Committee for monitoring and evaluating the specified nuclear facilities (provisional translation) (9th meeting)
Reference 1-2

Response to the Comments Received at the Eighth Meeting of the Committee for Monitoring and Evaluating the Specified Nuclear Facilities

- Water Treatment Operation Plan Excluding the Use of the Underground Reservoirs
- Usage of the Filtrate Water Tank in Response to the Disuse of the Underground Reservoirs

April 19, 2013

Tokyo Electric Power Company

Water Treatment Operation Plan Excluding the Use of the Underground Reservoirs

Operation Plan of the Water Treatment Facilities

Since the storage capacity of the RO concentrated water storage tanks will be tight due to the disuse of the underground reservoirs, the water treatment facilities will be operated as follows.

[Preconditions]

- Reactor injection water amount : 408m^3/d
- Amount of water flowing into the buildings (groundwater, etc.): 400m^3/d

[Operation of the water treatment facilities]

- SARRY or KURION: Approx. 30-40m^3/h
- RO3 system (approx. 50m^3/h) and RO recirculation (10-20m^3/h)
- RO concentrated water treatment by ALPS(A) system (150m^3/d)
  From March 30 to July 31: one system in operation
  From August 1: two systems in operation

Tank Storage Plan

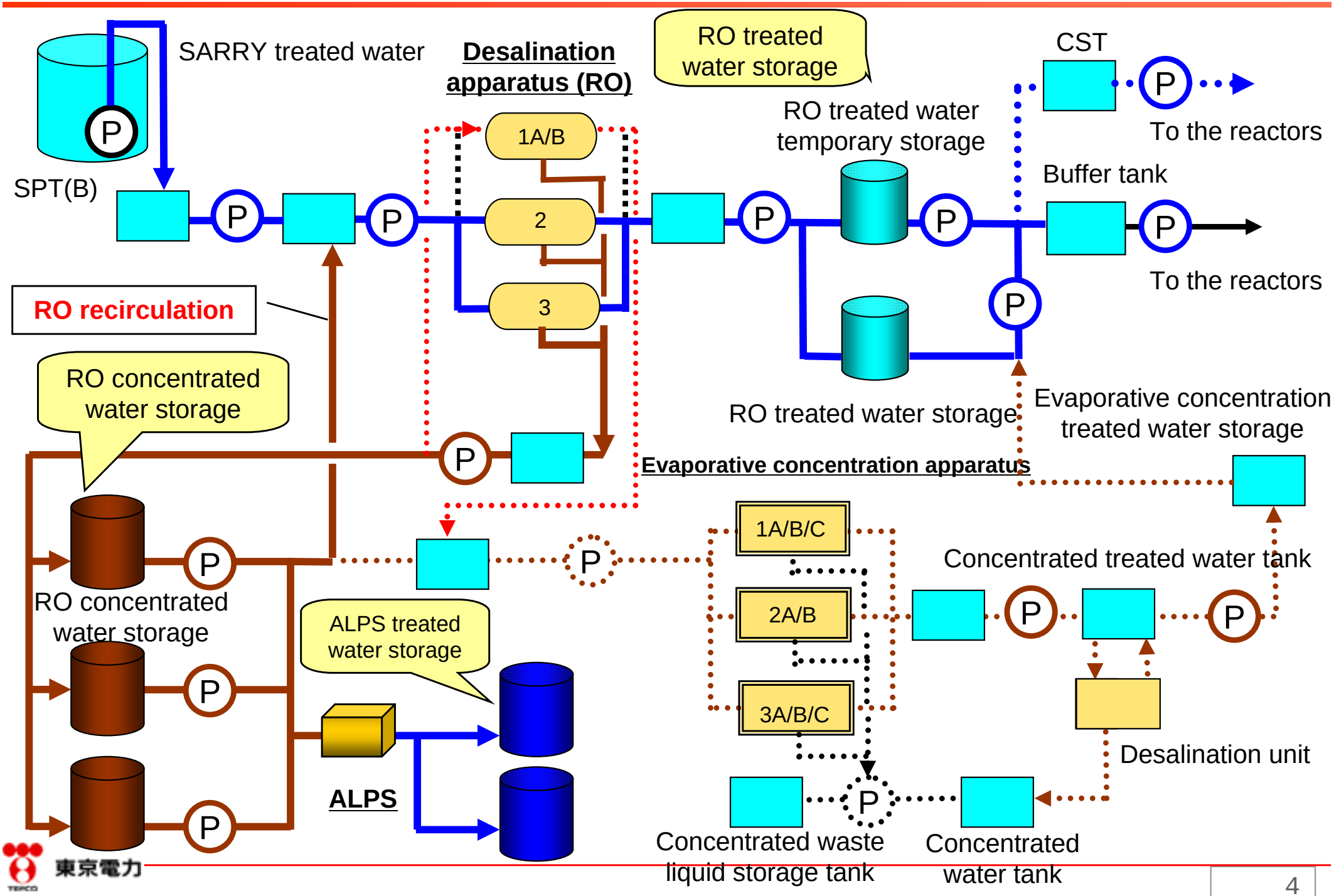
[Tank storage]

1. RO concentrated water
   - The increase in RO concentrated water as a result of ALPS(A) and RO recirculation put in operation is estimated to be approx. 170m^3/d. (Amount to be generated: 320m^3/d, amount to be transferred to ALPS: 150m^3/d)
   - Water is to be stored in H8 tank which is being installed (Total: 16,000m^3).
   - Water is to be stored in G4 tank (Total: approx. 20,000m^3) and G5 tank (Total: approx. 20,000m^3) to be additionally installed.

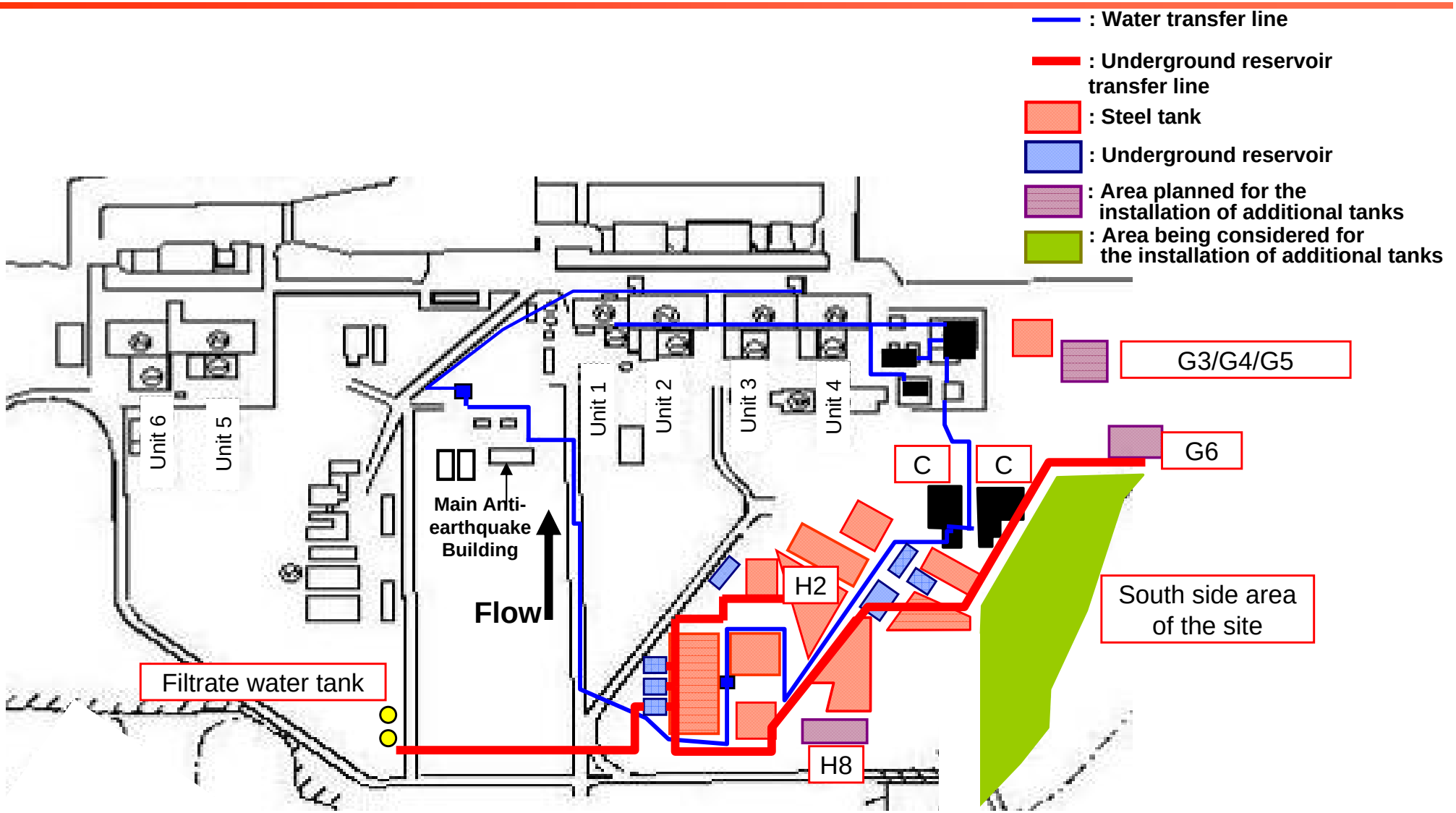
2. RO treated water
   - The increase in RO treated water as a result of the RO system and RO recirculation put in operation is estimated to be approx. 80m^3/d. (Amount to be generated: 480m^3/d, amount to be used for reactor injection: approx. 400m^3/d)
   - Concentrated water will be stored in H9 tank while the treated water will be stored in the buffer tank (as reactor injection water).
   - Since the amount of RO treated water will increase as a result of RO recirculation, the RO treated water will be transferred to Units 1-4 CST to ensure the appropriate storage amount (Approx. 3,400m^3).

3. ALPS treated water
   - The increase in ALPS treated water as a result of ALPS (one system) put in operation is estimated to be approx. 165m^3/d. (with the chemical (10%) taken into account).
   - Water is to be stored in G3 area tank being installed (Total: 70,000m^3).

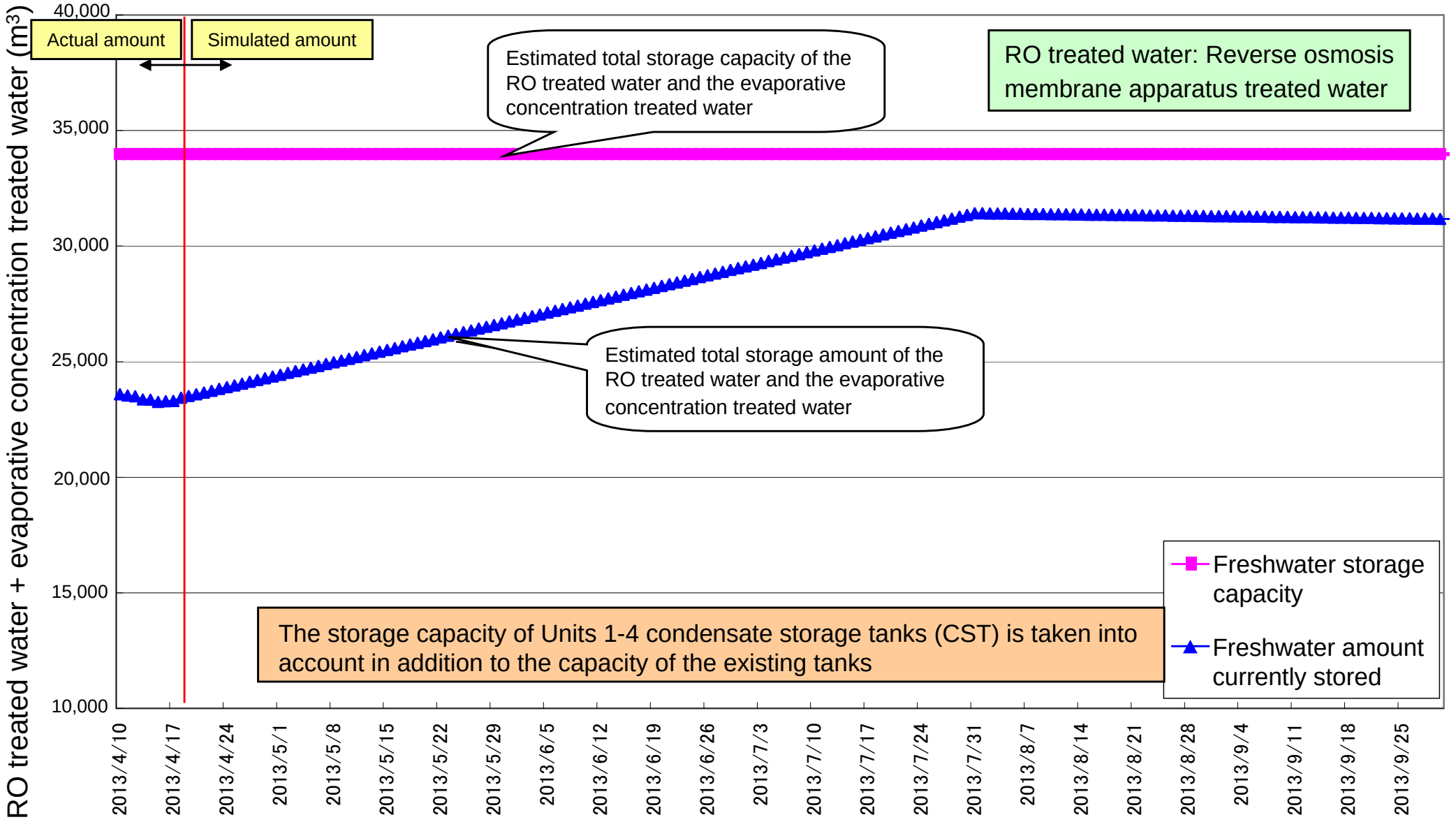
Operation of the Water Treatment Facilities



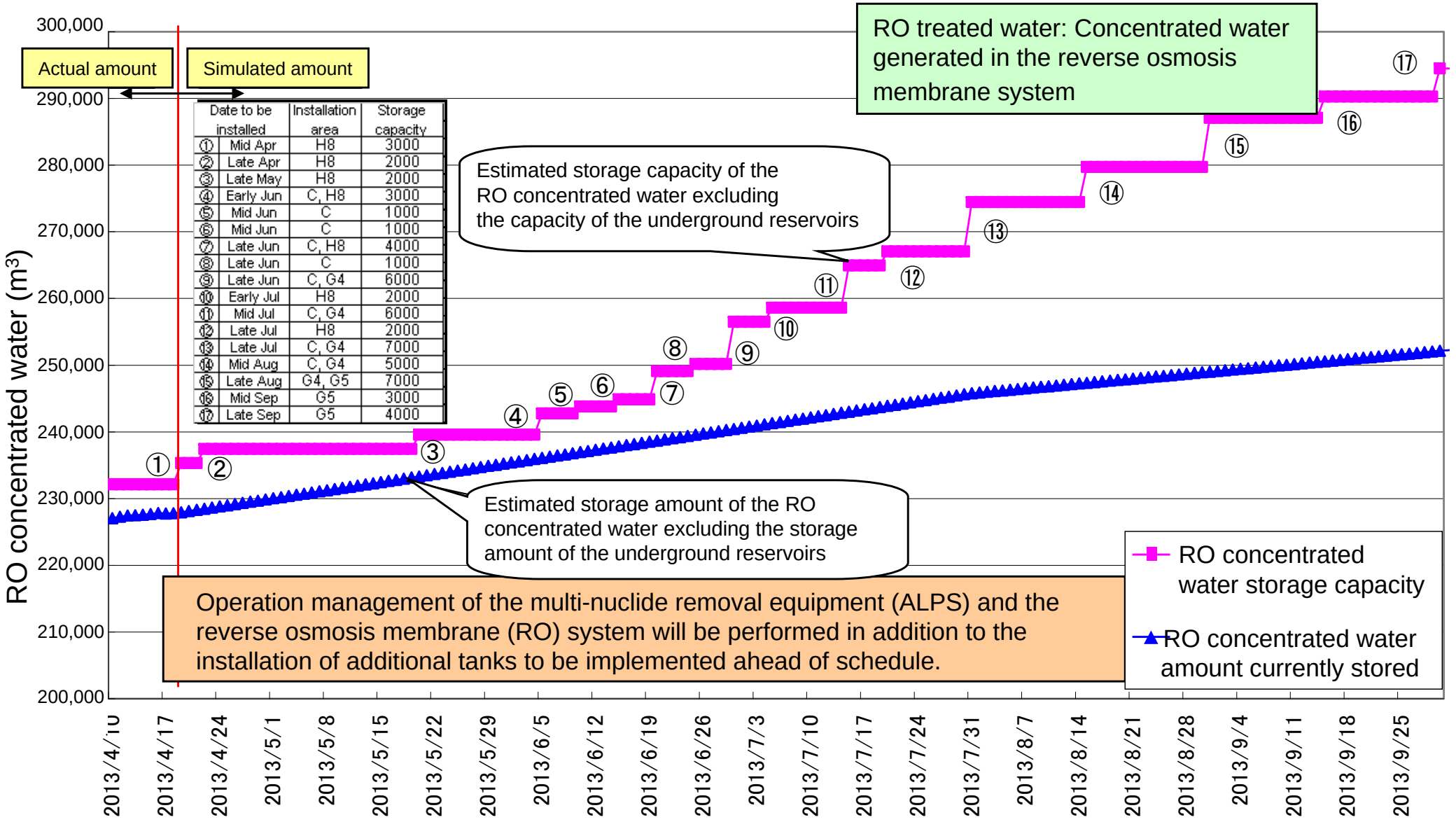
Locations for Installing Additional Tanks



Water Balance Simulation (Freshwater, Until the End of September 2013)

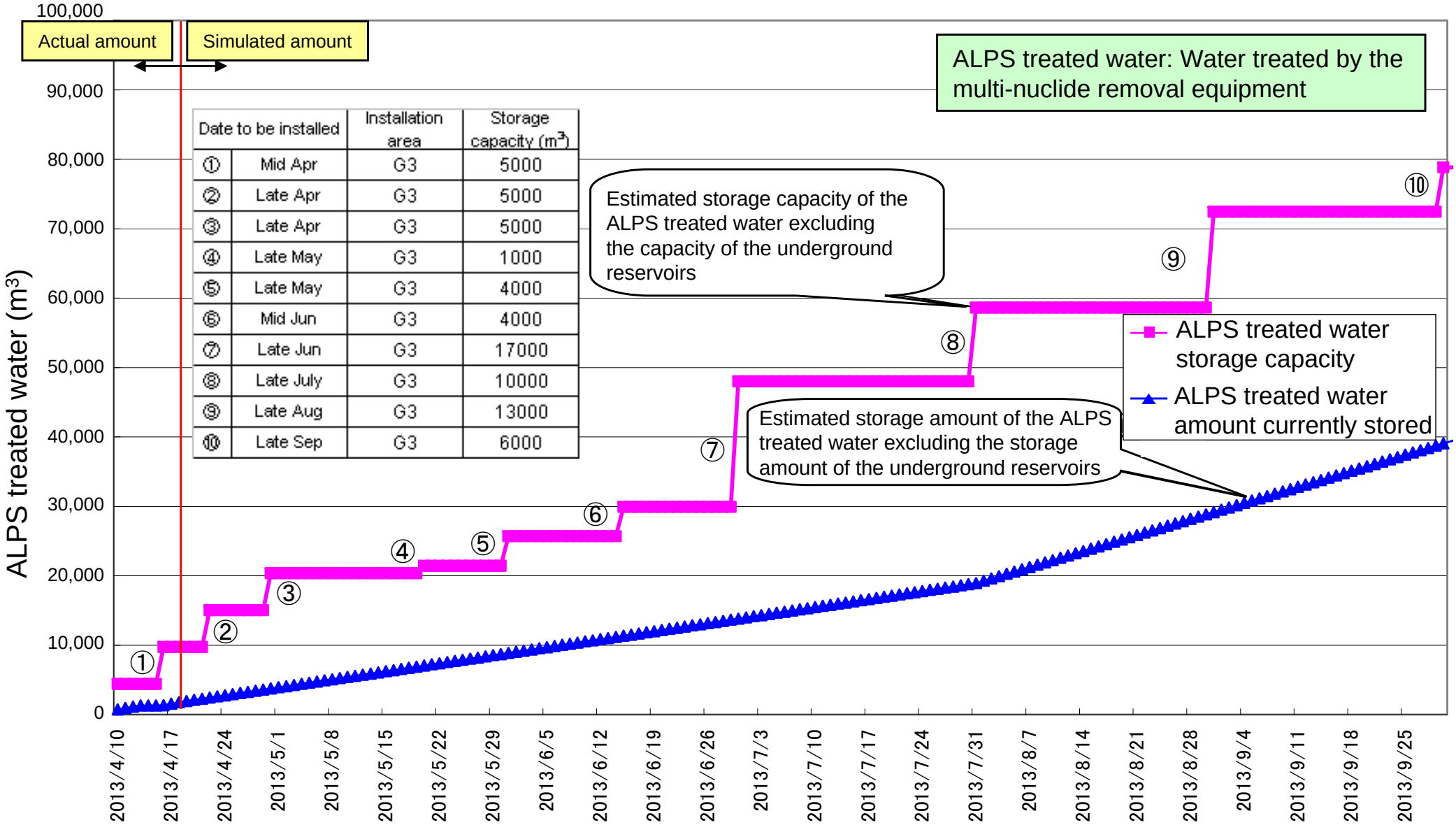


Water Balance Simulation (RO Concentrated Water, Until the End of September 2013)



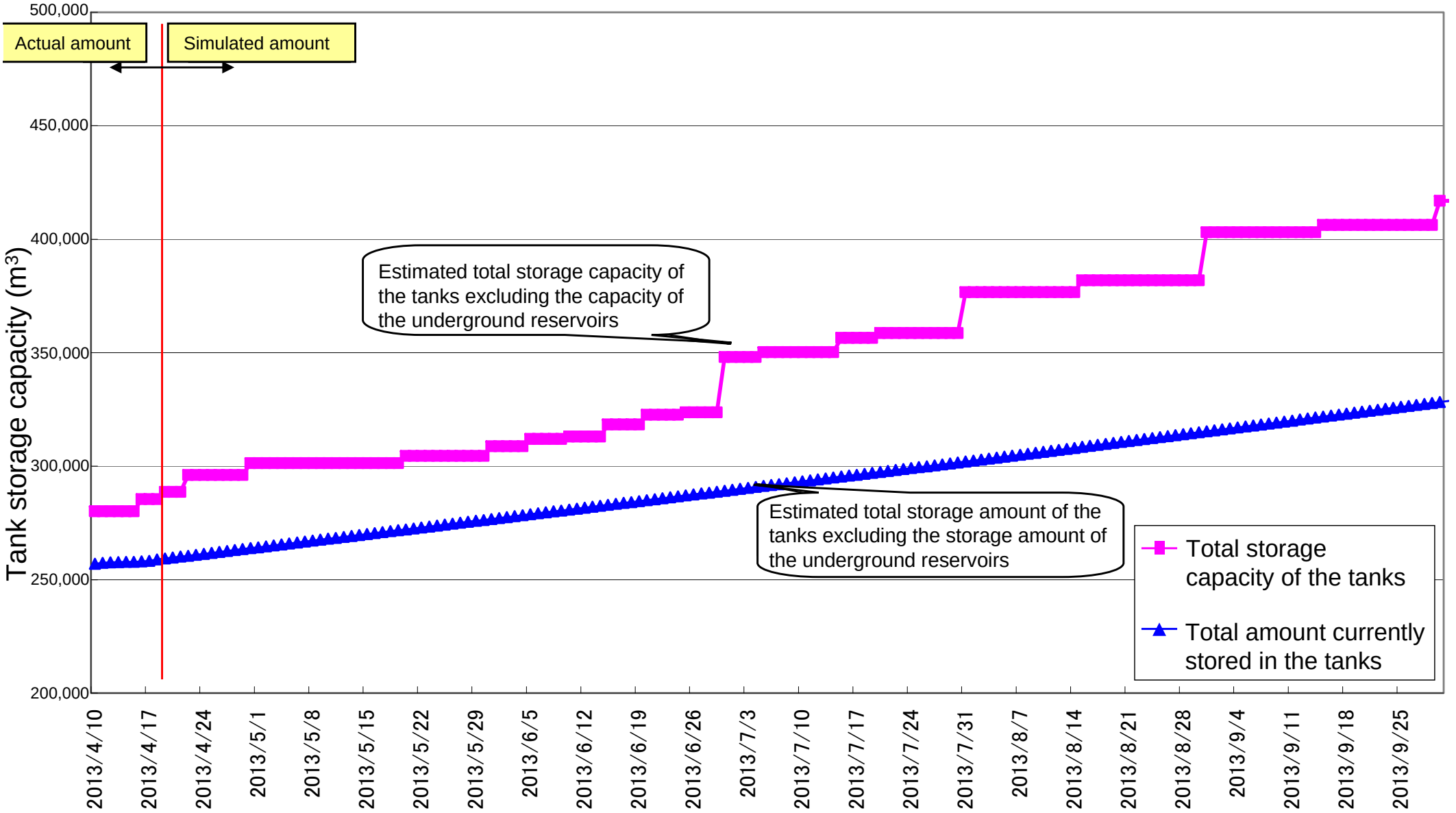
	Date to be installed	Installation area	Storage capacity
①	Mid Apr	H8	3000
②	Late Apr	H8	2000
③	Late May	H8	2000
④	Early Jun	C, H8	3000
⑤	Mid Jun	C	1000
⑥	Mid Jun	C	1000
⑦	Late Jun	C, H8	4000
⑧	Late Jun	C	1000
⑨	Late Jun	C, G4	6000
⑩	Early Jul	H8	2000
⑪	Mid Jul	C, G4	6000
⑫	Late Jul	H8	2000
⑬	Late Jul	C, G4	7000
⑭	Mid Aug	C, G4	5000
⑮	Late Aug	G4, G5	7000
⑯	Mid Sep	G5	3000
⑰	Late Sep	G5	4000

Water Balance Simulation (ALPS Treated Water, Until the End of September 2013)



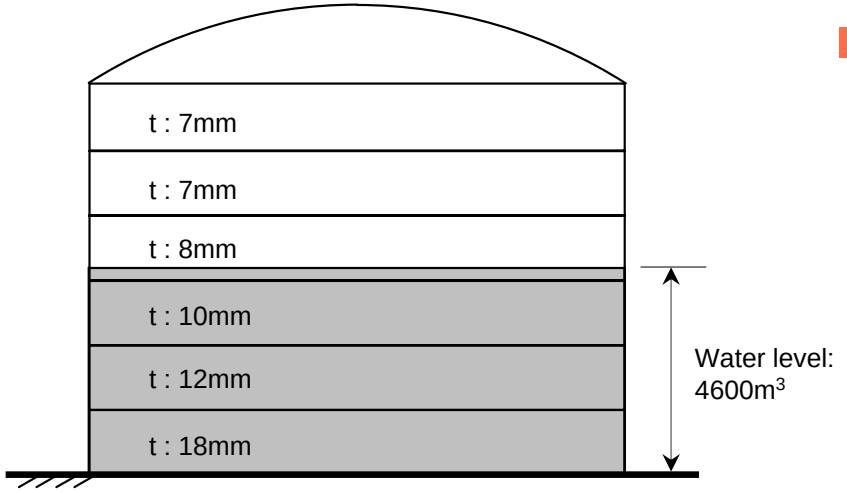
	Date to be installed	Installation area	Storage capacity (m³)
①	Mid Apr	G3	5000
②	Late Apr	G3	5000
③	Late Apr	G3	5000
④	Late May	G3	1000
⑤	Late May	G3	4000
⑥	Mid Jun	G3	4000
⑦	Late Jun	G3	17000
⑧	Late July	G3	10000
⑨	Late Aug	G3	13000
⑩	Late Sep	G3	6000

Comparison of the total tank storage capacity and the estimated storage amount



Usage of the Filtrate Water Tank in Response to the Disuse of the Underground Reservoirs

Filtrate Water Tank Specifications



- Capacity: 8,000m^3

  4,600m^3 of the RO concentrated water in the underground reservoir 1 will be stored.

- Number of units: 2

  One of them will be used for storing the RO concentrated water. The other one will be used as a backup water source for reactor water injection.

- Thickness: 7mm (top) - 18mm (bottom)

- Status of usage

  No damage or leakage was found with the tanks due to the earthquake occurred on March 11, 2011. Since part of the side plate was found to be deformed, a soundness evaluation was performed. The tanks are currently in use with the storage limit of 60% to ensure safety.

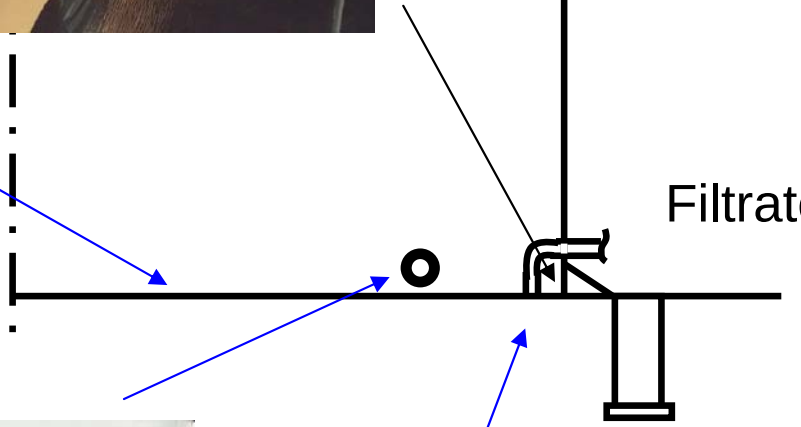
Filtrate Water Tank No.1 Inspection Results

Paint coming off of the bottom plate

Paint cracks along almost all circumference

Paint bubbles in some locations of the side surface

Paint bubbles in some locations of the bottom plate

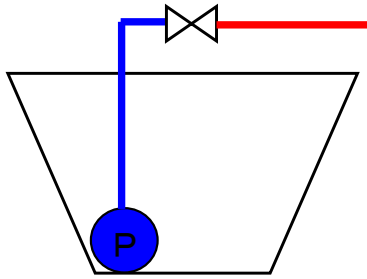


Filtrate water tank No.1

Corrosion of the spare nozzle flange

Trace of the drain pipe touching the bottom plate

Method of Water Transfer from the Underground Reservoir No.1 to the Filtrate Water Tank



Underground reservoir No.1

P：Permanent pump

：Permanent PE pipe (Valve unit installed on the upper part of the reservoir)

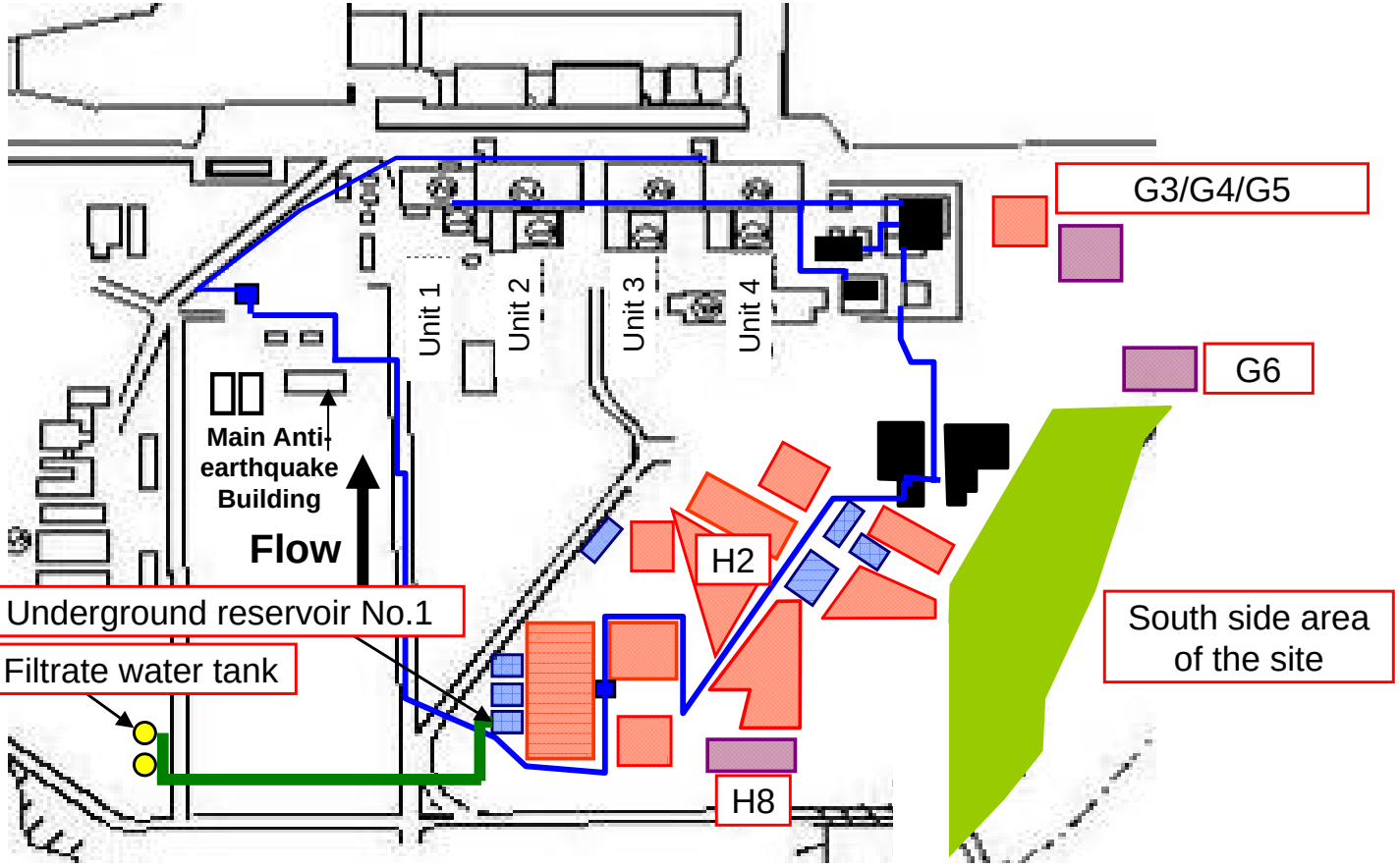
：Temporary pressure hose (approx. 500m)

4,600m³

Filtrate water tank

The following measures have been implemented for the flanges installed on the pressure hose:

- Clamp installed for fall-out prevention
- Protection implemented to prevent the expansion of contaminated water leakage.
- Receiving pan installation



: Circulatory water injection line
: No.1→Filtrate water tank transfer line
: Steel tank
: Underground reservoir
: Area planned for the installation of additional tanks
: Area being considered for the installation of additional tanks

Structural Strength and Seismic Capacity (1)

Thickness evaluation

Though the tanks were not originally made in accordance with the design and construction standards considering that filtrate water is stored. However, as a result of thickness evaluation based on the design and construction standards, it has been confirmed that the tanks are capable of withstanding internal pressure. The evaluation was done assuming the planned storage amount (4,600m^3).

$$t = \frac{DiH\rho}{0.204S\eta}$$

t: Thickness required for trunk calculation, Di: Inner diameter of the trunk, H: Water head,
ρ : Specific gravity, S: Allowable tensile stress of material at the maximum temperature,
η : longitudinal joint efficiency

Equipment	Parts evaluated	Required thickness [mm]	Actual thickness [mm]
Filtrate water tank	Thickness (bottom part)	7.3	18
	Thickness (fourth level from the bottom*1)	6.0*2	8

*1 Estimated water level

*2 Inner diameter taken into account

Seismic capacity evaluation (Fall evaluation)

The tank was evaluated as a “B class facility” considering that RO concentrated water is to be stored. As a result of comparing the overturning moment due to earthquake and the stability moment under its own weight, it has been confirmed that the tank will not fall over.

Overturning moment due to earthquake: M_1[N・m]=m x g x C_H x H
Stability moment under its own weight: M_2[N・m]=m x g x L

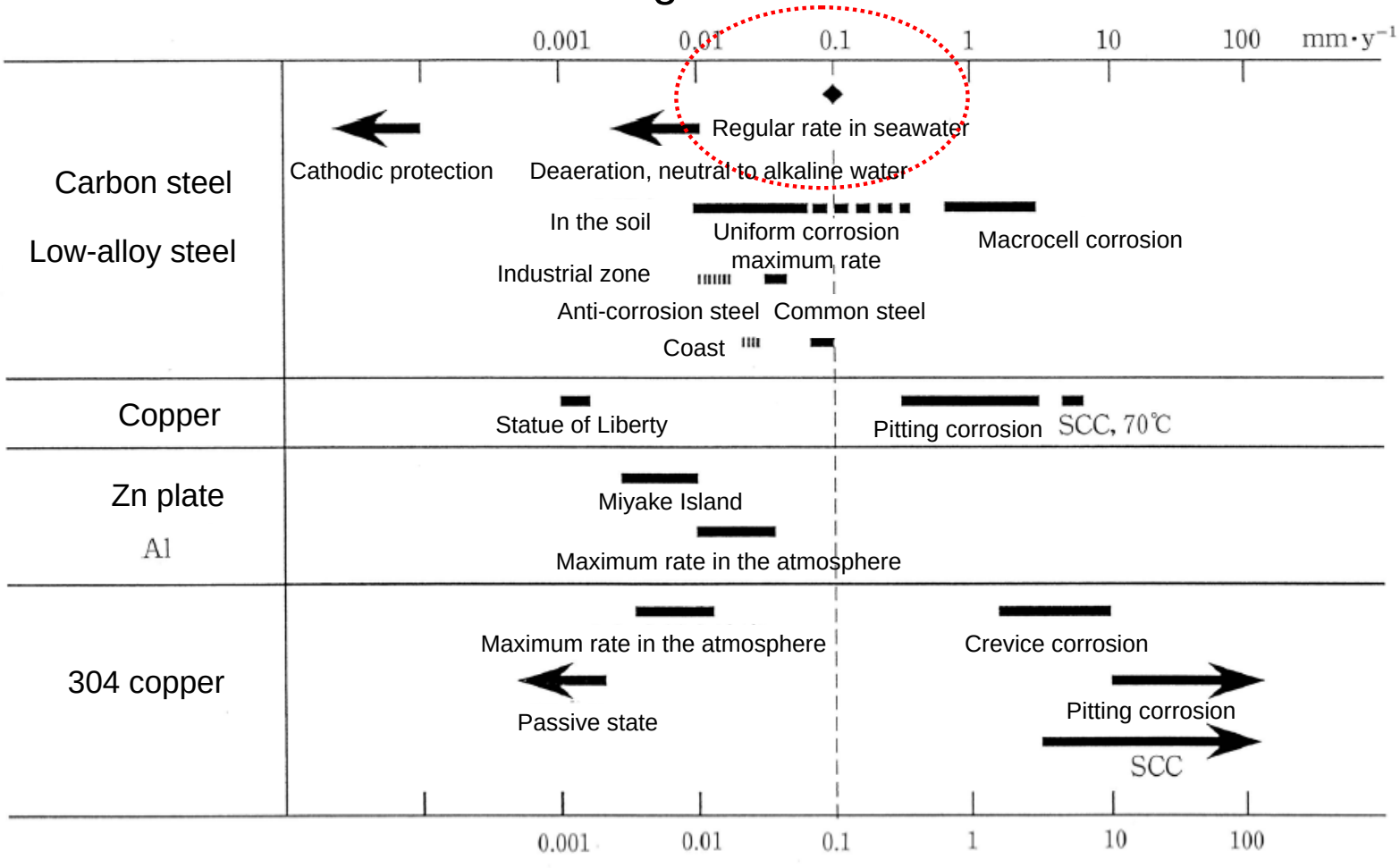
m: Equipment mass
H: Distance from the installation surface to the center of gravity
L: Distance from the tipping point to the center of gravity
C_H: Horizontal seismic coefficient

Equipment	Horizontal seismic coefficient	Overturning moment M_1 [kN·m]	Stability moment M_2 [kN·m]
Filtrate water tank	0.36	9.2×10^4	6.1×10^5

Structural Strength and Seismic Capacity (2)

Corrosion

As the uniform corrosion rate of carbon steel under standing water at normal temperature is about 0.1 mm/year, there is little possibility of thickness reduction which affects the structural strength.



*Source: Page 28 of “Zairyo Kankyogaku Nyumon” (1983) by the Japan Society of Corrosion Engineering

Operation Management Based on the Inspection Results (1)

Since paint peeling and deformation were found inside the filtrate water tank as a result of inspection, the following measures will be implemented before the water transfer from the underground reservoirs and during water storage.

Before water transfer

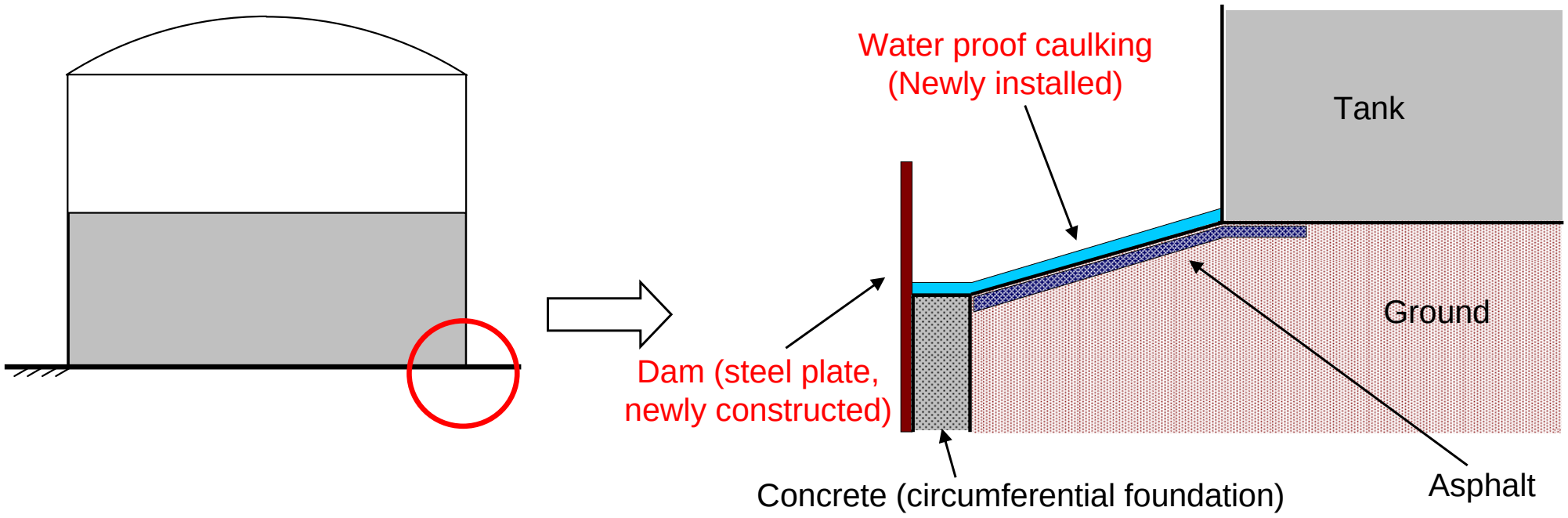
- For the areas with paint damages, the paint will be removed and repaired.
- For the corroded flanges, the flange surface will be cleaned and leakage prevention measure using repairing materials will be implemented.
- Detailed visual inspection and soundness evaluation will be performed on the areas with deformation.

During water storage

- Though it is considered that there is no problem with the soundness of the filtrate water tanks since no leakage has been found (filtrate water is currently stored in the tanks), the period in which RO concentrated water is stored in the tanks will be kept short. Once there is a sufficient amount of storage capacity of the RO concentrated water tanks with additional tanks are installed and multiple systems of the multi-nuclide removal equipment in operation, the water will be transferred back to the RO concentrated water tanks.
- A closure flange will be installed on the water intake to prevent leakage due to incorrect operation.
- Repairing equipment/materials will be prepared to allow for urgent repair in the case of leakage.
- Water level monitoring and patrol inspection will be performed for the purpose of monitoring for leakage.

Operation Management Based on the Inspection Results (2)

- Considering that the filtrate tanks are welded structures, there is little possibility of leakage. However, a dam will be constructed around the tanks to ensure safety in the case of leakage.



Dam to prevent leakage expansion (Draft)

[Reference] Water Transfer from the Underground Reservoirs