2022 IAEA General Conference, Side Event

Fukushima Daiichi Decommissioning Current Status and Challenges

September 26, 2022

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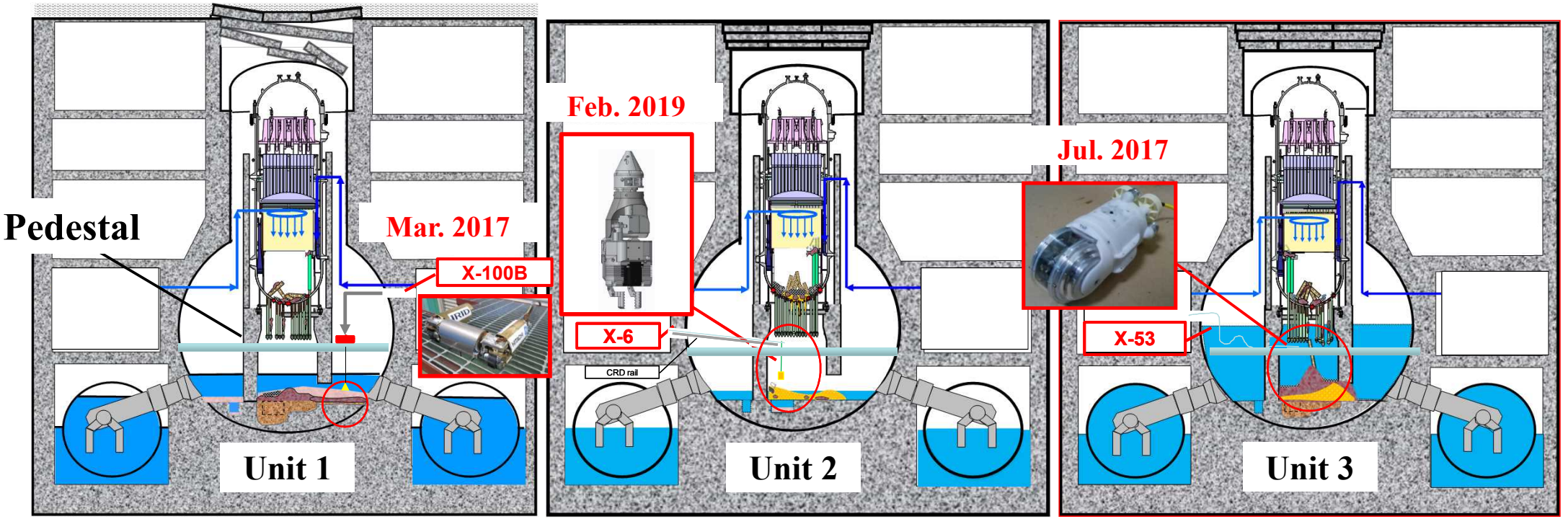
Work toward Fuel Debris Retrieval
IRID has contributed to some work shown here

Assumed distribution of fuel debris

Robotic exploration

Analysis of accident transient

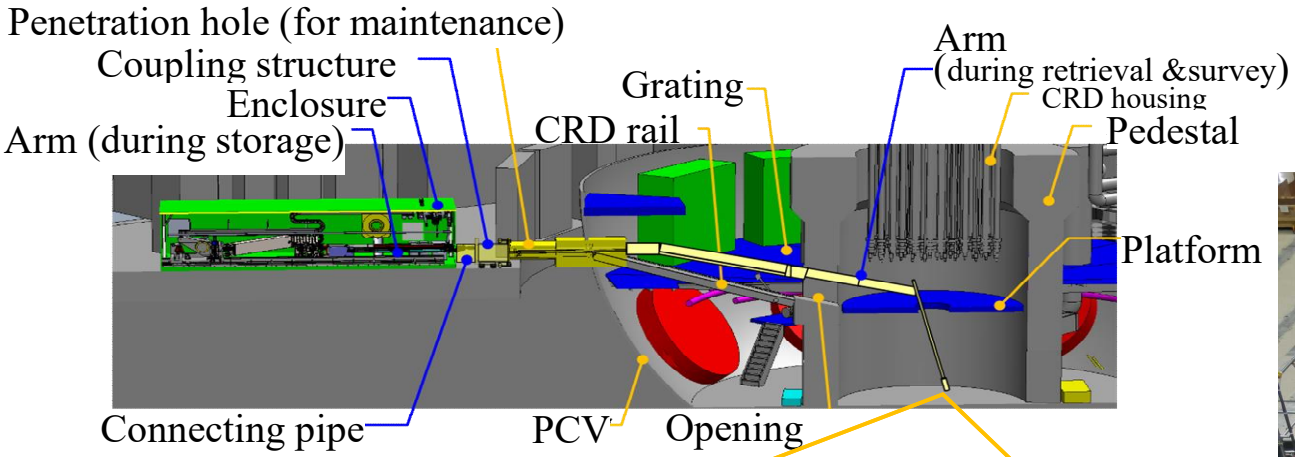
Muon Survey



Trial retrieval to start at Unit 2 in the near future

Equipment for trial retrieval and internal investigation at Unit2

- **The mock-up tests and trainings are being conducted using the actual equipment at "Naraha Center for Remote Control Technology Development" set up by JAEA.**

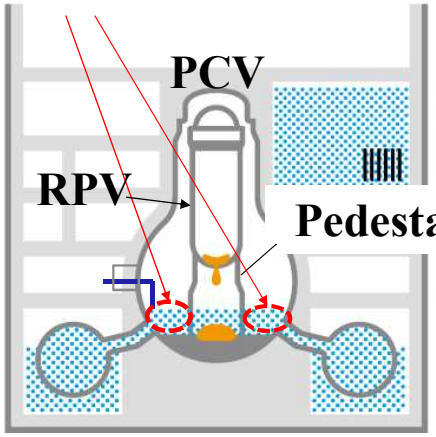


Investigation Item	Measuring devices to be mounted
Detailed vision	Pan-tilt camera
3D rendering	Airborne laser scanning equipment
Gamma ray dose rate	Gamma camera
Neutron flux	Neutron detector

Source: IRID

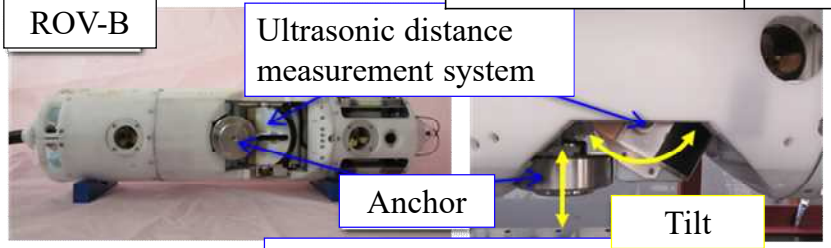
Unit 1 internal investigation (from February 2022)

Main investigation areas

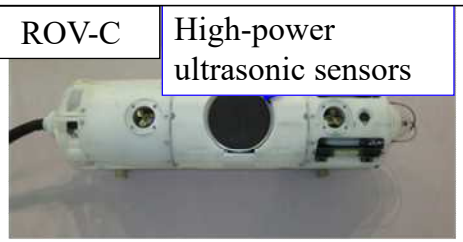


ROV category	Device	Purpose
ROV-A	Gamma ray detector	Setting the Guide ring
ROV-A2	Gamma ray and B10 detector	Getting detailed images to confirm the status
ROV-B	Ultrasonic distance measurement system	3D mapping of deposits
ROV-C	High-power ultrasonic sensors	Measuring the thickness of deposits
ROV-D	CdTe semiconductor detector, B10 detector	Measuring the neutron flux on the surface etc.
ROV-E	Suction type sampling device	Deposit sampling

ROV-B

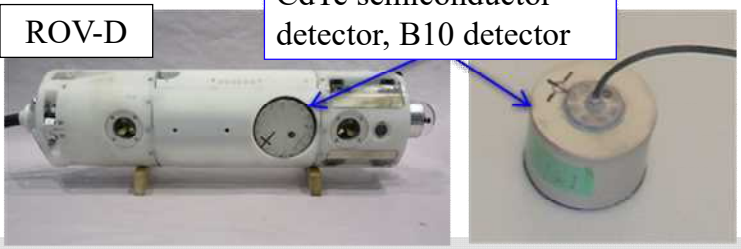


ROV-C

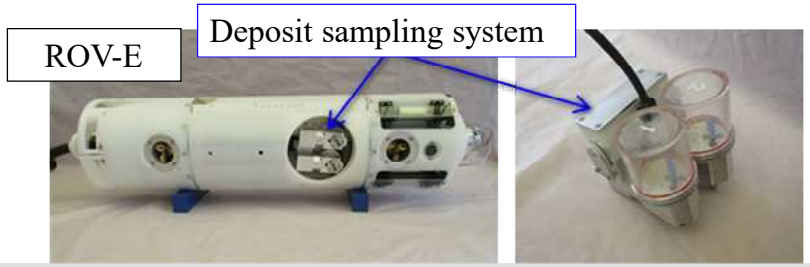


Note: ROVs to be submerged in the order of A, A2, C, D, E, B and A2.

ROV-D



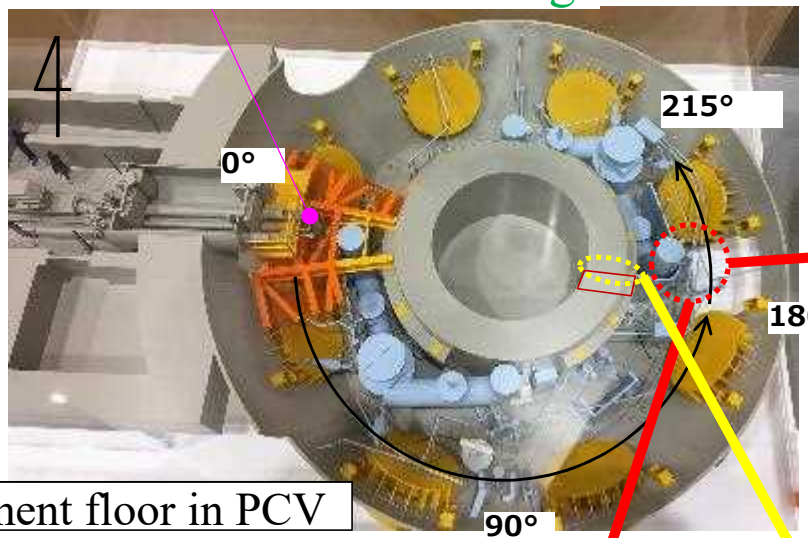
ROV-E



Source: IRID

Photos taken during the internal investigation at Unit1

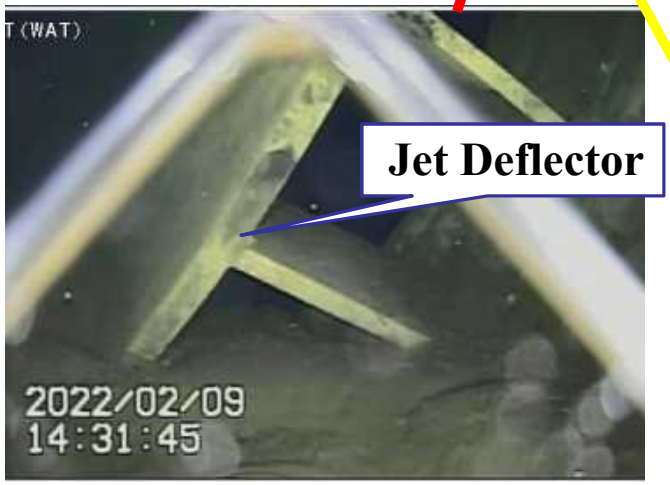
Area where the ROV was submerged



Basement floor in PCV

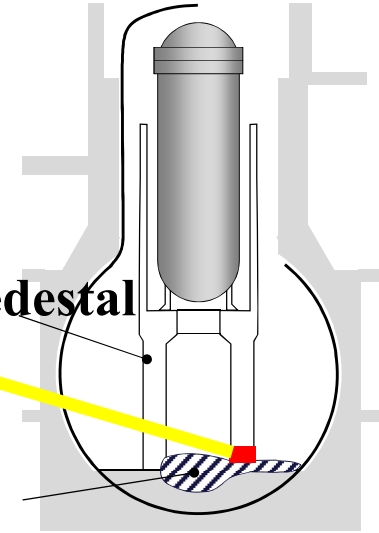
Jet Deflector

Layers of deposit



Jet Deflector

Reinforcing steel



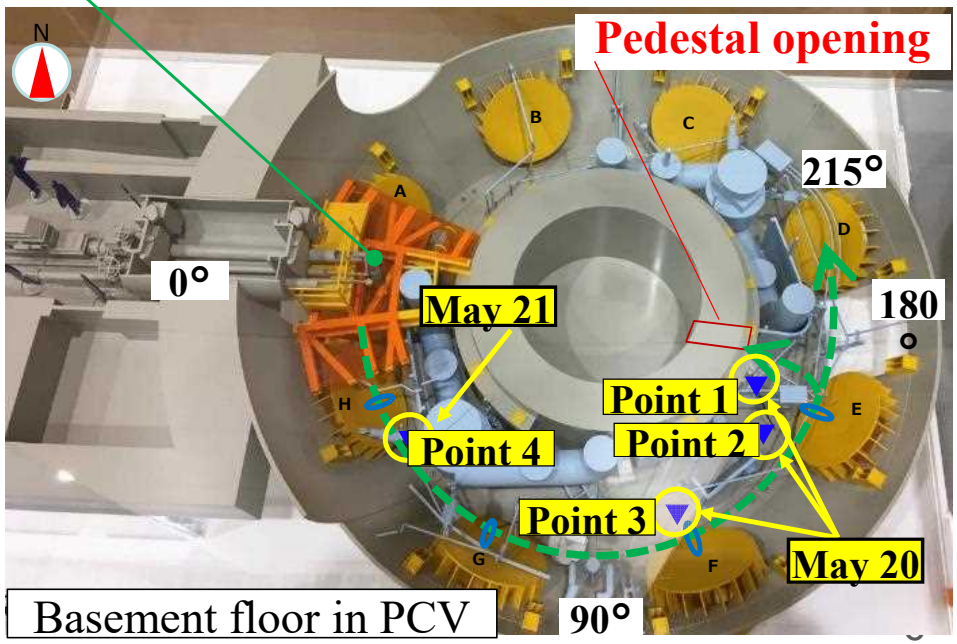
Pedestal

Source: IRID

Neutron flux measurements inside Unit 1

■ **Thermal neutron fluxes were detected at all measurement points. These can be attributed to the fuel debris.**

Area where the ROV was submerged



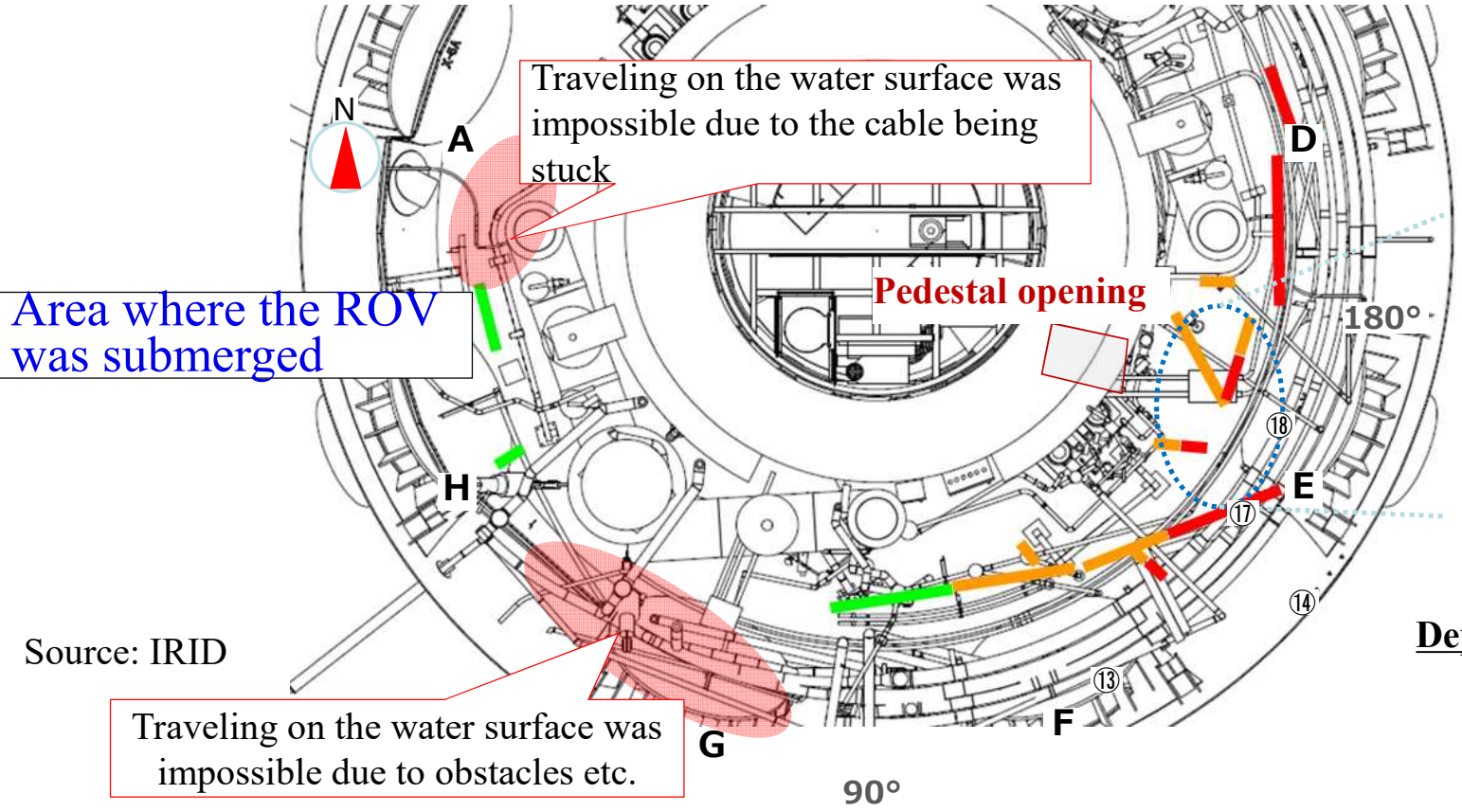
Neutron flux measurement results

Measurement points on deposits	Neutron flux [/cm2/s]
Point 1	48.0
Point 2	29.1
Point 3	50.2
Point 4	5.8

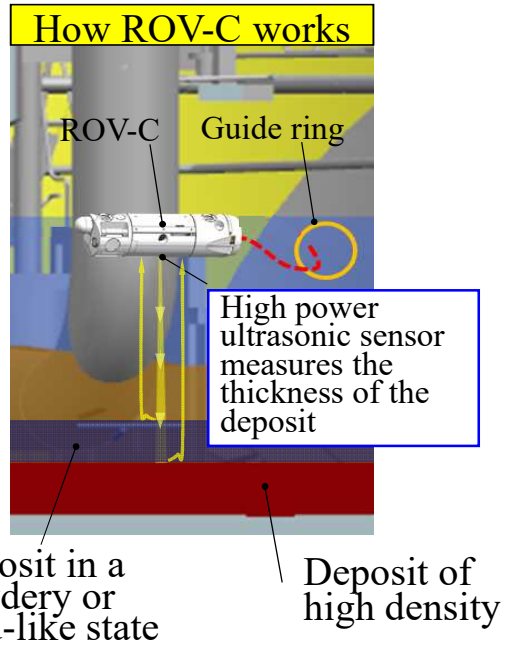
Source: IRID

Measurement of deposit thickness inside Unit 1

It was confirmed that the deposit thickness was relatively high near the pedestal opening and became lower as the ROV moved away from the opening.



Source: IRID



Deposit thickness from the PCV floor

- Approx. 0.8 to 1.1m
- Approx. 0.4 to 0.8m
- Approx. 0.0 to 0.4m

Handling of the ALPS Treated Water

Simple overview of water management at Fukushima Daiichi

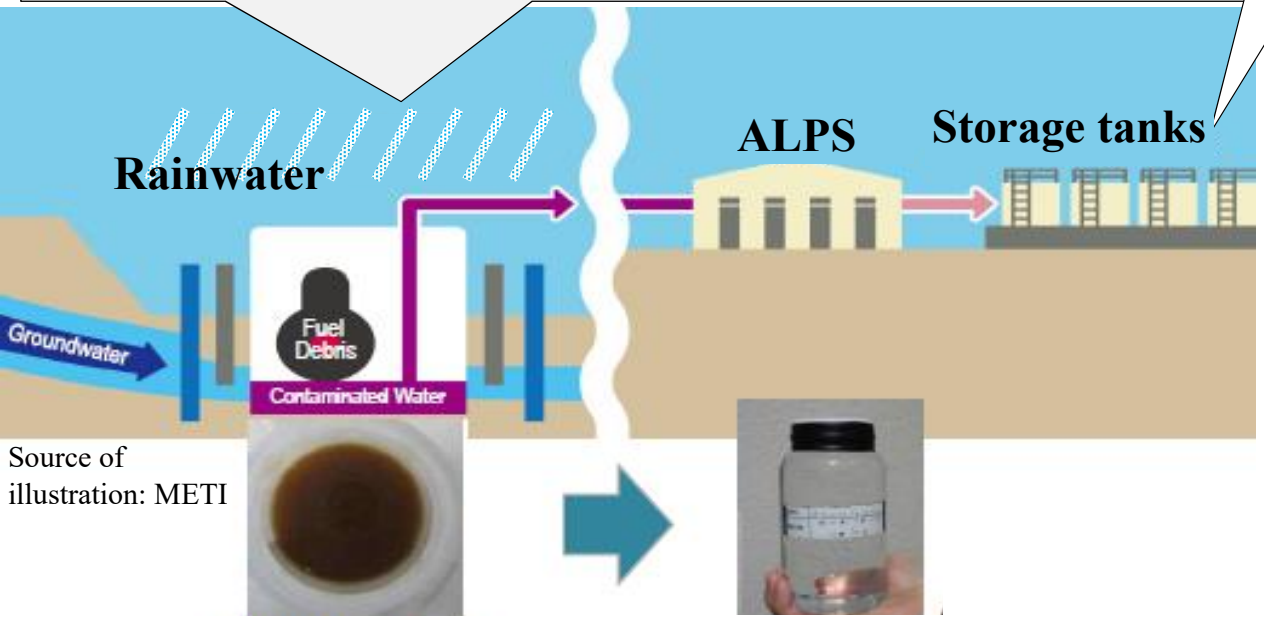
Contaminated water management

Redirect fresh water from contaminated areas

Contaminated water generation decreased **to about 130m³/day in FY2021 from about 500 m³/day in 2014**

Removing the stagnant water

Completed in 2020 except for reactor bldgs. etc.



Source of illustration: METI

Water Storage Status	
Volume of water stored in tanks	About 1.31 million m³ (as of early Sep. 2022)
Secured tank volume	About 1.37 million m³ (more than 1,000 tanks)
Generation rate of water stored in tanks	About 130 m³/day (as of FY2021)

Design and operations for ALPS treated water discharge (blueprint)

Secondary treatment facilities
(reverse osmosis membrane facilities are to be installed for dedicated use)

Measurement/confirmation facilities (K4 tank group)

Transfer pump

Secondary treatment facilities (ALPS)

Seawall

ALPS treated water, etc. tanks

Valves etc.

Header pipe

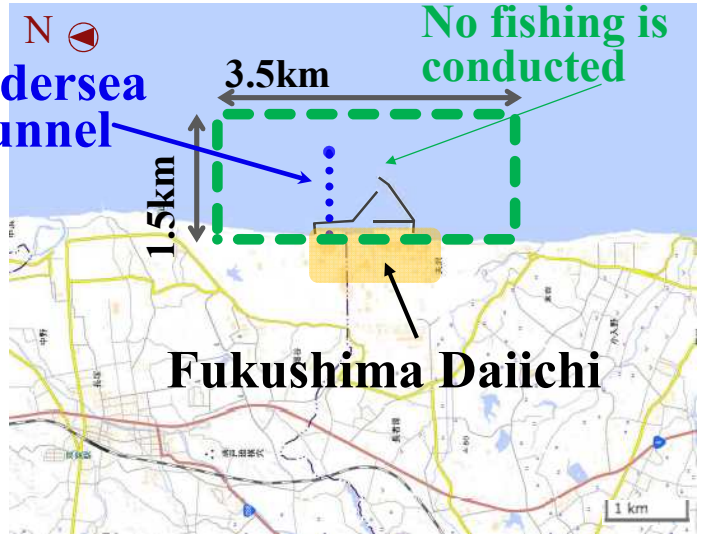
Seawater flow meter

Seawater pumps
(to be installed for dedicated use)

Seawater for dilution

Undersea tunnel (approx. 1km)

Discharge to sea



Confirming that ALPS treated water has mixed with sea water and been diluted before discharge

Assessment of Radiological Impact on Public and Environment Regarding the Discharge of ALPS Treated Water into the Sea (Design stage)

Human

Assessment
0.00003～0.0004 mSv*/year

Amount of radiation (mSv)

3 — Stomach X-ray approx. 3 mSv

2.1 — Natural radiation exposure (average in Japan / per person) 2.1 mSv/year

〔Breakdown〕
- From space Approx. 0.3
- From the ground Approx. 0.33
- Inhaled radon etc. Approx. 0.48
- Ingested from food Approx. 0.99

1 — Dose limit for the general public: 1 mSv/year

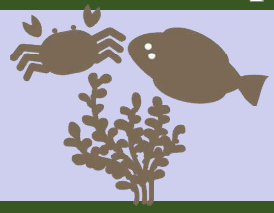
0.1 — Flying between Tokyo and New York (round trip) approx. 0.11～0.16 mSv

0.05 — Dose constraint for discharge of ALPS treated water into the sea: 0.05 mSv/year

0.0001 — X ray exam at a dentist approx. 0.01 mSv

Source: National Institute of Radiological Sciences (Japan)

Animals and plants



Assessment
0.00002~0.00006 mGy* /day

DCRL defined by the ICRP
-1～10 mGyb/day* for flatfish and brown seaweed
-10～100 mGy/day for crab

＊Sievert (Sv) is a unit expressing the impact of radiation on the human body.

＊Gray (Gy) is a unit expressing the energy of radiation on matter

＊DCRL is short for “Derived Consideration Reference Levels”, a kind of guide used when assessing radiological impact

Dialog with local stakeholders

Reconstruction through Decommissioning

Efforts toward creation of decommissioning industry cluster

		Basic Strategy	Current Activities
So far	STEP 1 Involve local firms in de-commissioning	- Place orders with local firms as much as possible if they can handle the work themselves - Create an environment for local firms to participate, or increase orders	● Briefing on procurement outlook ● Business meetings ● Consultation service center ● Networking parties
	STEP 2 Help local firms improve capabilities	- Help improve managerial & technological capabilities so that local firms can expand into more advanced areas	● Visits to individual firms ● Tours of Fukushima Daiichi Site for local firms
From now on	STEP 3 Create new industry in the Hamadori Region	**- Create new facilities or entities that can develop & manufacture core products which have thus far been sourced from Tokyo and abroad**	● **Decommissioning-related products factory (Manufacturing casks for spent fuel & fuel debris storage containers)**

Future direction

■ **TEPCO would like to play a key role in inviting companies with cutting-edge technologies from outside Fukushima and contributing to employment, HR development and creation of industrial & economic base in the region.**

【Basic flow of the decommissioning project】

【Key player】

So far	**Tokyo & Overseas**	**Decommissioning Site (Fukushima Daiichi & Daini in the Hamadori Region, Fukushima)**	**None (Yet to be done)**
Future	**In principle, all tasks to be conducted in the Hamadori Region, Fukushima**		

Initiative for creating a decommissioning-related products factory

TEPCO HD

Fukushima Daiichi &
Fukushima Daini
Nuclear Power Stations

Order placement ⇨

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・
・

Order placement ⇨

Other businesses

A new factory for decommissioning-related products

- JV between TEPCO & Hitachi Zosen
- Contribute to HR development & creation of economic base etc.

Example of product:
Casks for transport & storage

・Collaboration
・Alignment
・Order placement ⇔

Local firms

Company	(Provisional title) Hamadori decommissioning-related products factory
Location	Naraha Town, Fukushima Prefecture (planned)
Representative	To be announced
Establishment	October 2022 (planned)
Capital Contribution Ratio	TEPCO HD: 2/3　Hitachi Zosen: 1/3
Number of employees	Dozens
Business outline	Manufacturing & sales of casks and fuel debris storage containers ※For the time being, casks for Fukushima Daini Decommissioning Site to be produced


Thank you for your kind attention
消防水利
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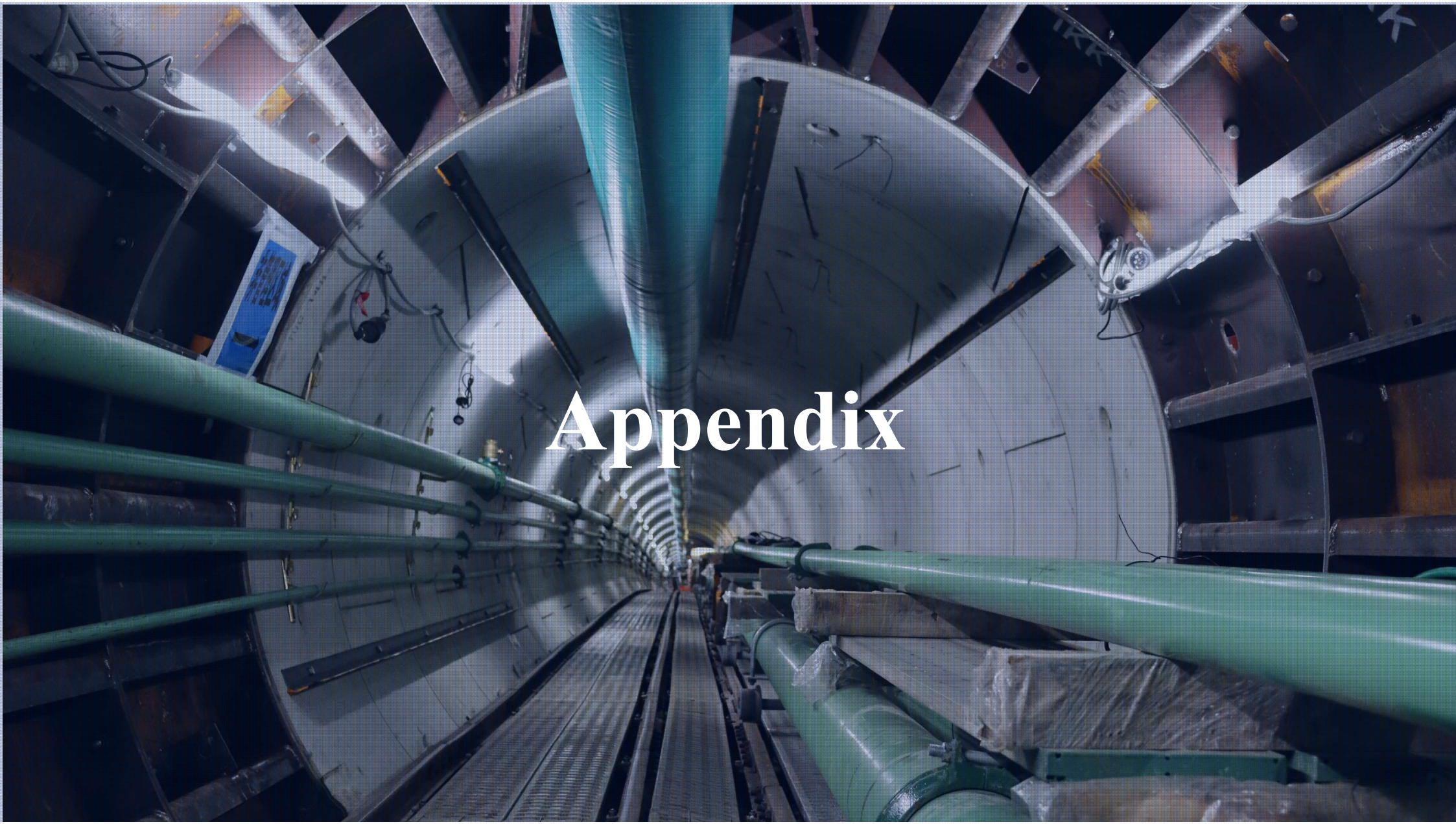
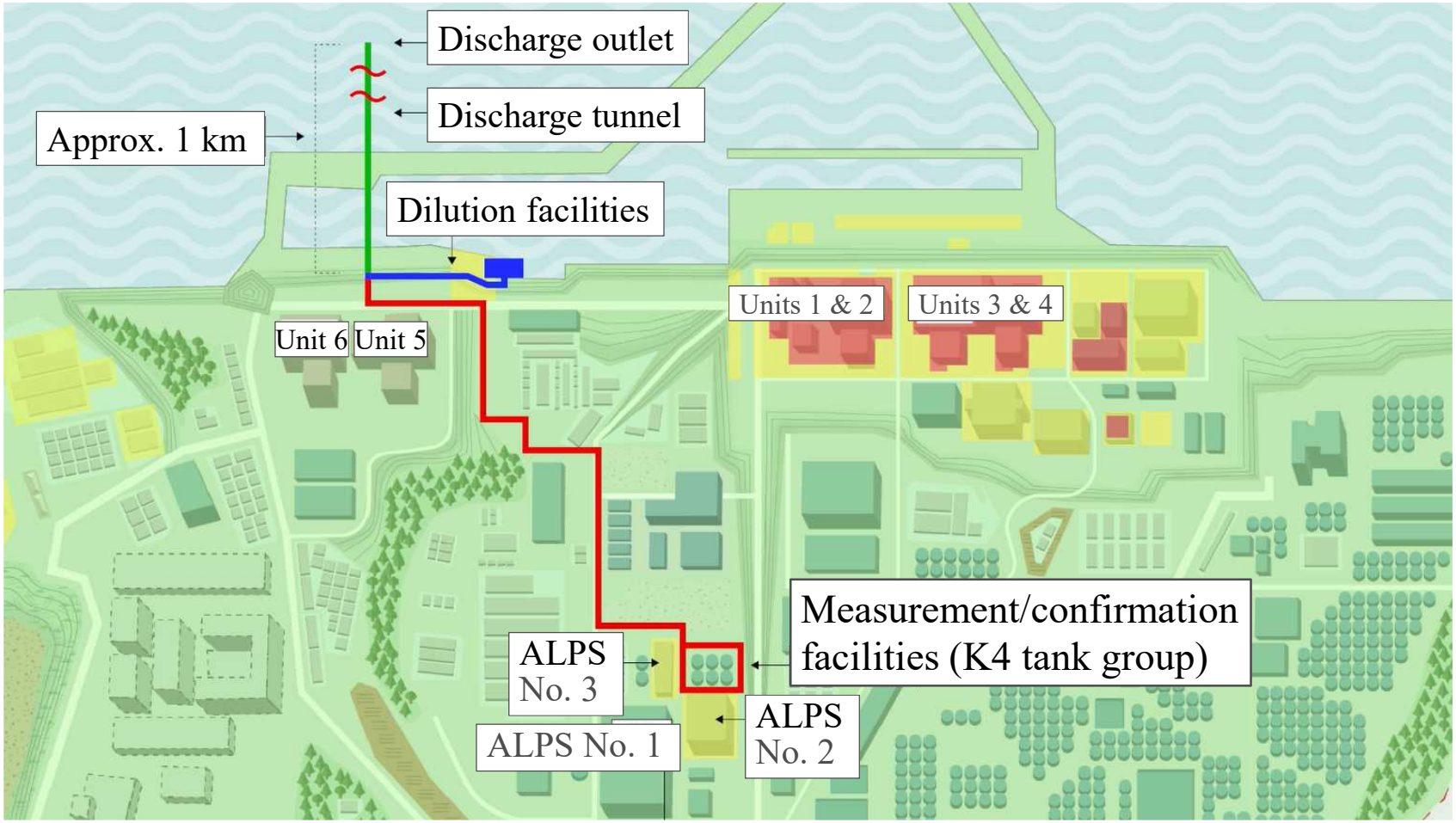

Appendix

Transport route for ALPS Treated water



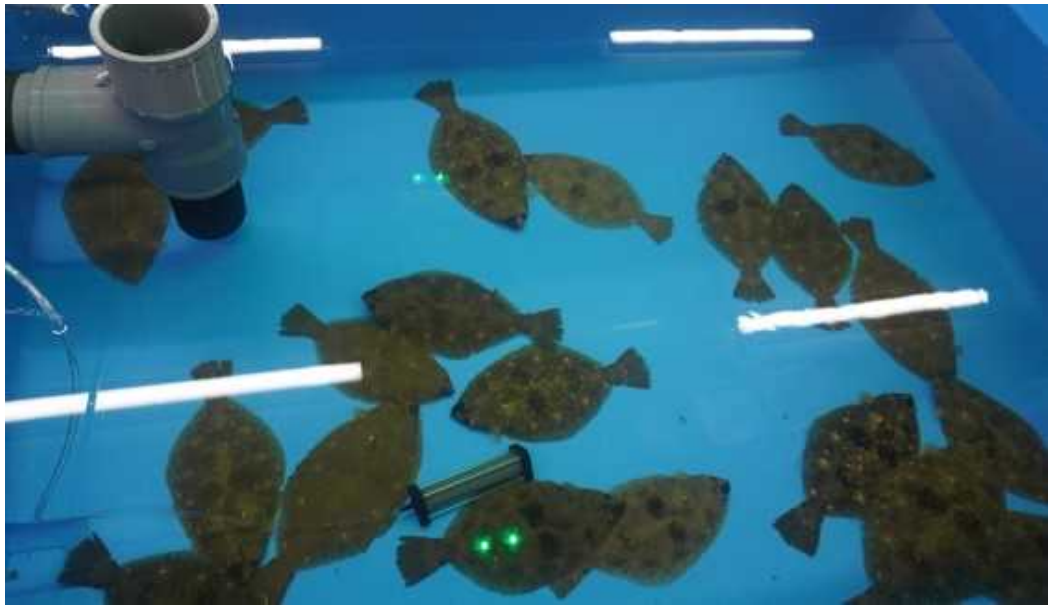
Caisson at the discharge outlet for ALPS Treated water

Unloading of a shield machine

Tunneling using a shield machine

Test breeding of marine life in mock-up aquariums

Flounder



Abalone