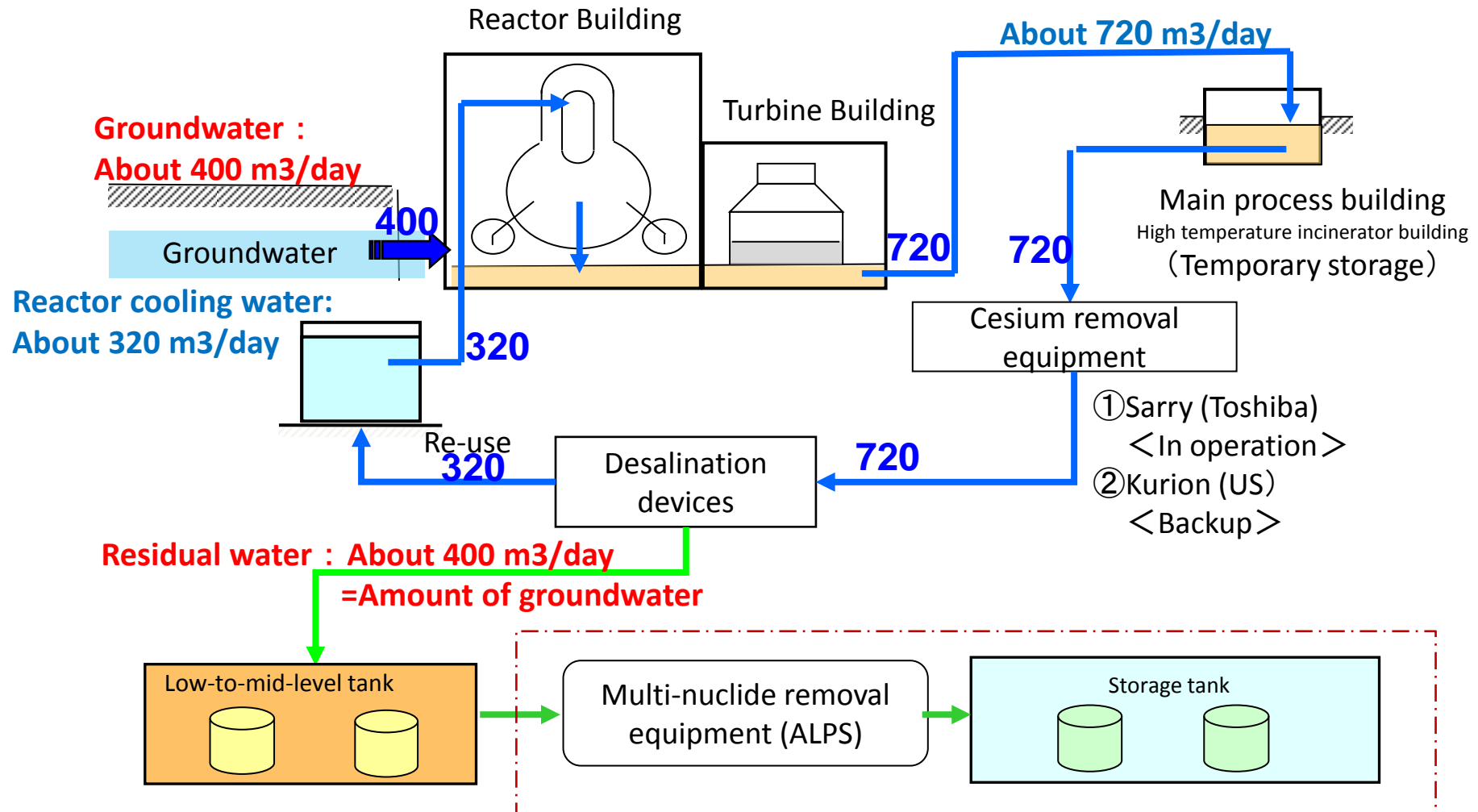
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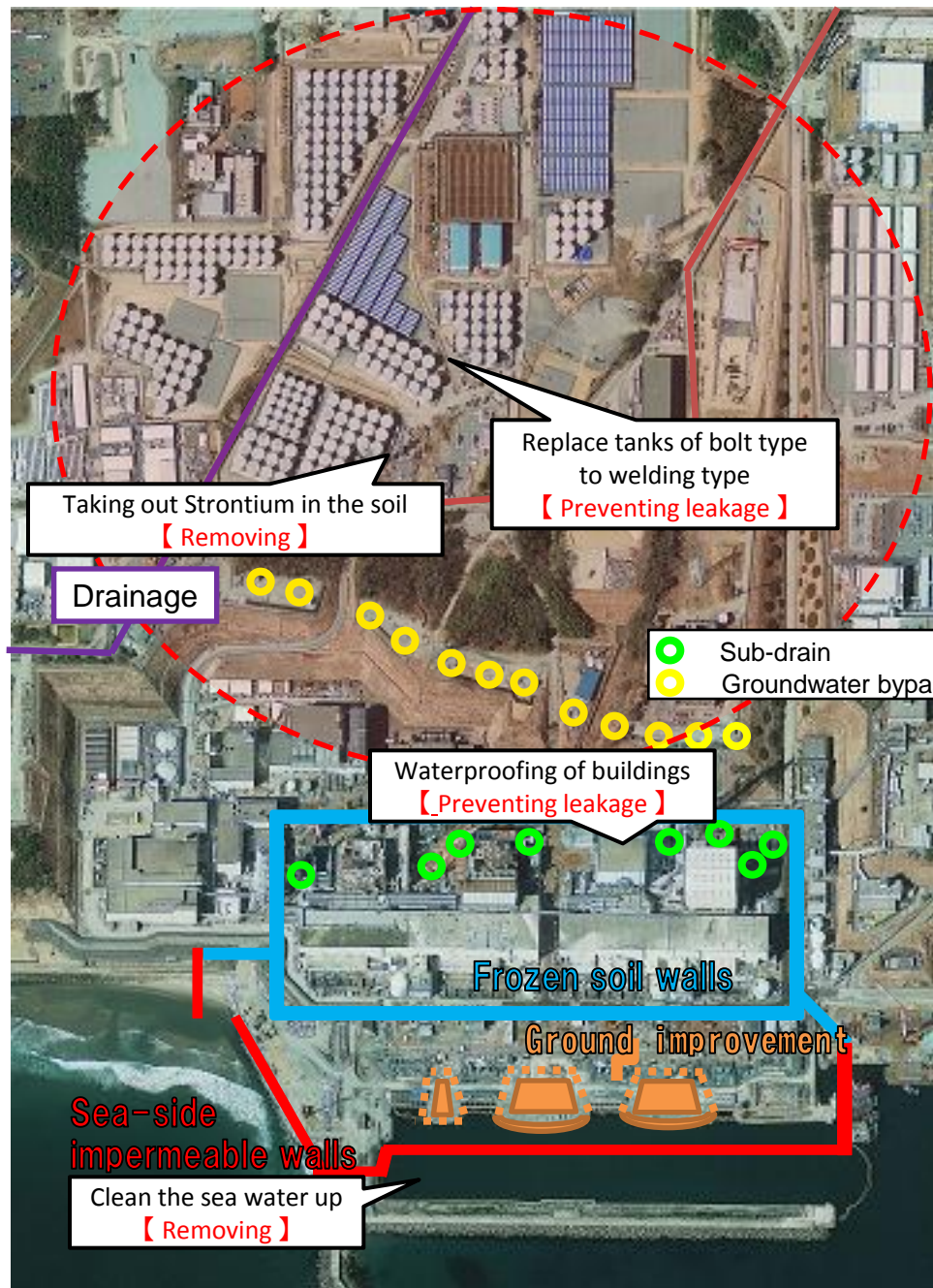
September 10, 2014

1. Management of Contaminated Water ~Overview of the System~

<Overview of the System>



2. Comprehensive Countermeasures to Manage Contaminated Water



- Three measure policy**
1. **Removing** the contamination source
 2. **Isolating** groundwater from the contamination source
 3. **Preventing leakage** of contaminated water



1. ① **Removing** the contamination source
 - ◆ Pump-up contaminated water from trench
 - ◆ Clean up of contaminated water by ALPS(Multi-nuclide removal equipment)
 - ◆ Post ALPS (planning and construction)
 - ◆ Countermeasure of leakage water (take out strontium in the soil)
 - ◆ Clean up the sea water in the harbor

1. ② **Isolating** groundwater from the contamination source
 - ◆ Land-side frozen soil impermeable walls
 - ◆ Groundwater bypassing system
 - ◆ Pump-up contaminated water from sub-drain
 - ◆ Facing including wide area facing etc.

1. ③ **Preventing leakage** of contaminated water
 - ◆ Ground improvement by water glass
 - ◆ Sea-side impermeable walls
 - ◆ Replace tanks of flange (bolt) type to welding type
 - ◆ Construction of welding type tanks

etc.

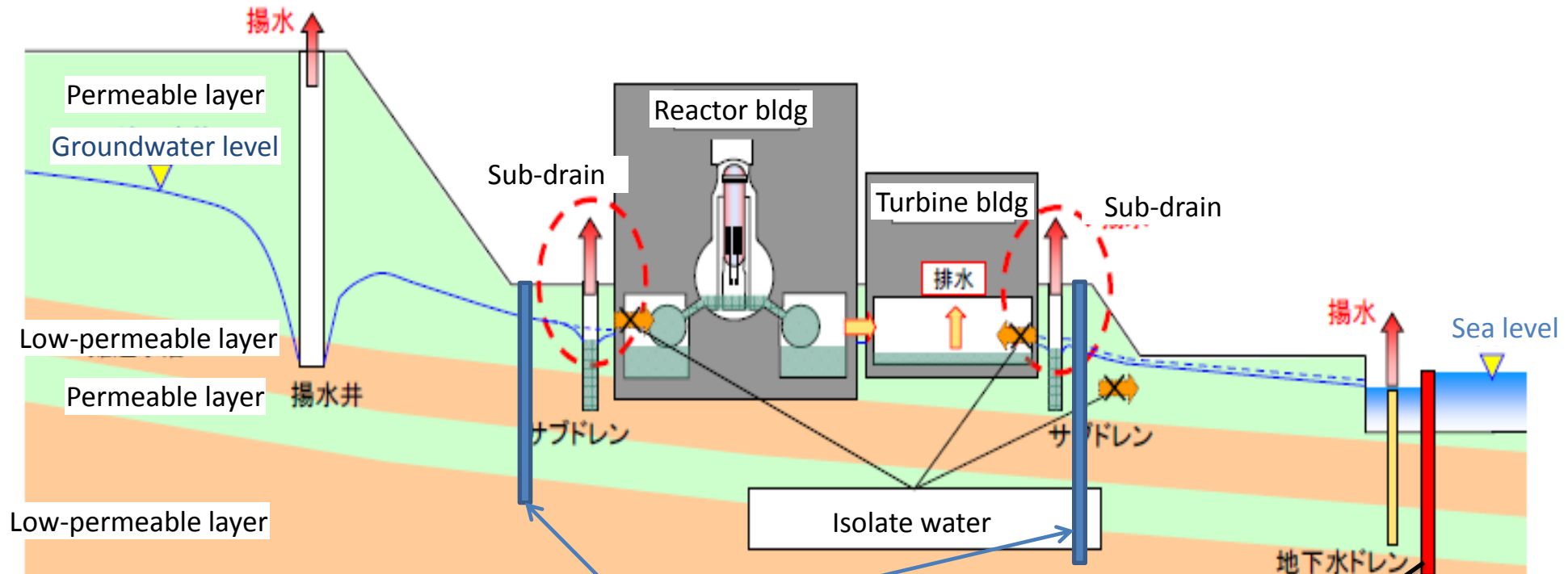
[Reference] Current Status of Main Measures for the Contaminated Water

	Measures		Progress
“Removing”	Multi-nuclide removal equipment	Completed/ Currently-operated	3-system operation is working Decontaminated about 120,000 tons (As of 19 August)
	Additional multi-nuclide removal equipment	Under construction	Planned to start the decontamination test in middle September
	High-performance multi-nuclide removal equipment	Under construction	Planned to start the decontamination test in October
	Removal of high-density contaminated water in the trenches	Under construction	Refer to 5.(4)
“Isolating”	Groundwater bypassing	Completed/ Currently-operated	Started pumping up from late May
	Sub-drain	Testing	Decontamination test of the pumped-up groundwater is ongoing / Explanation for stakeholders
	Land-side impermeable frozen walls	Under construction	Started construction in June Planned to start freezing in the end of FY2014
	Waterproof pavement	On-going	Started sequentially from January 2014 Planned to be completed until the end of FY2014
“Preventing leakage”	Heightening and duplicating tank fences,	Completed/ Currently-operated	Completed in middle July
	Ground solidification by sodium silicate	Completed/ Currently-operated	Completed in March
	Sea-side impermeable walls	Under construction	98% completed
	Increase tanks	On-going	Planned to install 800,000 tons of tanks until the end of FY2014 (Current stocked water: 0.5 Mt)

3. Sub-drain [Isolating]

- Preventing groundwater from flowing into the Reactor buildings and the seaside areas, by sub-drain water pumping. Greater effect is expected by pumping close to the building.
- Currently restoration work of sub-drain well is in operation. On August 11, TEPCO applies for a change of plan of drain facilities to NRA.

(1) Pumping well for groundwater bypassing



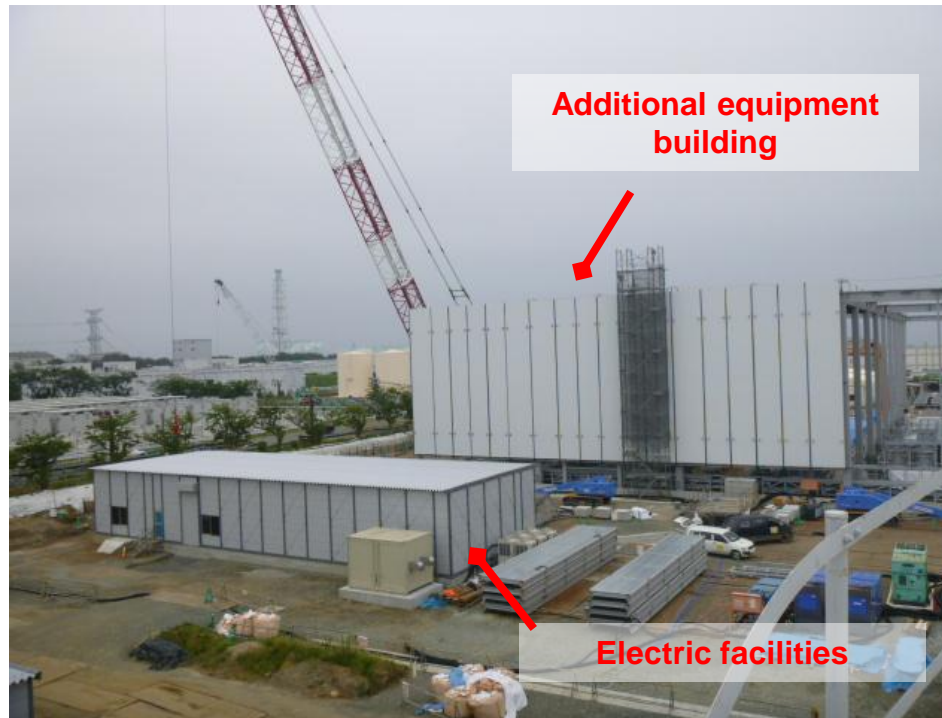
(3) Frozen soil walls (locational image)

(2) Sea-side impermeable walls

4. Multi-Nuclide Removal Equipment [Removing]

- The equipment removes radionuclides from the contaminated water in tanks, and therefore reduces risk. The existing multi-nuclide removal equipment (known as ALPS: Advanced Liquid Processing System) aims to reduce the levels of 62 nuclides in contaminated water to the legal discharge limits or lower. (ALPS cannot remove tritium.)
- TEPCO is planning to install additional equipment similar to the existing one. Moreover, TEPCO has already started the validation project for installation of high performance equipment, which can reduce secondary wastes by more than eighty percent (a national subsidized project with the budget of JPY 15.1 billion).

Additional equipment



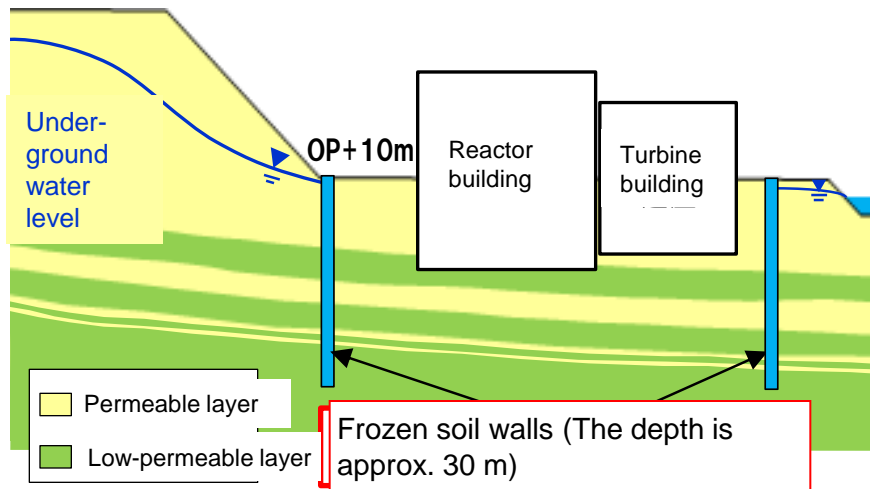
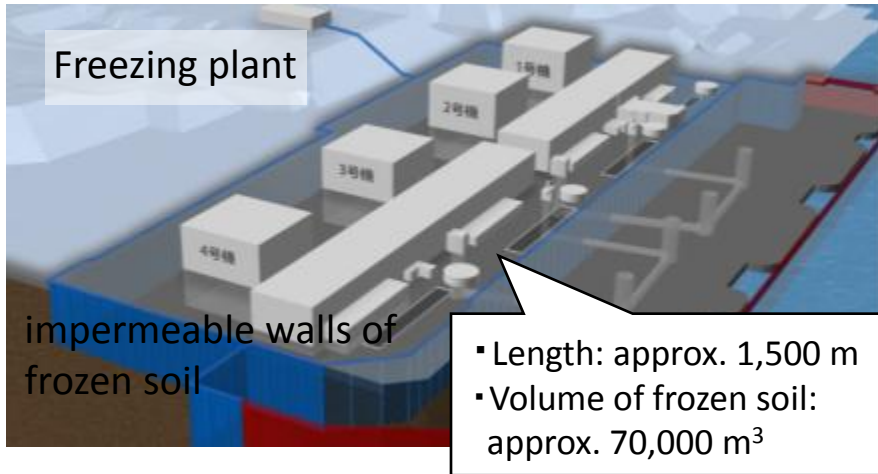
	Existing equipment	Additional equipment	High performance equipment※
Volume of treatment	750 m ³ /day	750 m ³ /day	500 m ³ /day or more
Commission date	March 2013	In early period of FY2014	In early period of FY2014

※ The installation is conducted as a government subsidized project.

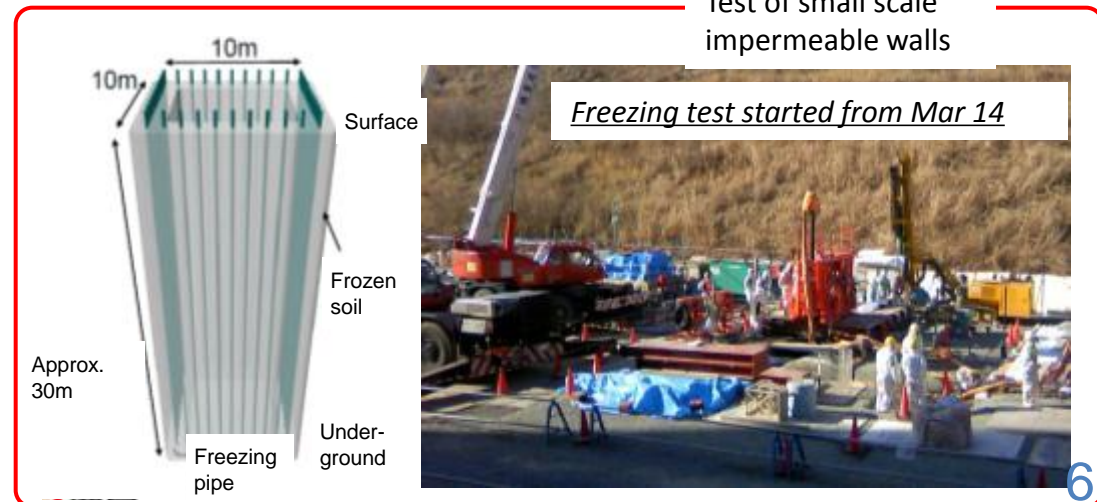
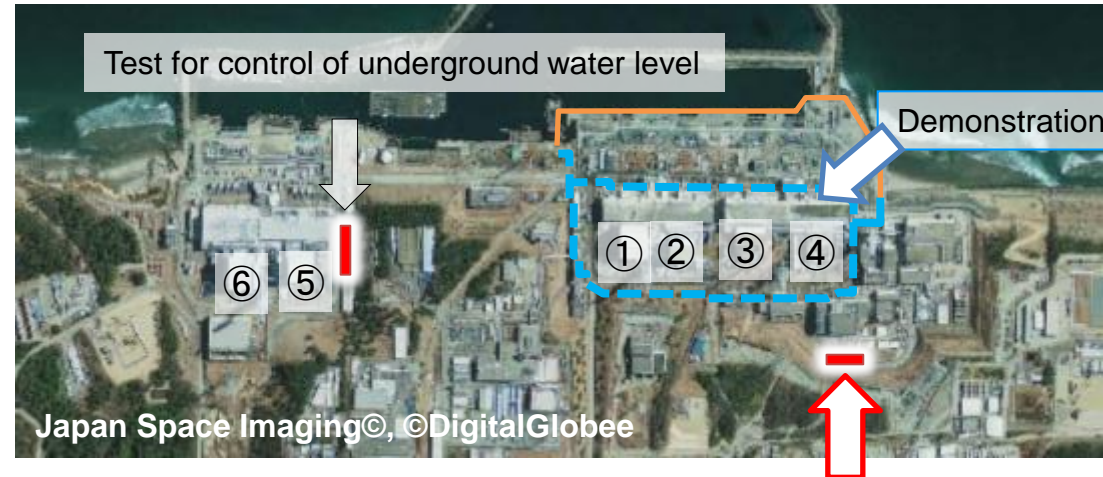
5. Land-side impermeable walls of frozen-soil method [Isolating]

- This measure aims to reduce the volume of groundwater inflow into the buildings by surrounding the buildings with froze-soil walls (a national subsidized project with the budget of JPY 31.9 billion).
- Technical validation for countermeasures for high-velocity groundwater and for controlling groundwater level has been conducted since last August, and small scale test succeeded in construction of frozen soil wall.
- The construction work began from June 2 with the aim of starting the freezing operation in FY 2014.

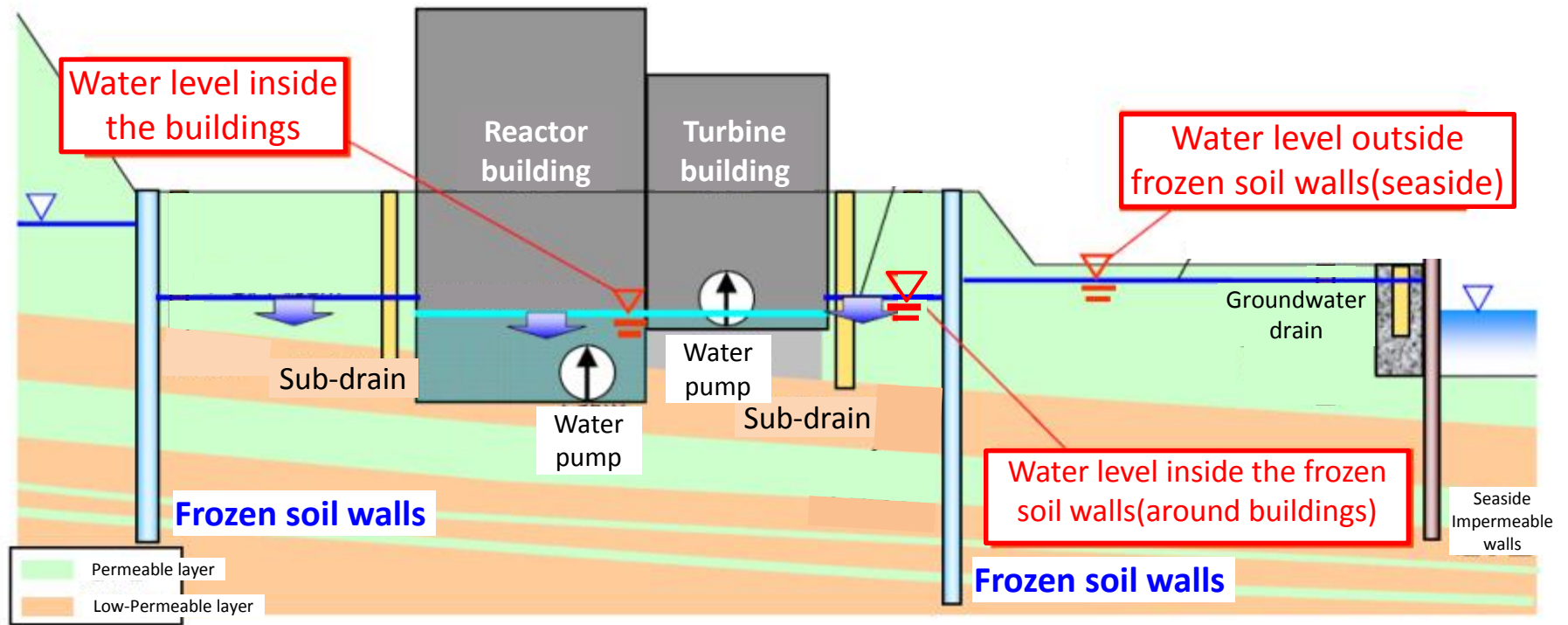
Overall view and sectional view of the walls



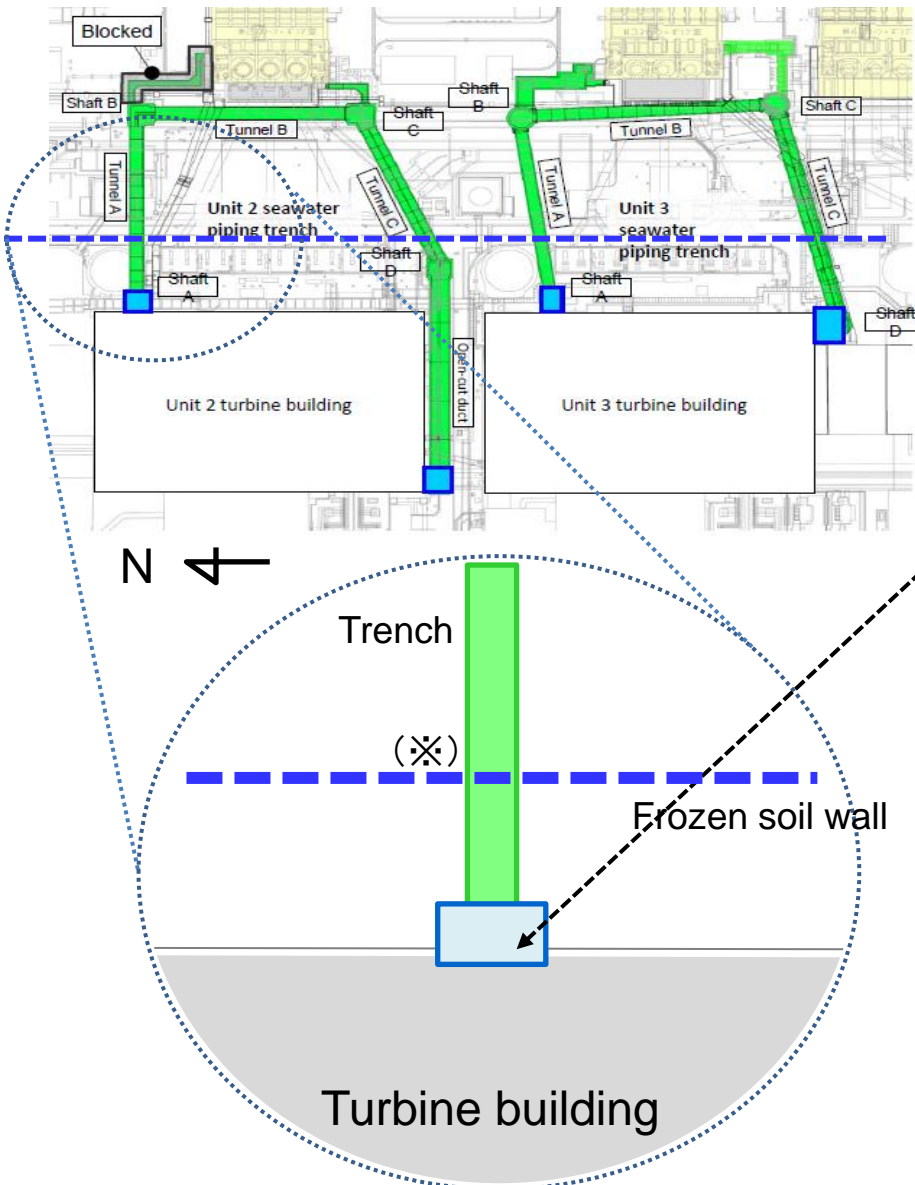
Feasibility study



[Reference] Cross-sectional Image (operation of the frozen soil walls)



6. Freezing the binding part of the trench and the building [Removing]



Conceptual diagram

「Removing contaminated water from the Seawater Piping trench」

① Freezing the binding part of the trench and the turbine building

- **Water is the target of frozen measure.**
- The countermeasures to accelerate the freezing process are planned and actioned as follows.

【STEP I】

- Increasing the number of freezing pipes inside the trench (Done)
- Adding ice and frozen carbon dioxide inside the trench and the shafts (In operation)
- Increasing the number of freezing pipes outside the trench (In preparation)

【STEP II】

- Adding the packer inside the trench (In review)
- Injecting water cutoff material inside the trench (In review)

② Pumping out contaminated water inside the trench

③ Injection of the water cutoff material


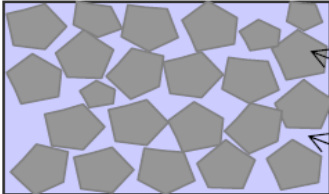
7. Difference between two measures

「Removing contaminated water from the Seawater Piping trench」

- The contaminated water in the Seawater Piping Trench will be removed in order to eliminate the contamination source.
- ①Freezing the binding part of the trench and the turbine building, ②Pumping out contaminated water inside the trench, ③Injection of the water cutoff material in the trench and shafts
- Water is the target of this frozen measure.

「Frozen soil wall」

- Surrounding the turbine buildings by setting a frozen soil wall in order to isolate the contamination source from the groundwater and prevent the groundwater from flowing into the buildings
- Pore water is the target.

	Freezing the connection to the turbine buildings	Frozen soil wall measure
The condition of the target to be frozen (i.e. water)	 Water	 Soil particles Pore water
Volume of the target (water)	large	small
Inflow of the water	The volume of the inflow fluctuates due to turbulence and convection.	It is less volatile because the pore water flows rather slow between the particles.