

# Sea Area Monitoring

October 1, 2013

Nuclear Regulation Authority (NRA), Japan

# Sea area within 2km radius from the NPS

Fukushima Daiichi-NPS

Sampling Point	Sampling Date	Cs-134	Cs-137	total $\beta$	H-3	Sr-90	total $\alpha$	Pu-238	Pu-239+Pu-240
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Sea water radioactivity (Bq/L):  
 ND: under detection limits; Numbers in parentheses: detection limits

T-1	2013/09/16	ND (1.3)	2.3	ND (15)	In progress				
	2013/09/09	ND (1.3)	ND (1.5)	ND (16)	ND (1.8)				
	2013/08/12	ND (1.2)	1.4	ND (19)	4.7	In progress	In progress		
	2013/08/06	ND (1.4)	1.7					In progress	In progress

T-0-1	2013/09/11	ND (0.88)	ND (0.58)	ND (16)	ND (1.8)				
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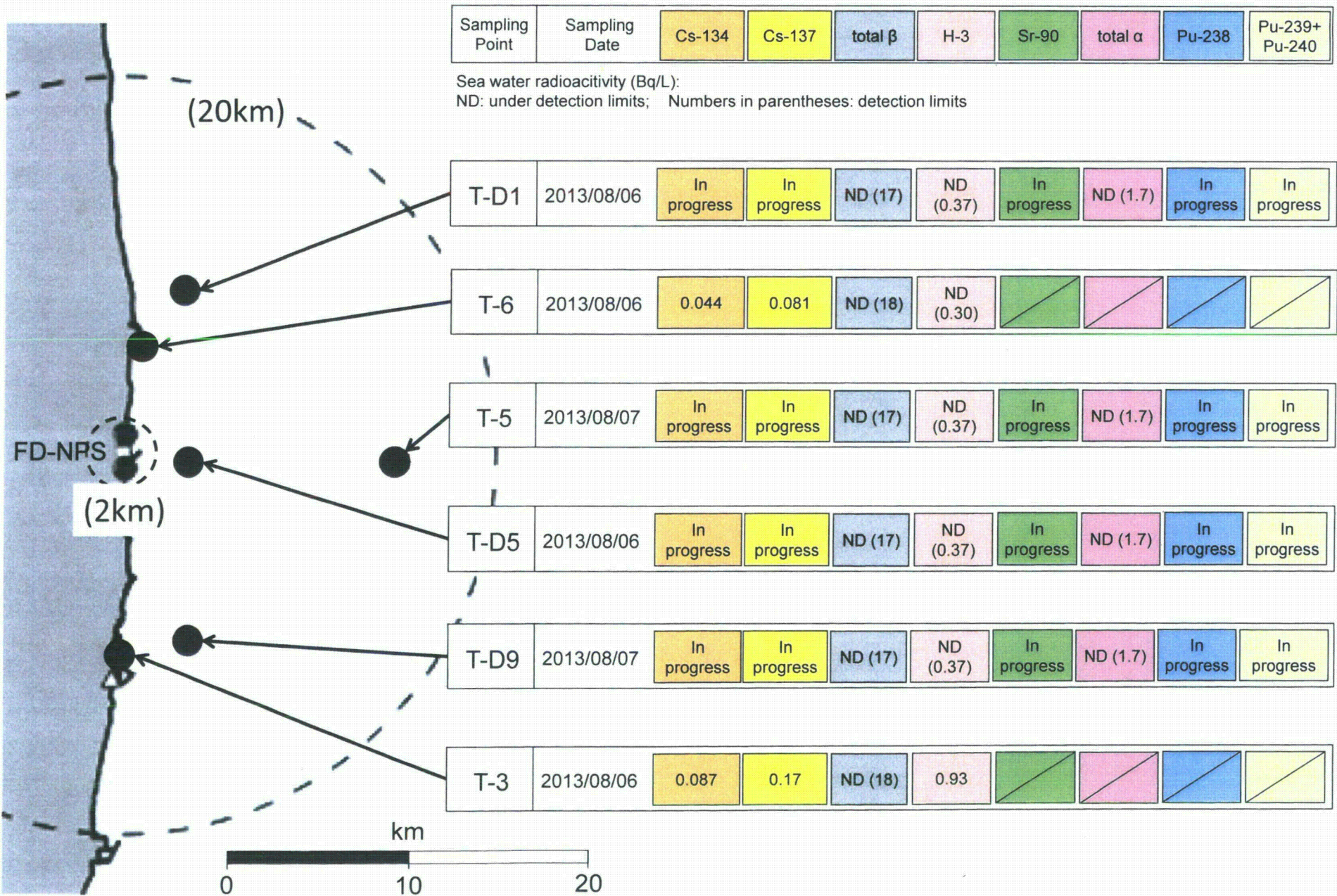
T-0-2	2013/09/11	ND (0.63)	ND (0.69)	ND (16)	ND (1.8)				
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T-0-3	2013/09/11	ND (0.43)	ND (0.66)	ND (16)	ND (1.8)				
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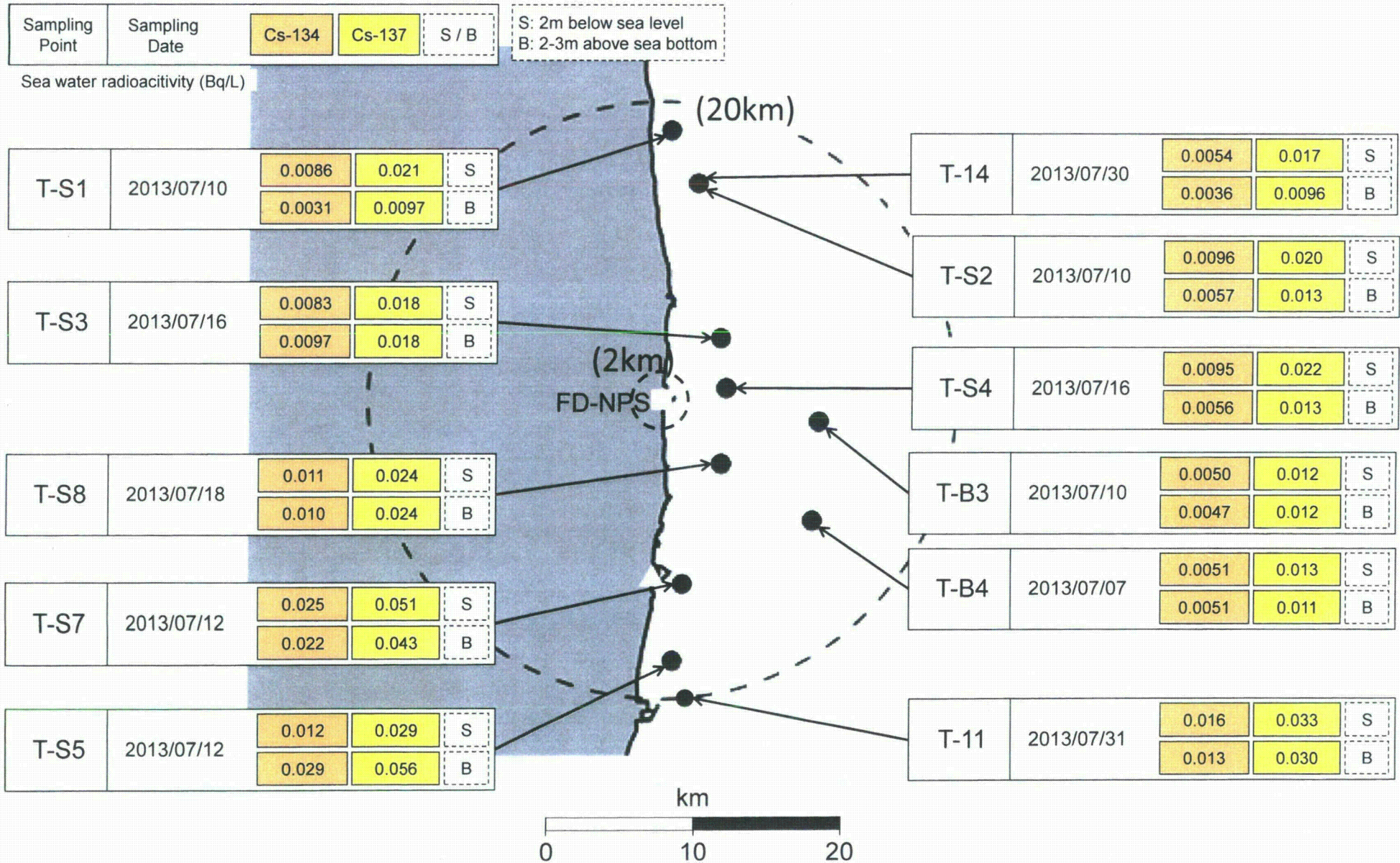
T-2-1	2013/09/16	ND (1.3)	ND (1.8)	ND (19)	In progress				
	2013/09/09	ND (1.3)	ND (1.5)	ND (15)	ND (1.8)				
	2013/08/12	ND (1.2)	ND (1.4)	ND (19)	ND (2.9)	In progress	In progress		
	2013/08/06	ND (1.4)	ND (1.3)	ND (21)				In progress	In progress

0 0.5 1km

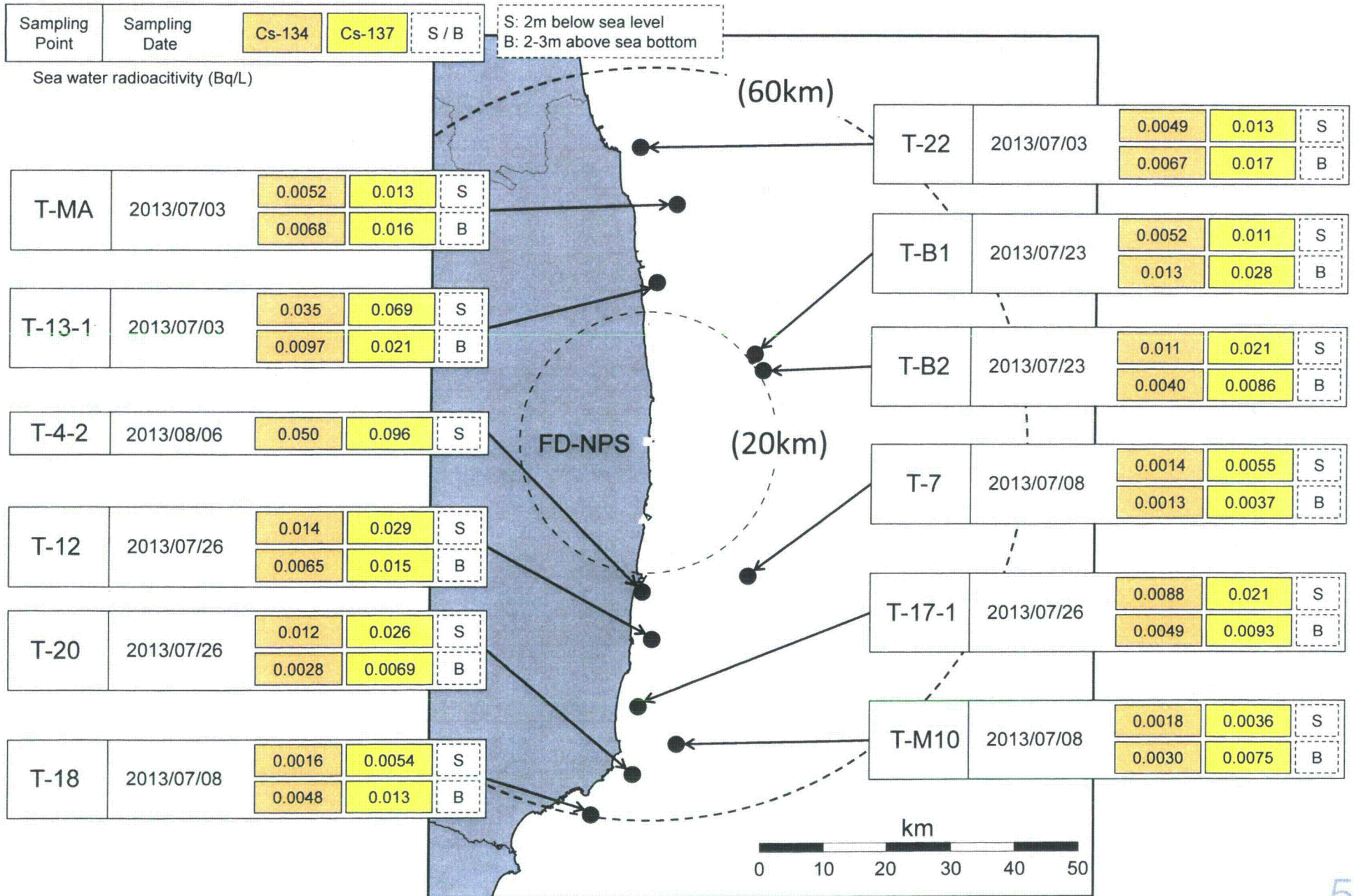
# Sea area between 2-20km radius from the NPS (1)



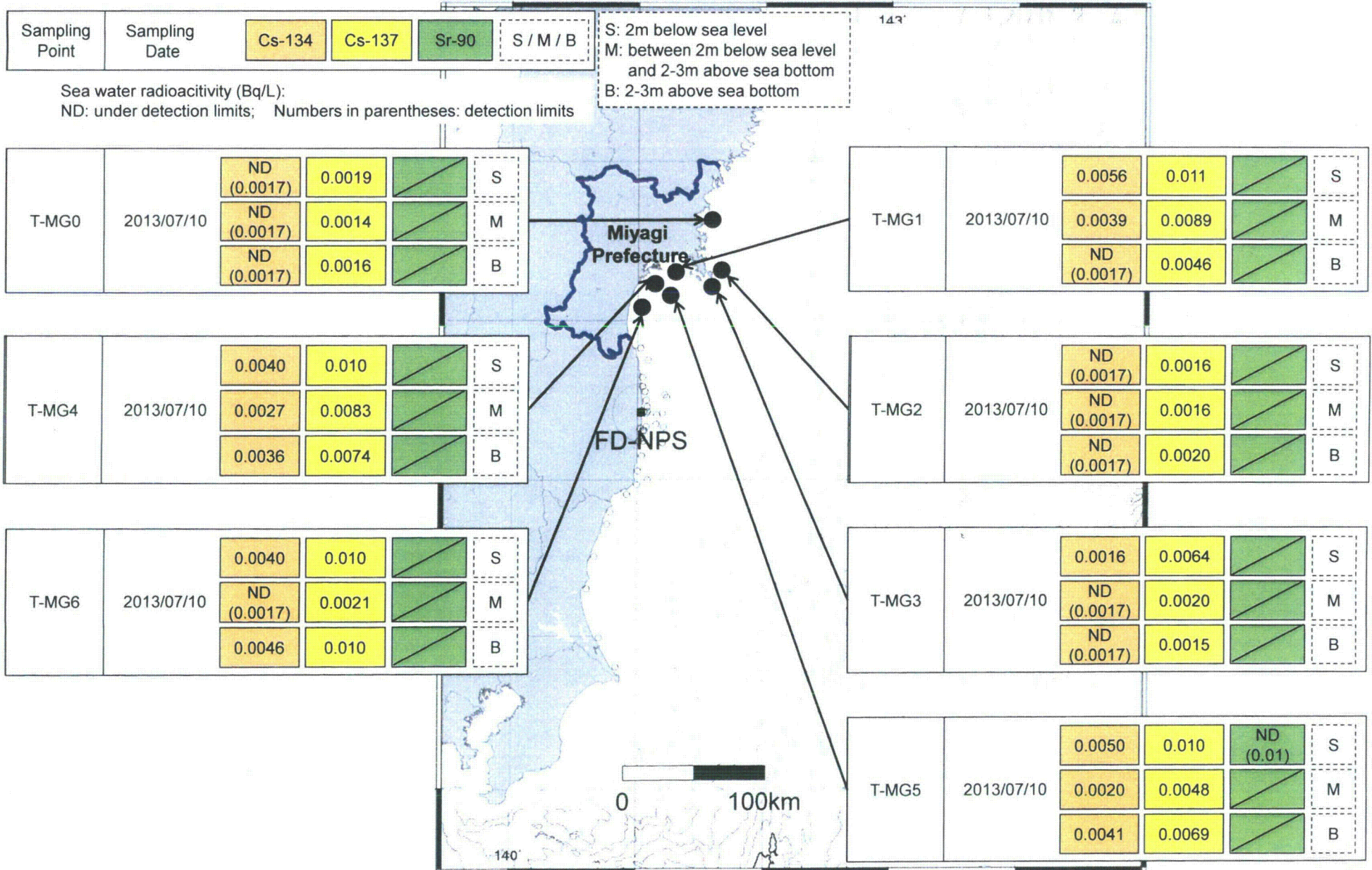
# Sea area between 2-20km radius from the NPS (2)



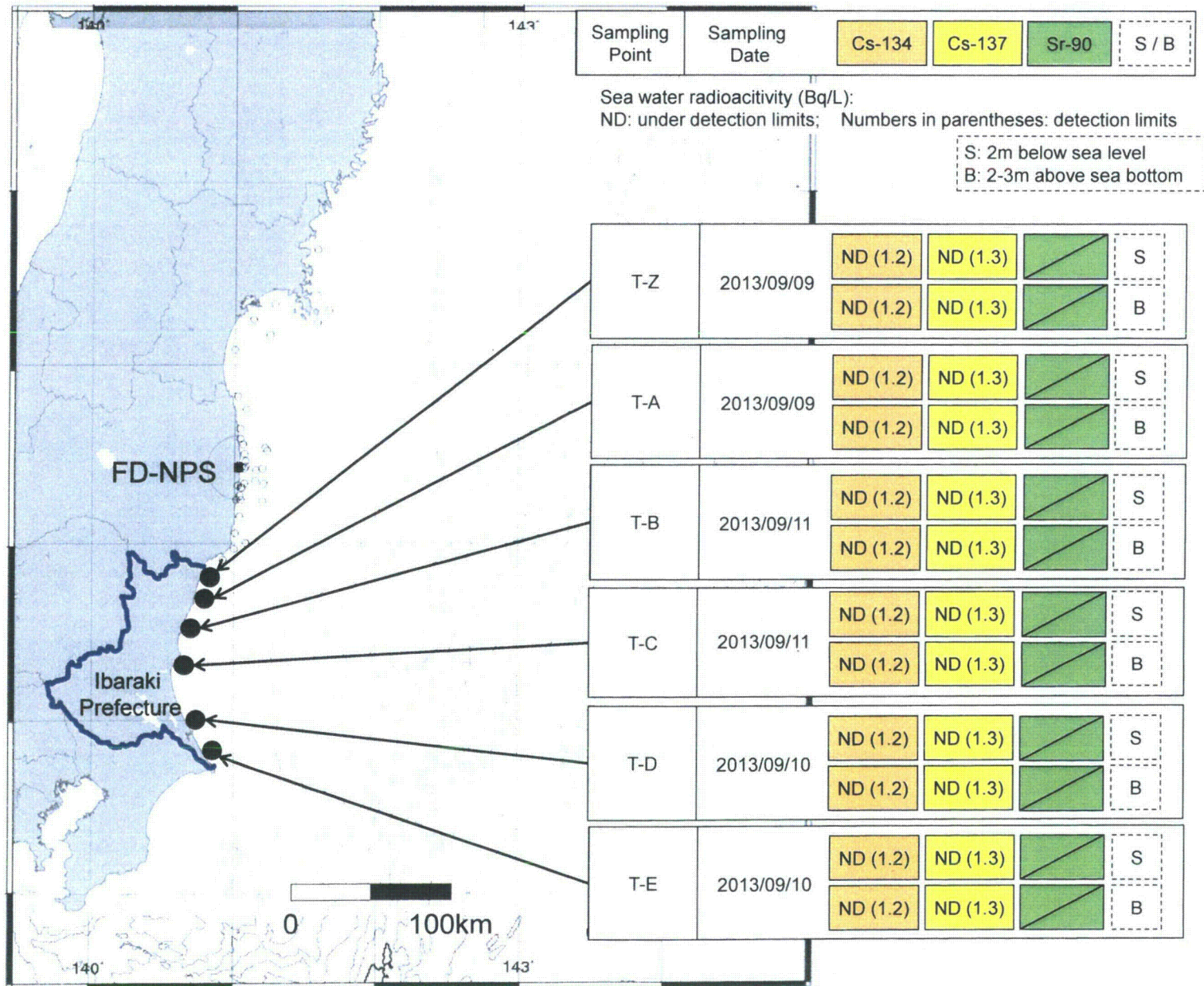
# Sea area between 20-60km radius from the NPS



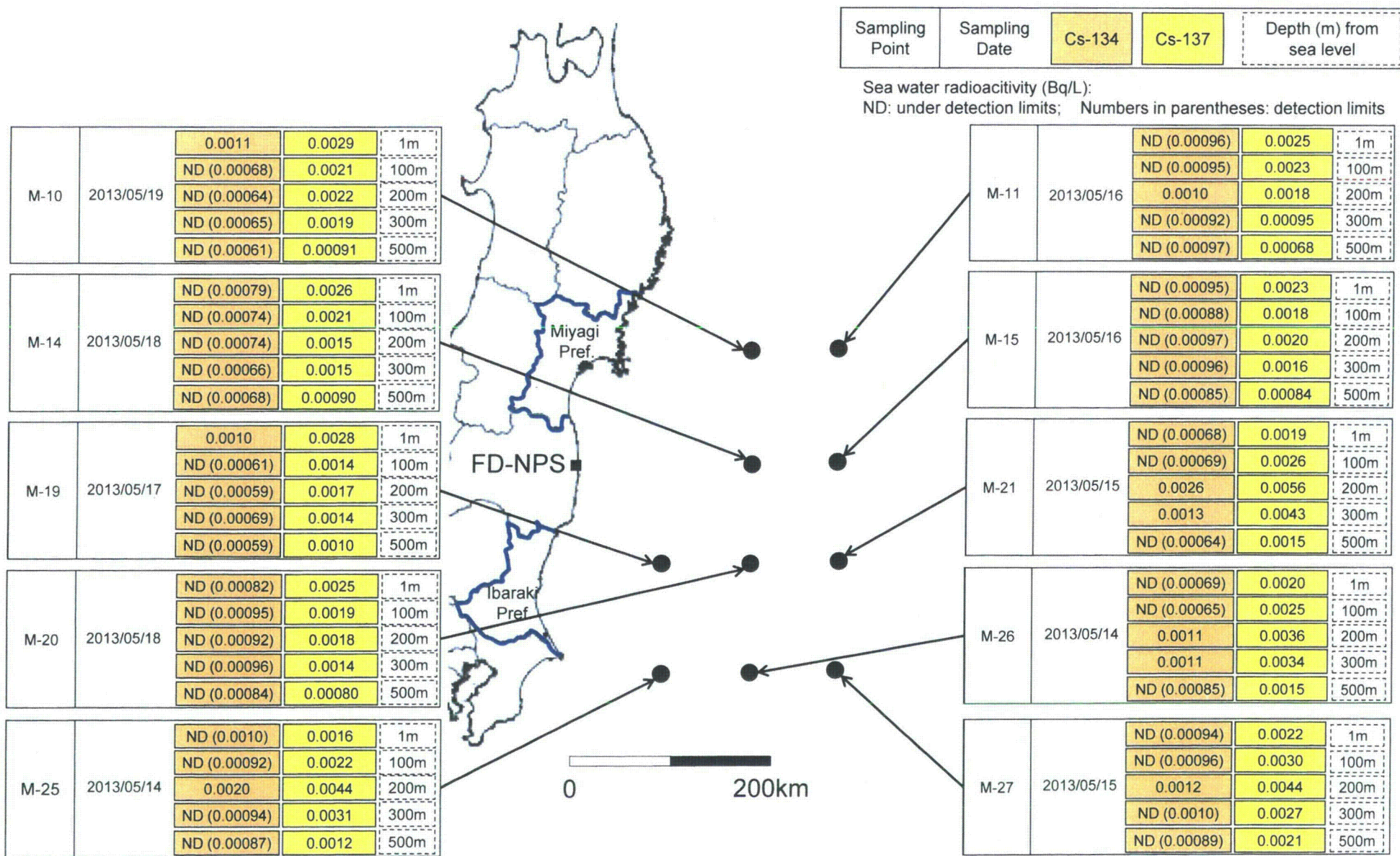
# Sea area along the coast of Miyagi Prefecture



# Sea area along the coast of Ibaraki Prefecture



# Open sea off the coast of Eastern Japan





## Fracture Found on Steel Members (Diagonal Bracings) in the Intermediate Section of the Exhaust Stack for Units 1 and 2 at Fukushima Daiichi NPS

<Reference>

September 18, 2013

Tokyo Electric Power Company

### [Overview]

- We have been conducting an on-site inspection for seismic safety evaluation on the exhaust stack\* for Units 1 and 2 at Fukushima Daiichi NPS. Today (on September 18, 2013), in the inspection, we found fracture on steel members (diagonal bracings) of the exhaust stack.
- Although the main body and the principle members are estimated to be safe, we found fracture, fracture-like traces, and rust at 8 out of 440 points of the questioned exhaust stacks. We continue to monitor and analyze the situation.
- The exhaust stack in question has been out of use.

### [Schedule in future]

- As high radiation dose is detected in the stack area, investigations will be performed after the details of investigations are examined.

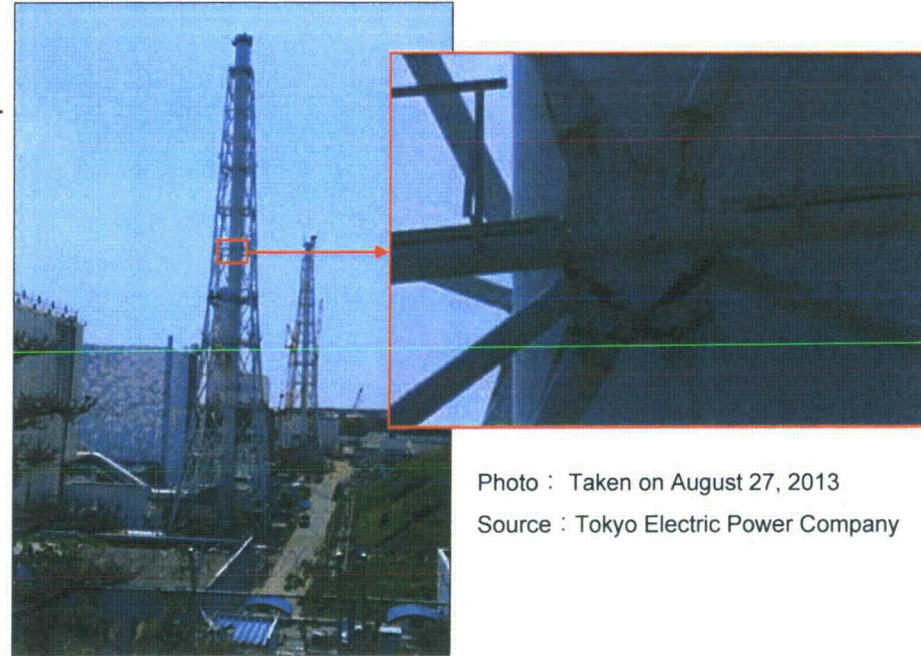
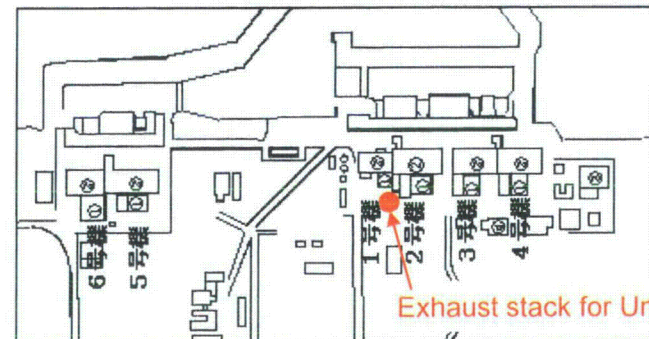


Photo : Taken on August 27, 2013

Source : Tokyo Electric Power Company

\*Exhaust stack: An exhaust stack refers to a facility to centrally exhaust gas evacuated from the inside of a building and condenser for the purpose of keeping vacuum state.



Map of Fukushima Daiichi NPS

Exhaust stack for Unit 1 and 2

# Fukushima – a view from the ocean

Ken Buesseler, Senior Scientist

*Woods Hole Oceanographic Institution*

<http://cafethorium.whoi.edu>



Daisan Kaiyu Maru  
Sept 2013



## Cesium in the ocean: what do we know?

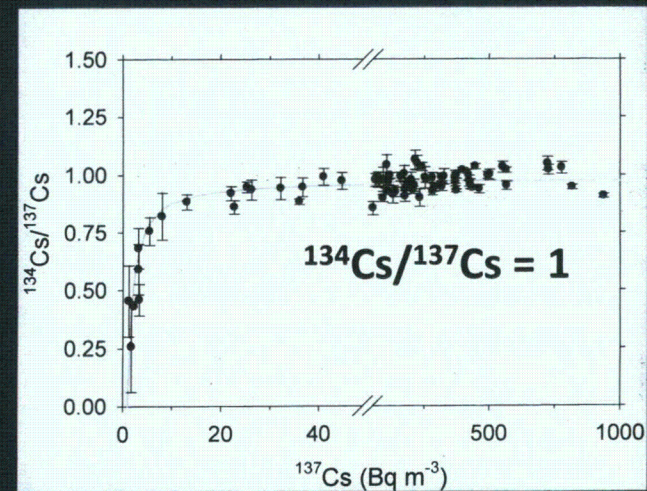
- ❑ mostly from 1960's weapons testing
- ❑ one of the major Fukushima radionuclides of concern
- ❑ soluble in seawater

$^{137}\text{Cs}$  half-life = 30 years

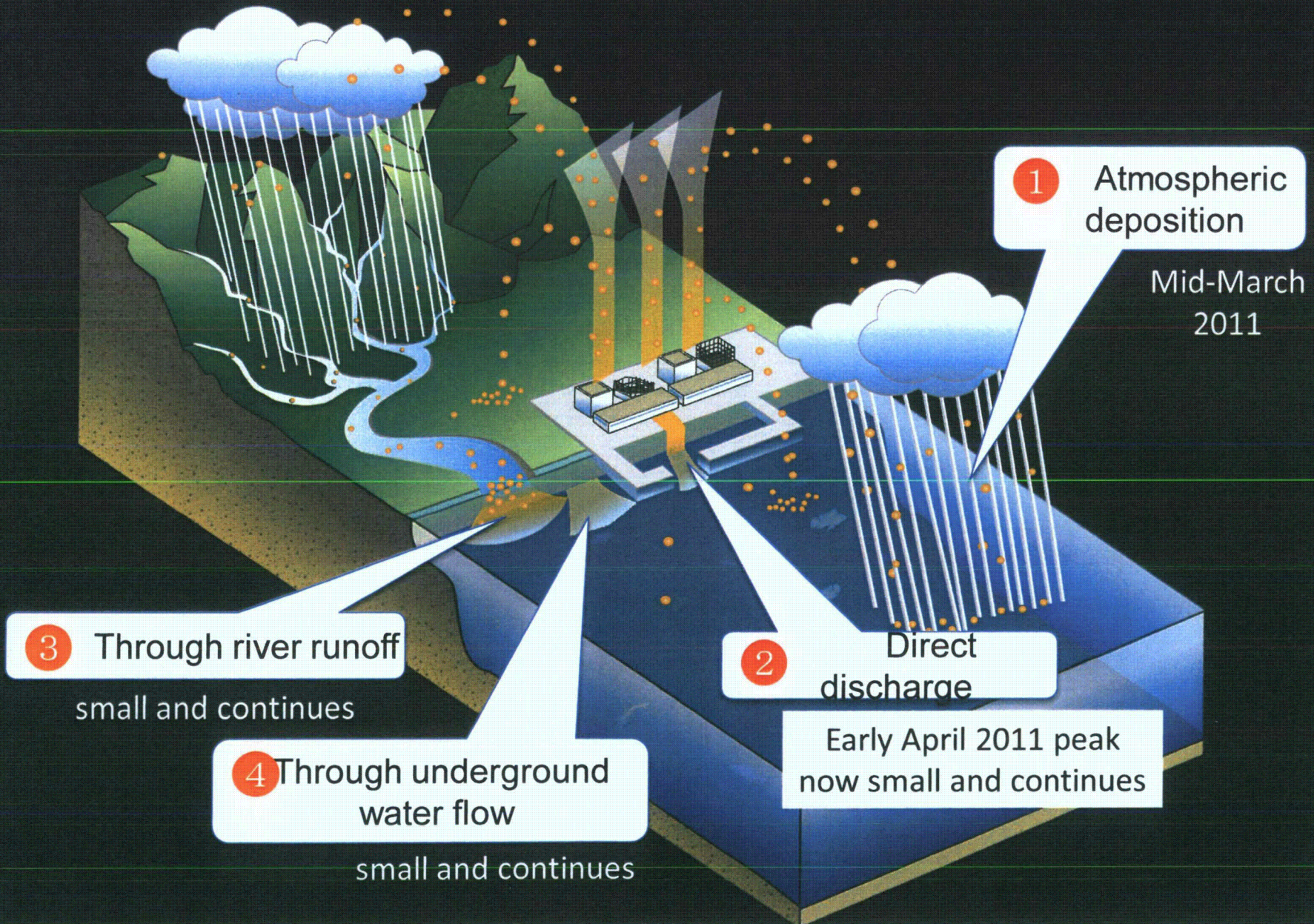
$^{134}\text{Cs}$  half-life = 2 years

both isotopes of cesium have same chemical properties

## Fukushima Cs fingerprint



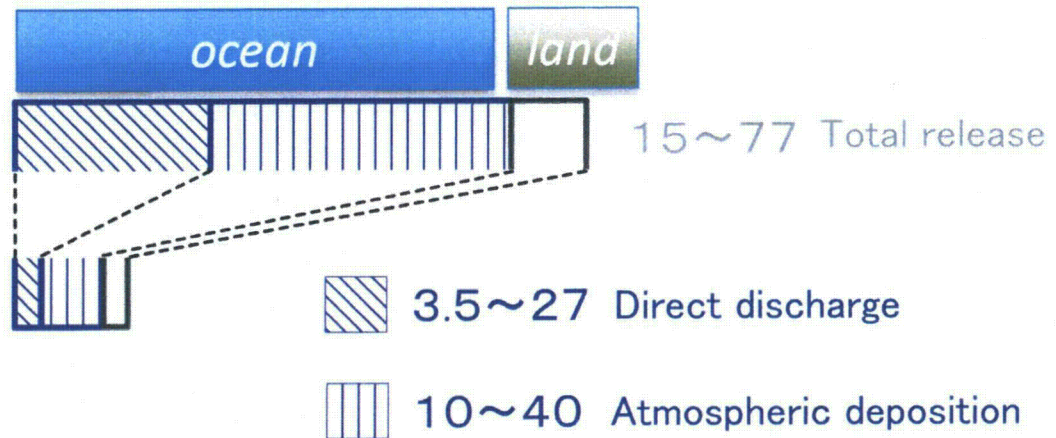
# Sources of radionuclides to ocean



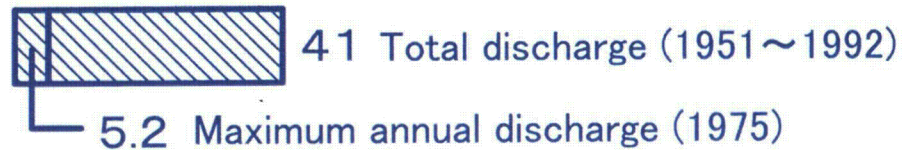
# How much cesium-137 was released?



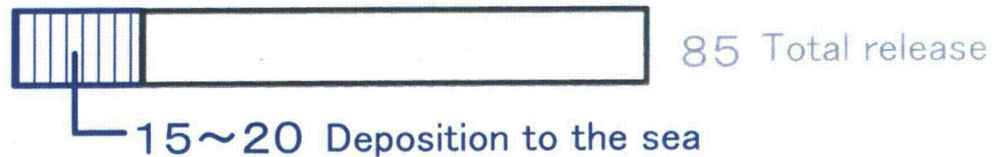
Fukushima



Sellafield



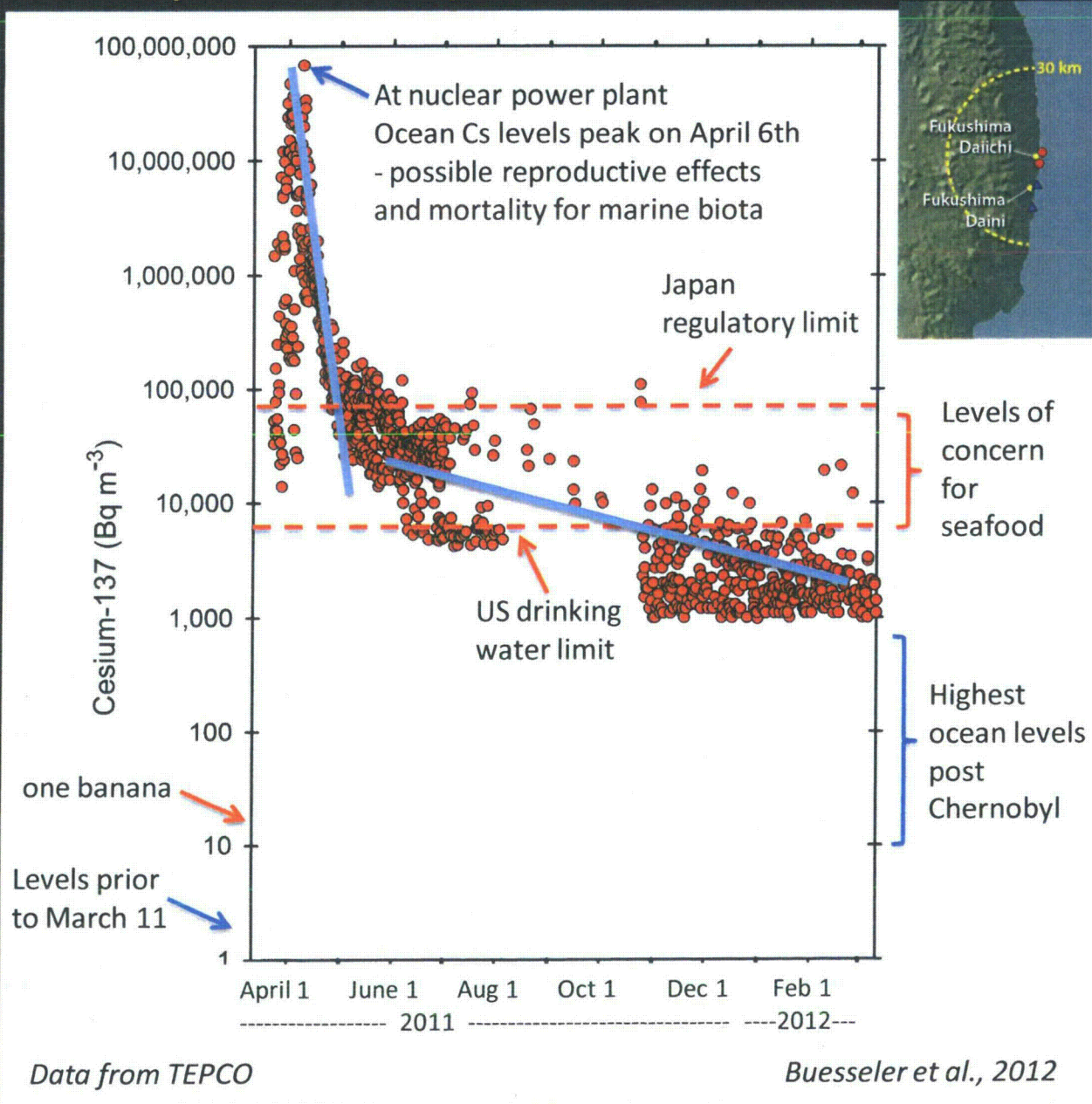
Chernobyl



$^{137}\text{Cs}$  release to the sea (PBq =  $10^{15}$  Bq)

Data sources: Chino *et al.* (2011), Tsumune *et al.* (2012), Bailly du Bois *et al.* (2012), Morino *et al.* (2011), Stohl *et al.* (2011), Gray *et al.* (1995), Aarkrog (2003), UNSCEAR (2000)

# One year history of cesium-137 in ocean off Fukushima



Fukushima is an unprecedented event for the ocean

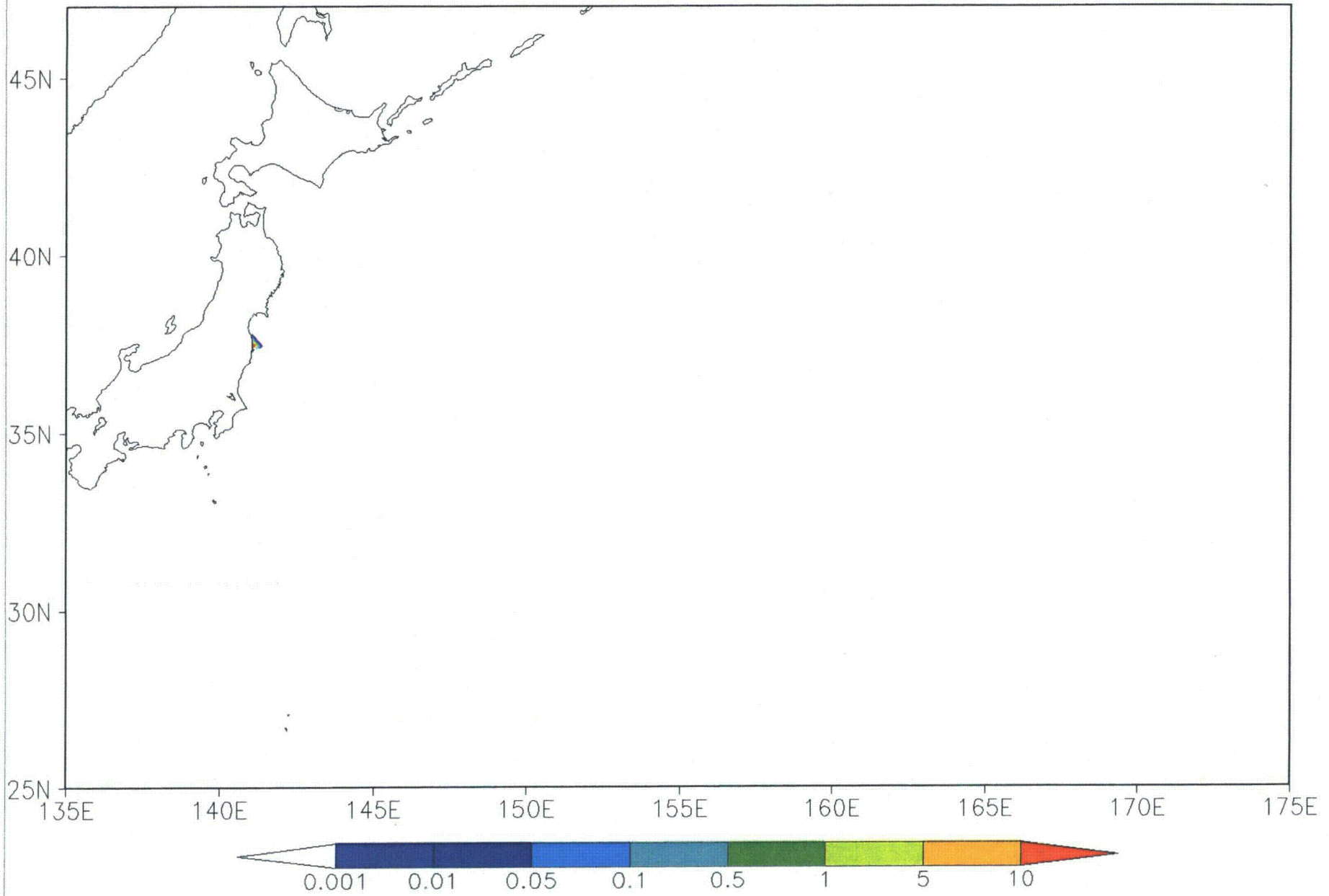
levels highest in 2011, then leveled off

reactor site remains a source

levels now safe for marine biota & human exposure

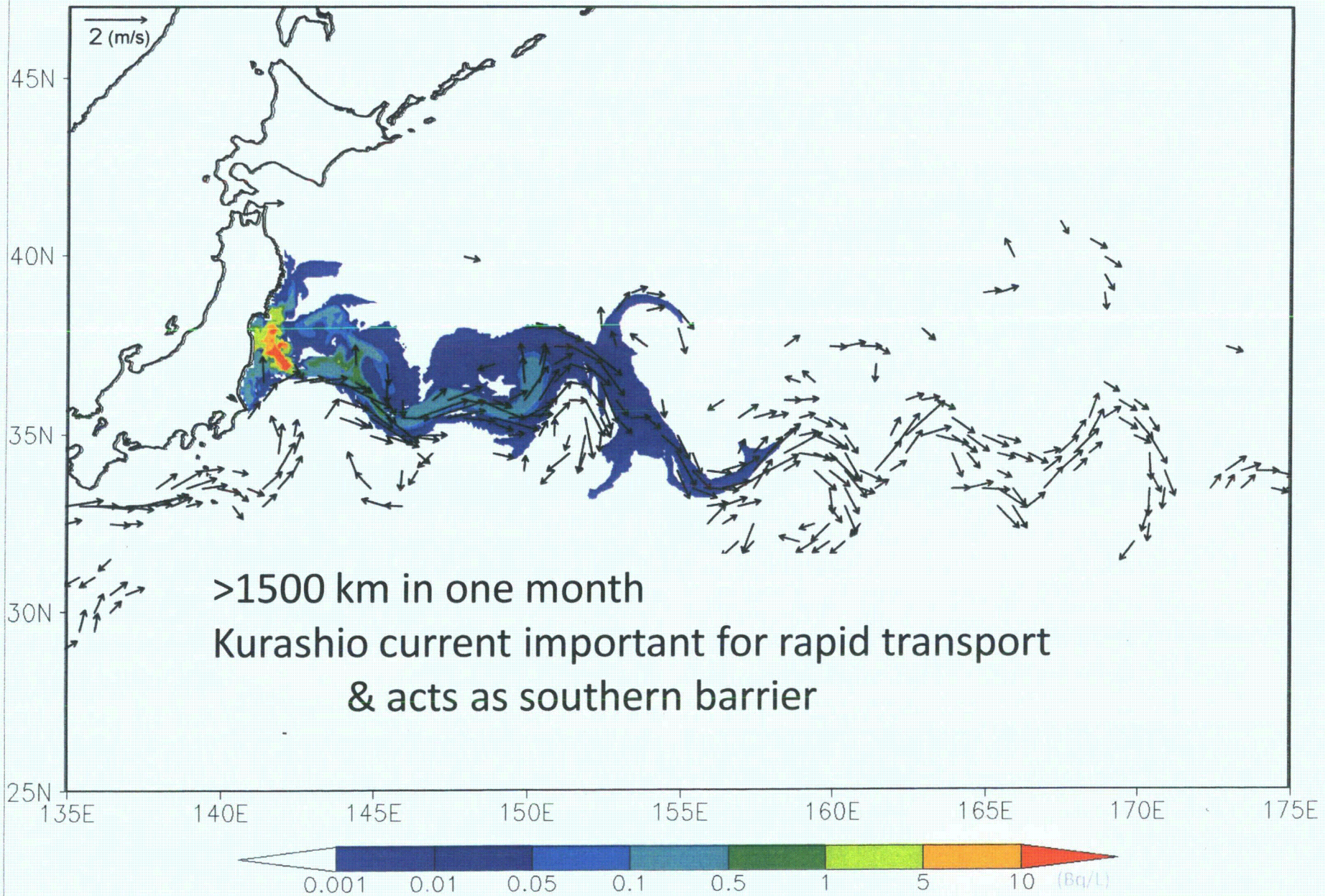
what about seafood?

# Cs-137 (2011 MAR 21)



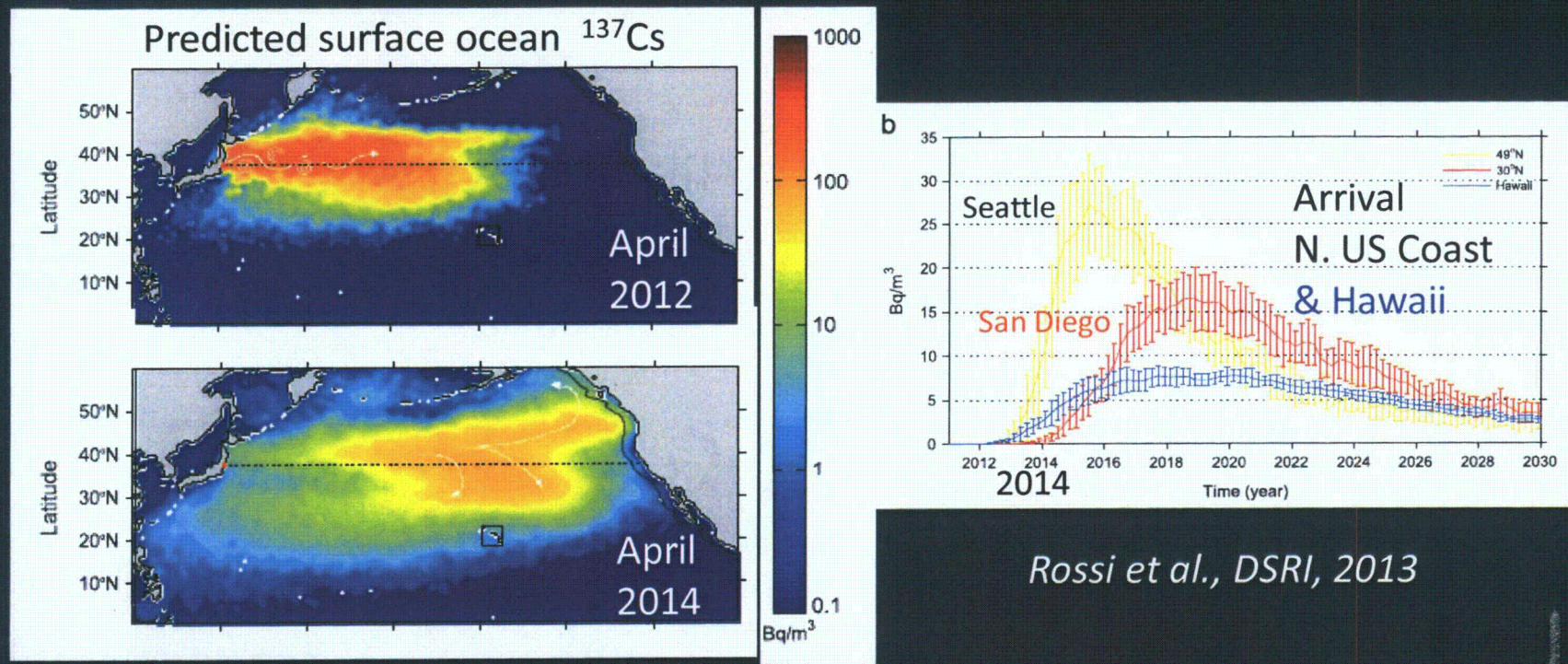
Cs-137 (2011 APR 30)

Masumoto et al. JAMSTEC





# How long until cesium reaches US west coast?



Rossi et al., DSRI, 2013

- ❑ Arrives 2013-2014 (after debris)
- ❑ Predicted  $^{137}\text{Cs}$  off US varies from 1-2 to 30  $\text{Bq m}^{-3}$  in different models (safe for exposure & fisheries)
- ❑ Little/no vertical data to test!

## How big is NPP source today?

### For cesium isotopes

- ❑ Total today = 0.3 TBq/mo
- ❑ Source in March/April 2011 = 10-30,000 TBq/mo

### For strontium-90

- ❑ Total today = 0.1 TBq/mo
- ❑ Source in March/April 2011 = 100 TBq/mo

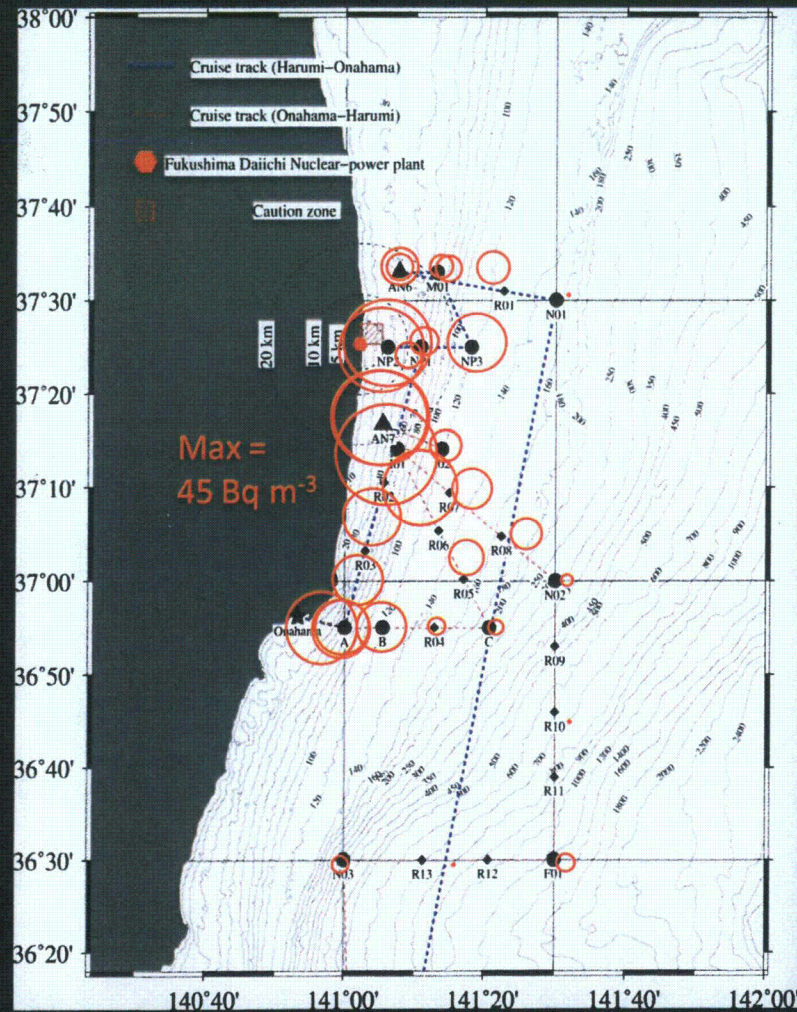
At NPP, Cs is actively being removed from cooling water, and naturally sorbed to sediments, while <sup>90</sup>Sr and tritium are not

- ❑ w/diversion of groundwater, salt water intrusion could lead to Cs remobilization

- ❑ w/leaking tanks, large potential <sup>90</sup>Sr source

$$\text{Each tank} = 300 \text{ tons} \times 40 \times 10^6 \text{ Bq/L} = 12 \text{ TBq}$$

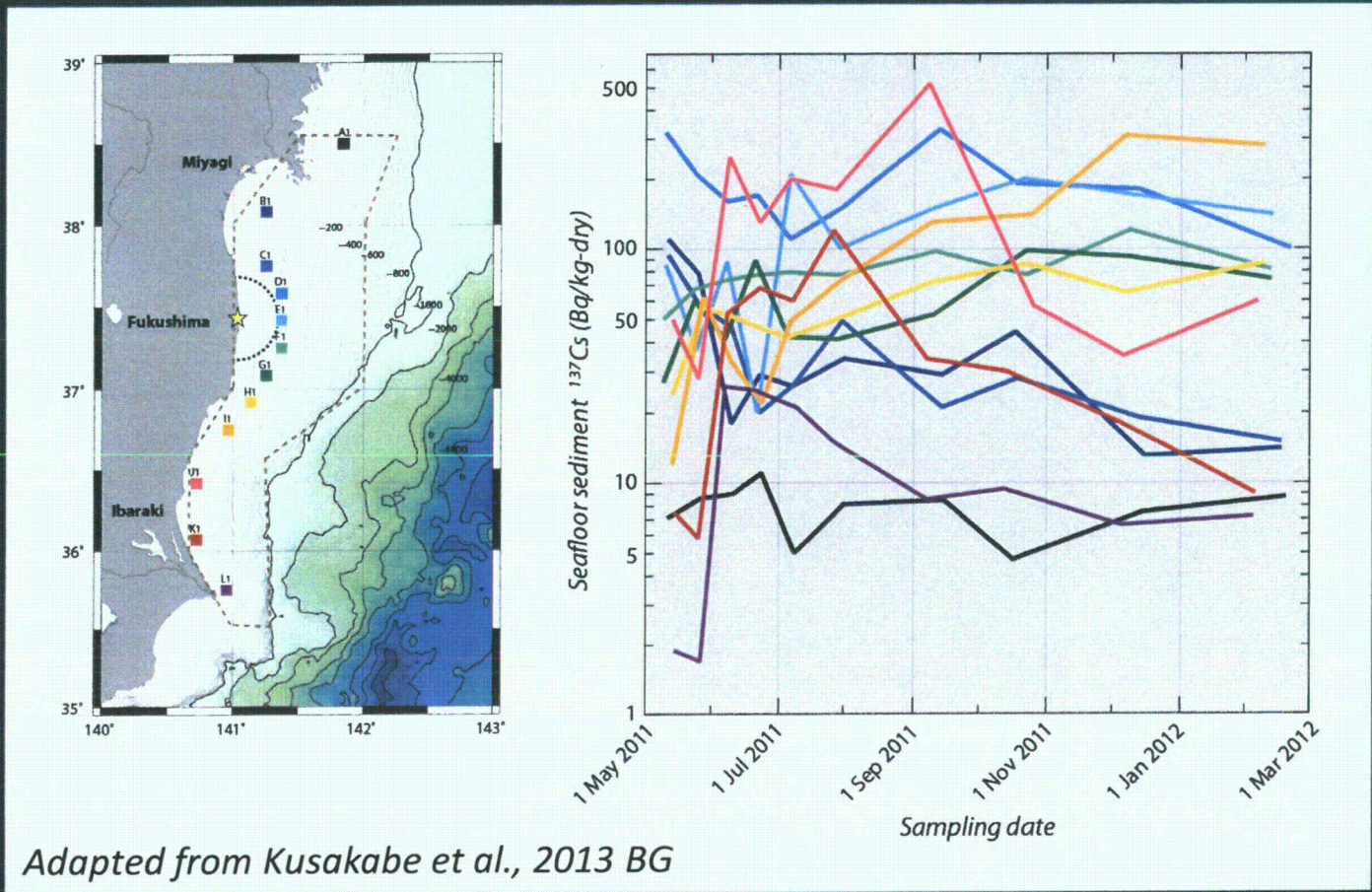
# What about surface ocean cesium-134 in May 2013



Buesseler, unpublished

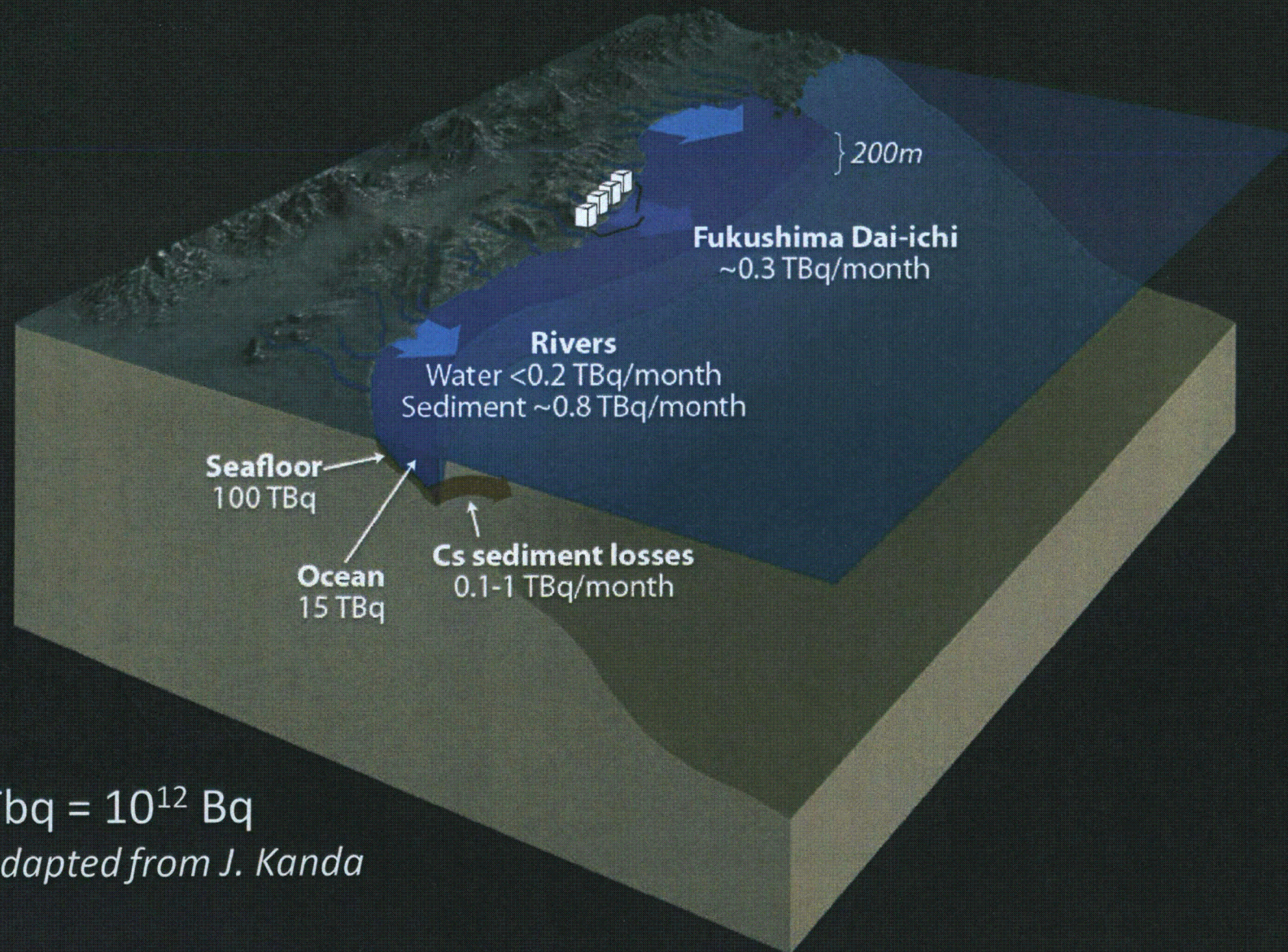
- <sup>134</sup>Cs indicates continued source at NPP
- Highest Cs closest to shore, associated with locations of higher groundwater input

# What about seafloor sediments?



- Variability common
- <0.1-0.2% Fukushima Cs found associated with seafloor
- Long term sink/source for Cs near Japan

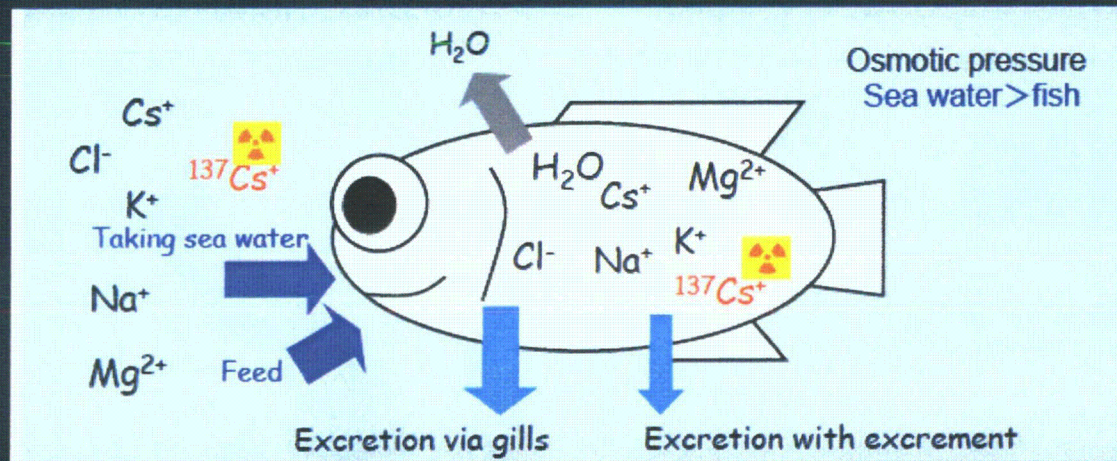
# What are cesium-137 sources and sinks today?



Tbq =  $10^{12}$  Bq

*adapted from J. Kanda*

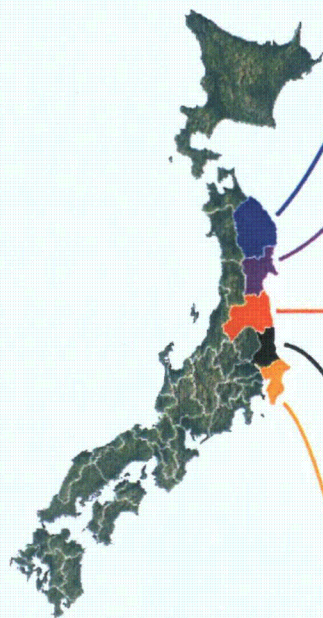
## What about Fish and cesium accumulation?



- Cesium uptake and loss from fish is rapid
- 50% loss in 50 days

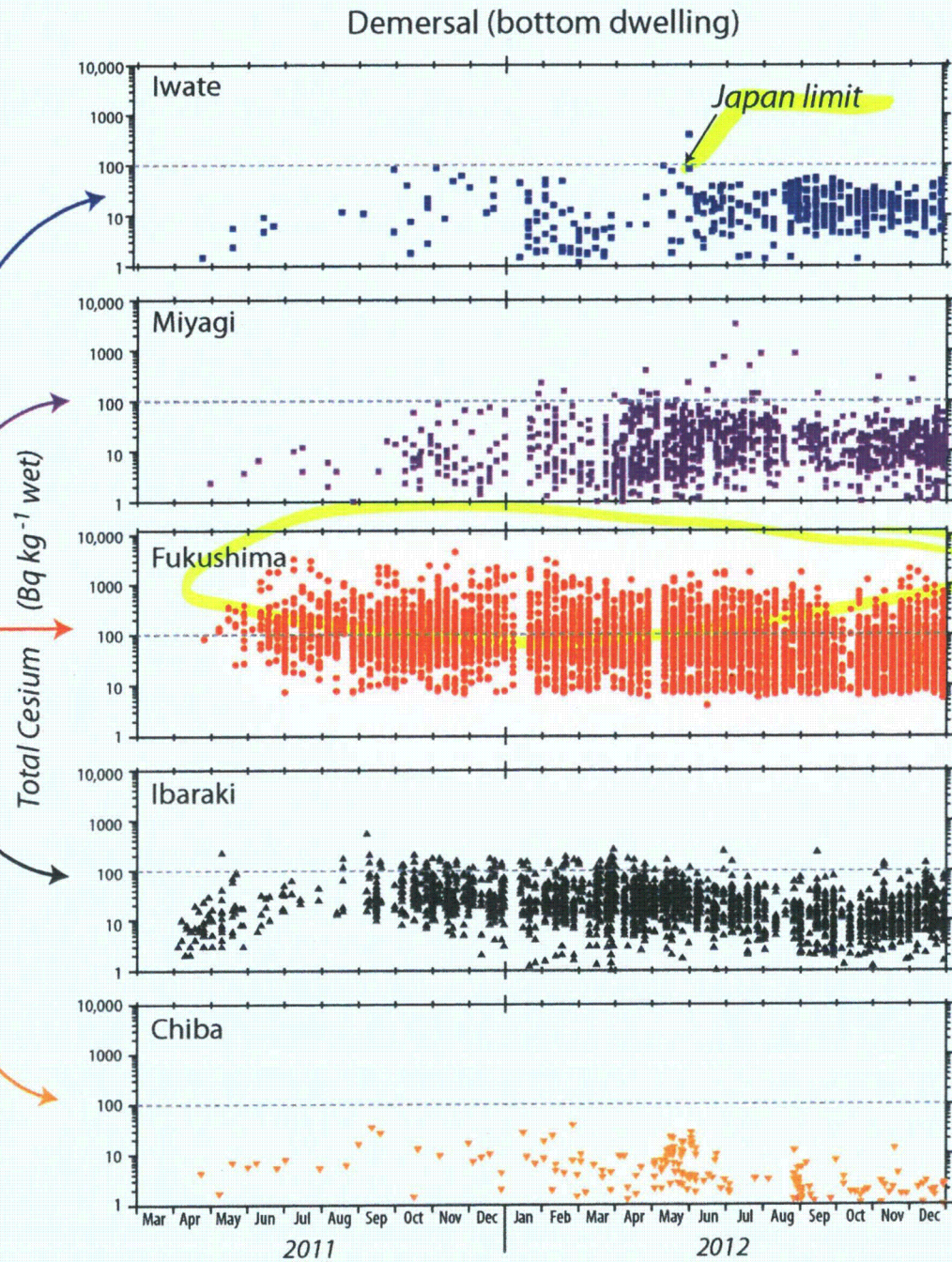
*information page from Japanese Ministry of Agriculture, Forestry and Fisheries (MAFF)*

Fisheries closed off Fukushima



Elevated Cs consistent with continued sources

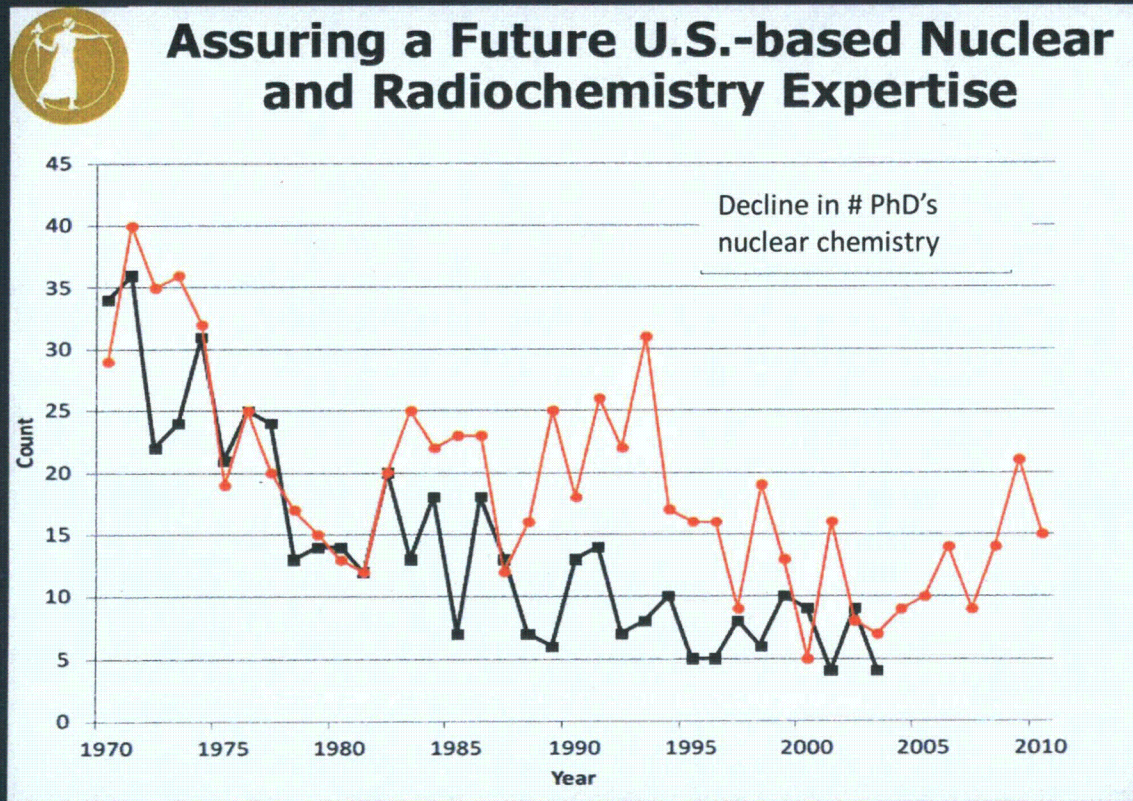
Data from Japan Fisheries  
Figure adapted from  
Buessler, Science, 2012



# Motivation to launch new Center of Excellence

## *Fukushima demonstrated*

- ❑ Public interest & concern
- ❑ Education & training need





# Motivation to launch new Center of Excellence

## *Fukushima demonstrated*

- ❑ Public interest, concern & anxiety



### Aug. 7, 2013 Fukushima's Radioactive Water Leak: What You Should Know

*"it's actually thousands of times less than ... in the immediate aftermath of the disaster, ..." according to Buesseler.*

NBC Nightly News; ABC World News; Weather Channel; PRI the World; NPR; AP Tokyo; NY Times; Wall Street Journal; CNN; Science; New Scientist; LiveWire; Deutsche Welle; Anchorage Daily news; Canadian Broadcasting; NHK Japan, Surfer Magazine.....

- ❑ Need for trusted independent source of information



## Mission

- ❑ to increase scientific and public understanding of natural and human-made radioactive elements in the oceans

## Goals

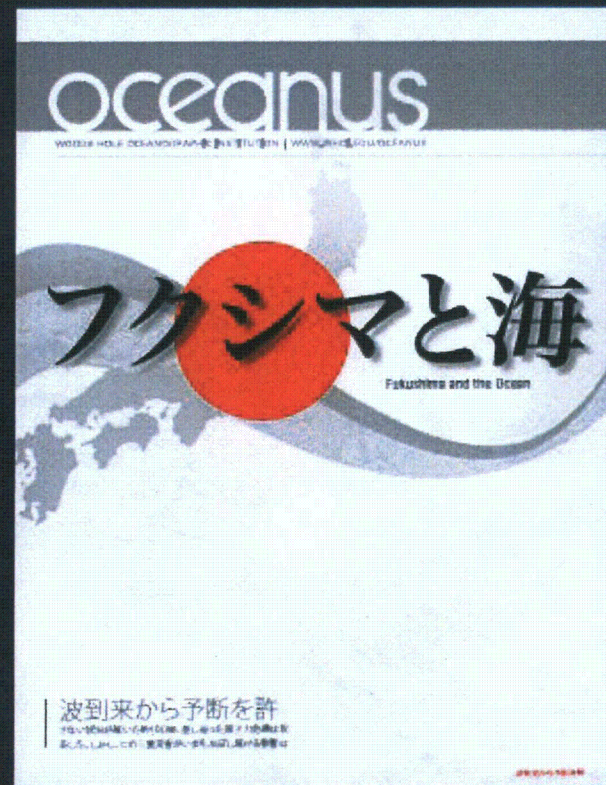
- ❑ public outreach
- ❑ education and training
- ❑ promote research & engineering

## Activities thus far

- ❑ Nov. '12 and May '13 public events
- ❑ Oceanus
- ❑ <http://www.who.edu/CMER>  
*Fukushima FAQ's*

## Multiple funding partners sought

- ❑ agencies, private, industry



## Fukushima- lessons learned from the ocean

- ❑ Fukushima NPP represents unprecedented release of radionuclides to the ocean off Japan
- ❑ Many reasons for study-  
Human health, radioecology, ocean tracers, future accidents
- ❑ Japan is leading studies, but confirmation by international labs will build public confidence (and increase scientific insights)
- ❑ Fukushima NPP site continues to leak radionuclides via groundwater and tanks (strontium-90 concern)
- ❑ Studies of fish are not enough- need long term studies of ocean, seafloor, rivers, etc. & new technologies
- ❑ Motivation for new Center for Marine & Environmental Radioactivity

## What is needed next?

In response to ongoing leaks at Fukushima-

“An international alliance on research and clean-up would help restore shattered public trust”

*Nature editorial Sept 3, 2013*

In the long term, if it is in our national interest to-

- help public understand that we live in a radioactive world
- build workforce trained in radiochemistry
- promote science and engineering advances in ocean radiochemistry and radioecology

*But, which agency(ies) will step up to the plate?*

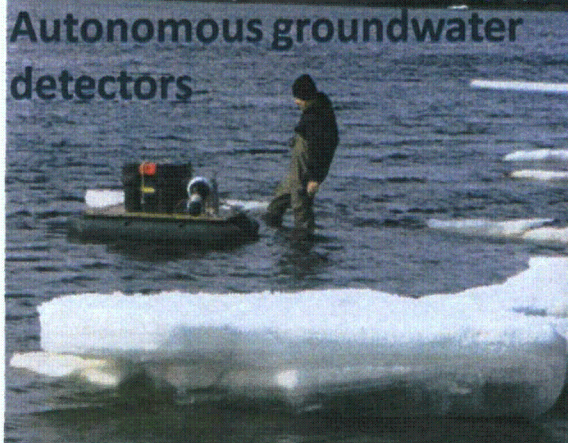




**Biota nets**



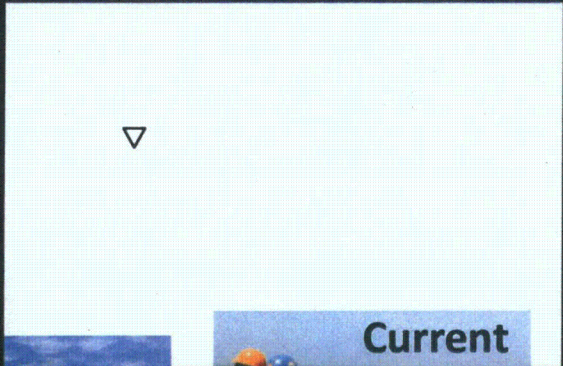
**Seafloor coring**



**Autonomous groundwater detectors**



**ASV Jetyak**

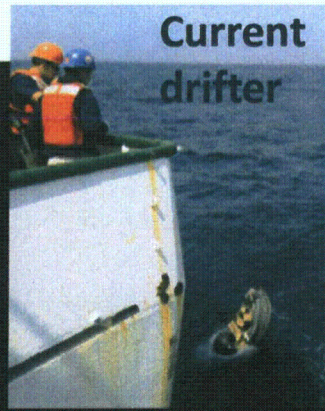


**AUV "Rad hopper"**



Princeton Gamma-Tech  
Scintillation Sensor

**AUV glider  
rad detector**

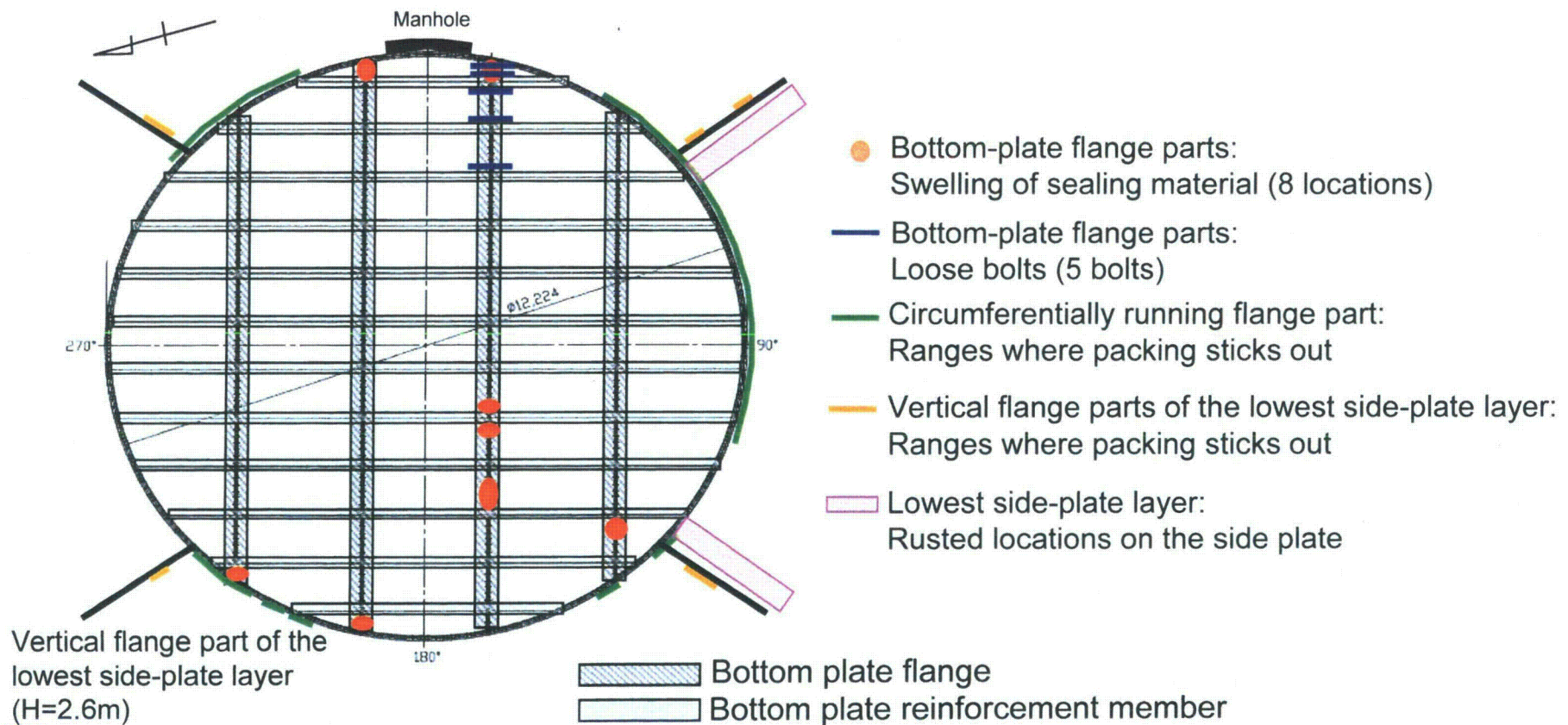


**Current drifter**

# Investigation of the Inside of Tank No.5 in H4 Area

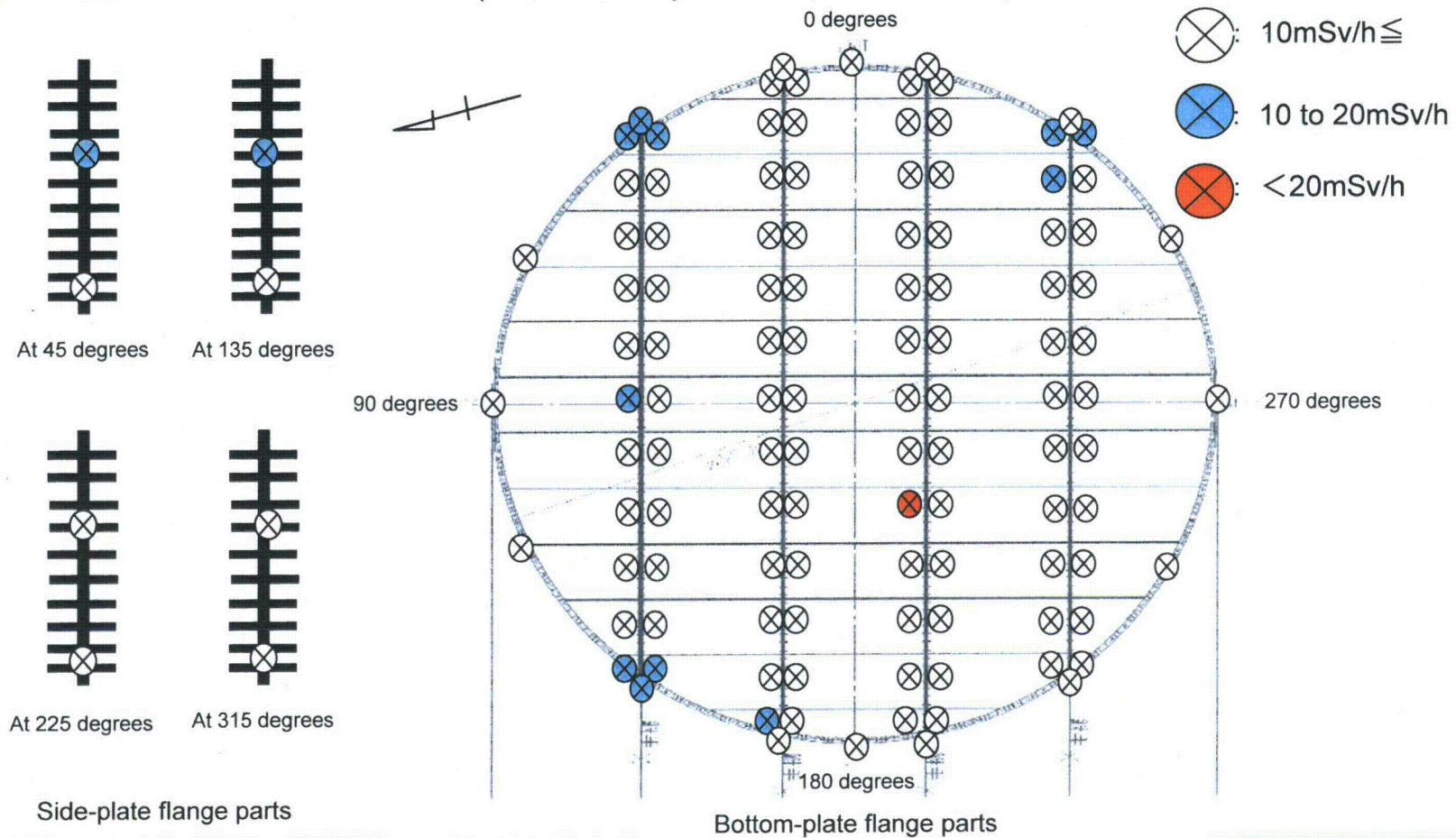
<Reference>  
 September 20, 2013  
 Tokyo Electric Power Company

- The inside of the tank was visually checked. Deformed or damaged parts were found at the flange part connecting the lowest side-plate layer and the bottom plate, and at the flange parts of the bottom plate.
- Condition of fastening of the bolts was checked by sounding the bolts. Five bolts were found loose.



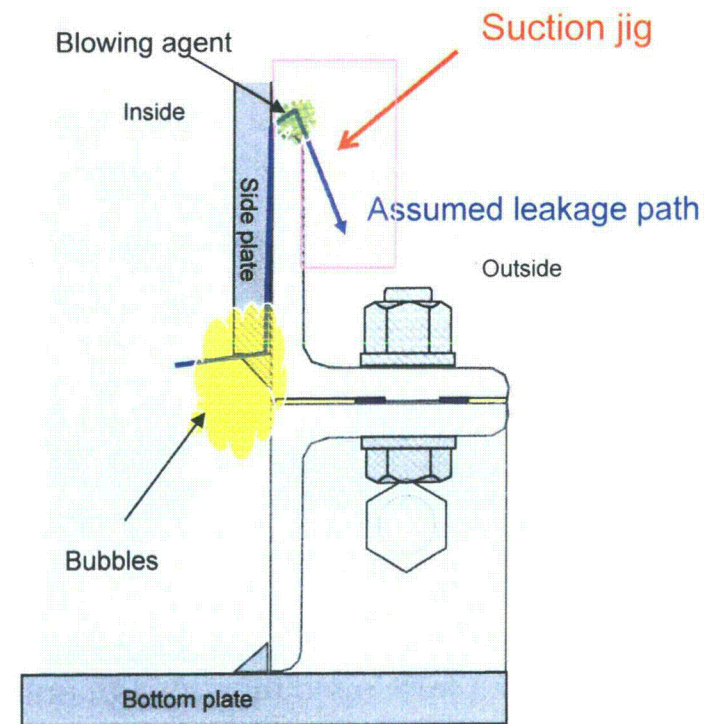
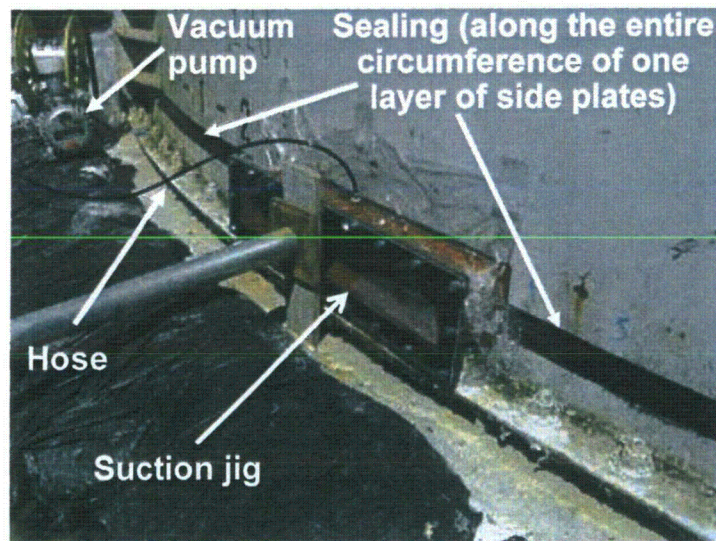
## Dose Measurement Results on the Flange Parts

- As a result of dose measurement on the flange parts, we found that dose rates on the flange parts were not more than 10mSv/h ( $70 \mu\text{m}$   $\beta$ -ray dose equivalent rate) for almost all over the flange parts, and approx. 22mSv/h at the maximum ( $70 \mu\text{m}$   $\beta$ -ray dose equivalent rate).



## Local Vacuum Test on the Tank Side Plate

- In a welded part joining the lowest side-plate layer of the tank and the flange part together, suction was conducted locally at a location (rusted location) that showed a relatively high dose rate.
- Continuous generation of bubbles from a blowing agent applied to this location was not observed. In addition, bubbles applied to the inside of the tank were not vacuumed up.

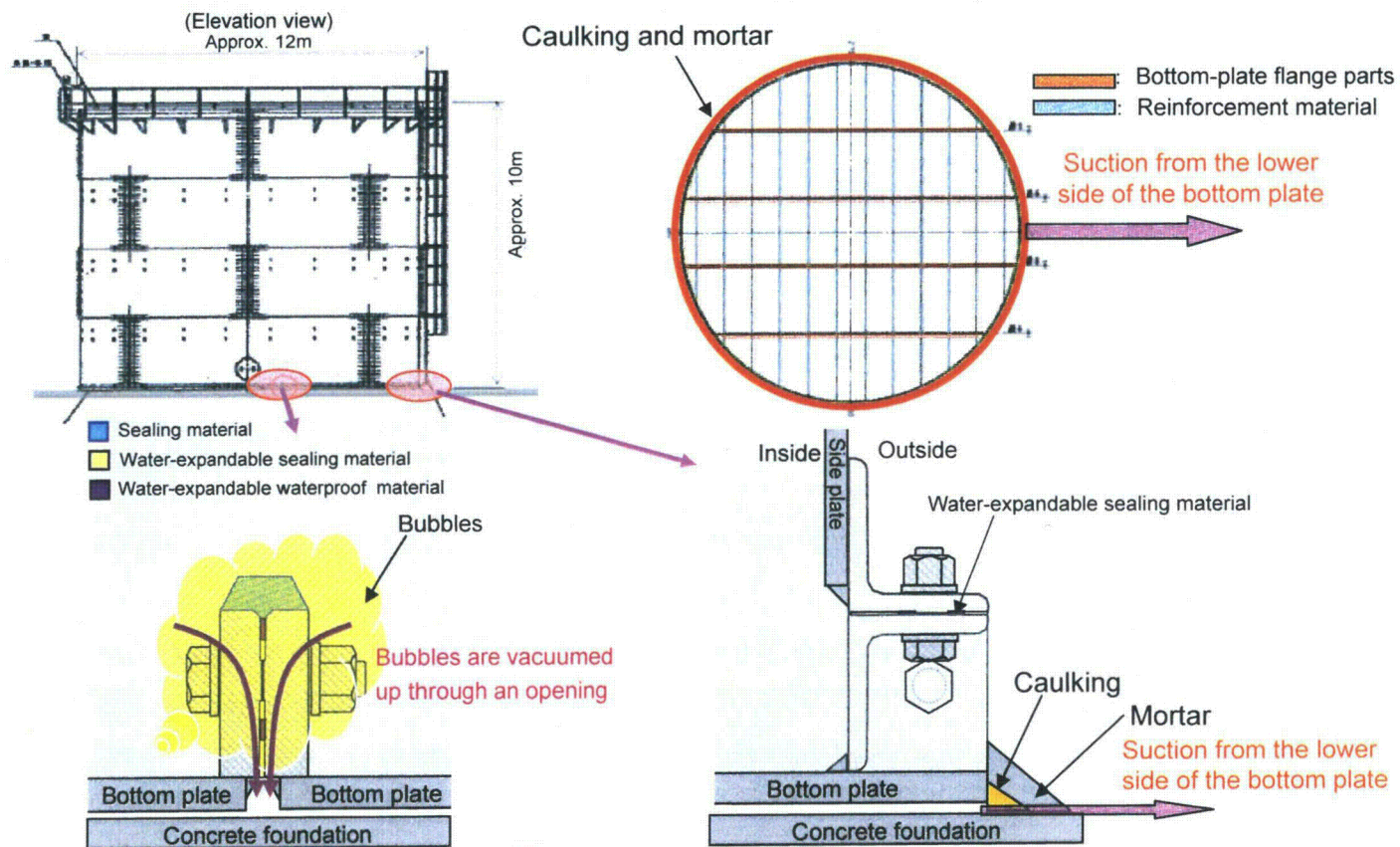


Cross-sectional view of a side plate flange part



# Vacuum Test from the Lower Side of the Tank Bottom Plate

- This test is a method to locate openings by applying bubbles to the flange parts, etc., in the inside of the tanks, then conducting suction from the outside of the tank bottom plate, and then confirming whether there is any opening through which bubbles are vacuumed up.



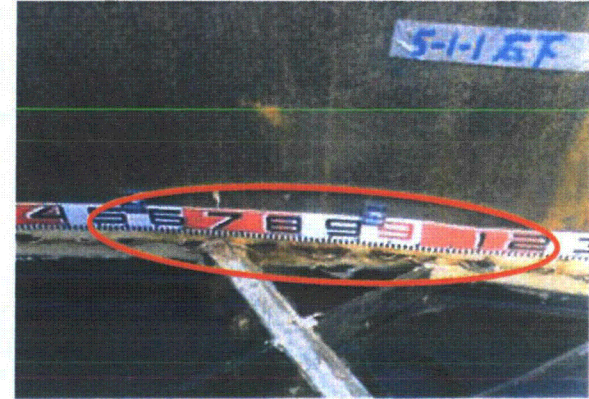
## Results of Investigation on the Inside of Tank No.5 in H4 Area (Photographs)



A loose blot at a flange part of the bottom plate  
(Photographed on September 19, 2013)



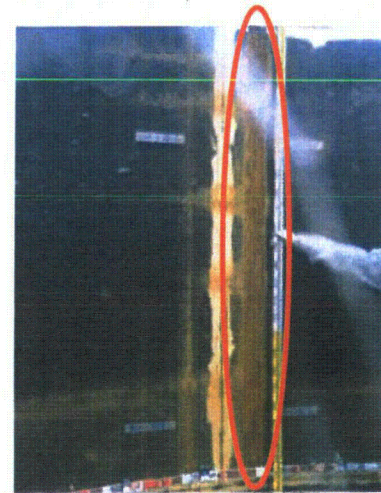
Swelling of the sealing material at a bottom plate flange part  
(Photographed on September 19, 2013)



Sticking out of packing from the circumferentially running flange part  
(Photographed on September 19, 2013)



Sticking out of packing from a vertical flange part in the lowest side-plate layer (Photographed on September 19, 2013)



A rusted location on the lowest side-plate layer  
(Photographed on September 19, 2013)

# Press Release



3 October, 2013

Nuclear Regulation Authority, Japan

On 2 October, the Nuclear Regulation Authority (NRA) received a report from TEPCO pursuant to the Act on Regulation of Nuclear Source Material, Nuclear Fuel Material and Nuclear Reactors. The report delineates it was found by TEPCO that the water was leaking from the top plate of storage tank (B-A5) in B Tank South Area into/outside of the dike surrounding the tank.

The following URL of TEPCO's website leads to details of the report:

[http://www.tepco.co.jp/en/press/corp-com/release/2013/1231162\\_5130.html](http://www.tepco.co.jp/en/press/corp-com/release/2013/1231162_5130.html)

## **NRA Actions**

Immediately after Nuclear Safety Inspectors of the NRA's Local Office acknowledged this incident on 2 October, the NRA directed the following points to TEPCO:

- To screen contaminated area;
- To recover promptly the water and soil in B Tank South Area;
- To analyze promptly sampling-water obtained in the side ditch near B Tank South Area and the drainage channel toward its outlet; and
- To take countermeasures for contaminated water not to flow to the sea.

Further directions to TEPCO will be considered by the NRA.

**Attachment:** B Tank Area

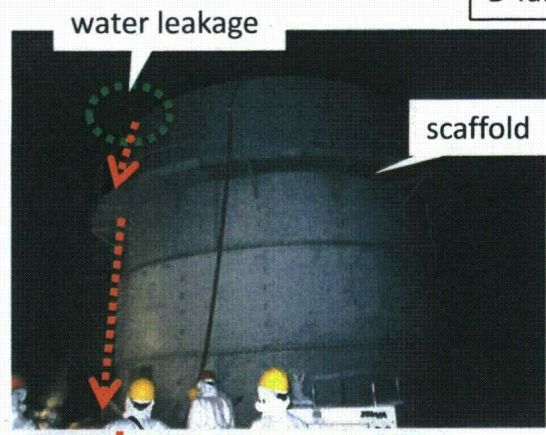
### **<Contact Person>**

Mamoru Maeoka  
International Affairs Division,  
Nuclear Regulation Authority (NRA), Japan  
Phone: +81-(0)-3-5114-2107

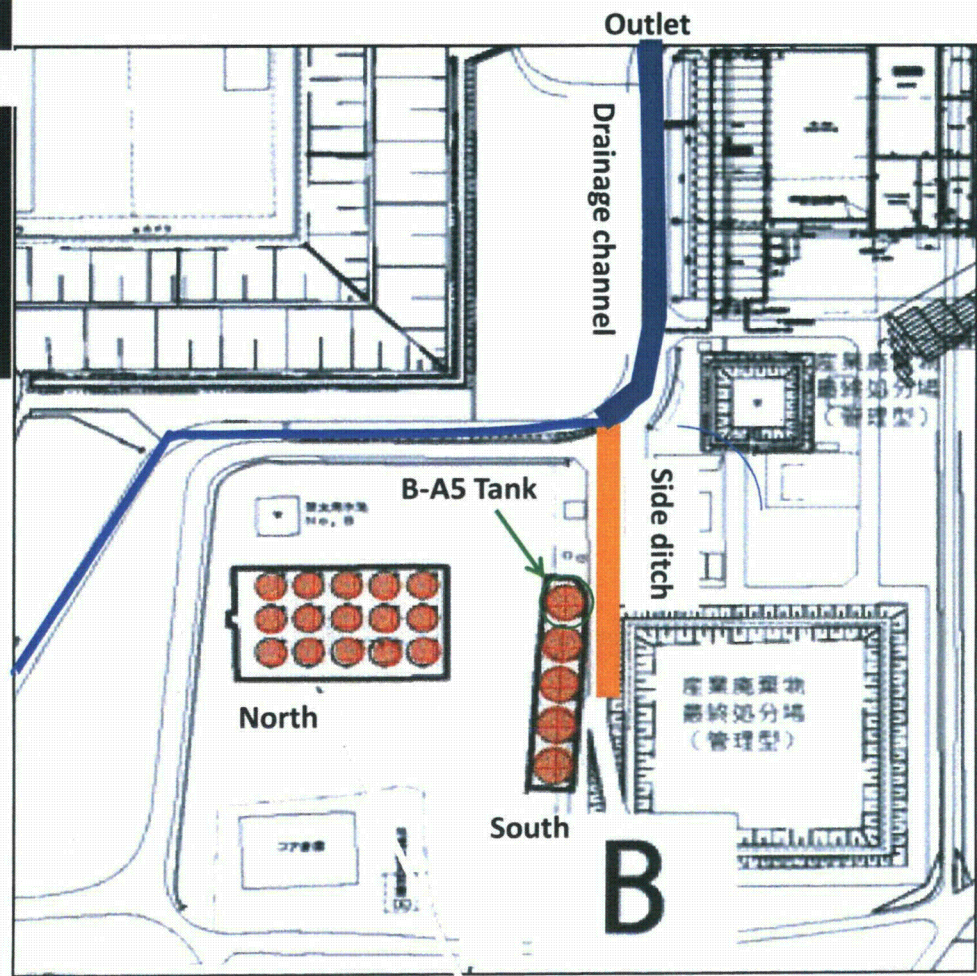
## B Tank Area

Attachment

The water was leaking from the top plate of storage tank(B-A5) in B Tank South Area into/outside of the dike surrounding the tank.



B-A5 Tank



# **Modeled Concentrations of Cs-137 along the Pacific Coast: Interpreting the Literature**

Mark Fuhrmann, Ph. D  
NRC Office of Nuclear Regulatory Research

# Four Papers Discussing Different Modeling Results Cs-137 in Seawater

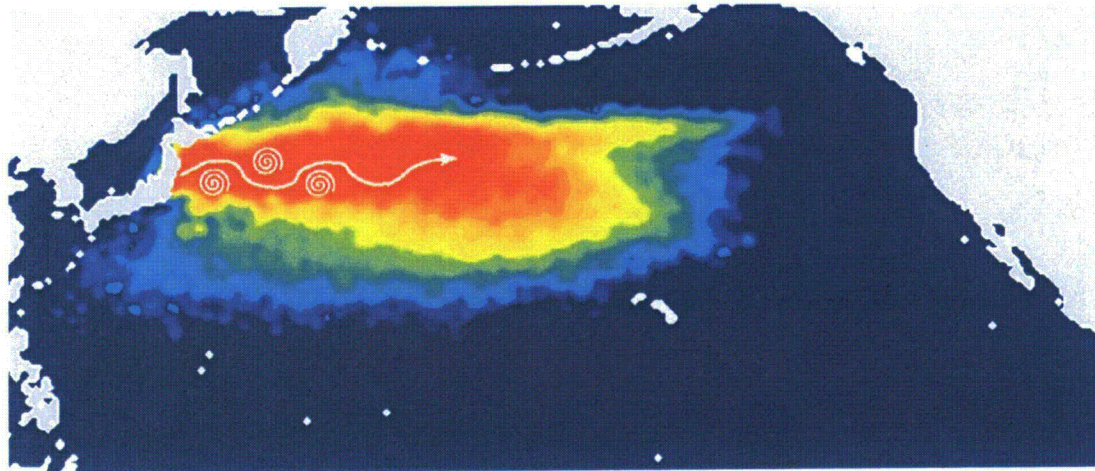
- **Cs-137 concentrations along Pacific coast will increase:**
  - Concentrations vary among papers
  - High estimate  $\sim 30 \text{ Bq/m}^3$ , low estimate  $\sim 2 \text{ Bq/m}^3$ 
    - Background subtracted
  - Current background  $\sim 2 \text{ Bq/m}^3$
- **Timing of W. coast arrival; all estimates similar**
  - Spring 2014 to 2015
  - Maximum concentrations within a few years
  - Lasts  $\sim 10$  years till steady state
- **Distributions:** More activity and earlier arrival along north coast then spreads to south.
- **Differences:** primarily due to source terms used and amount of dispersion.

# Context

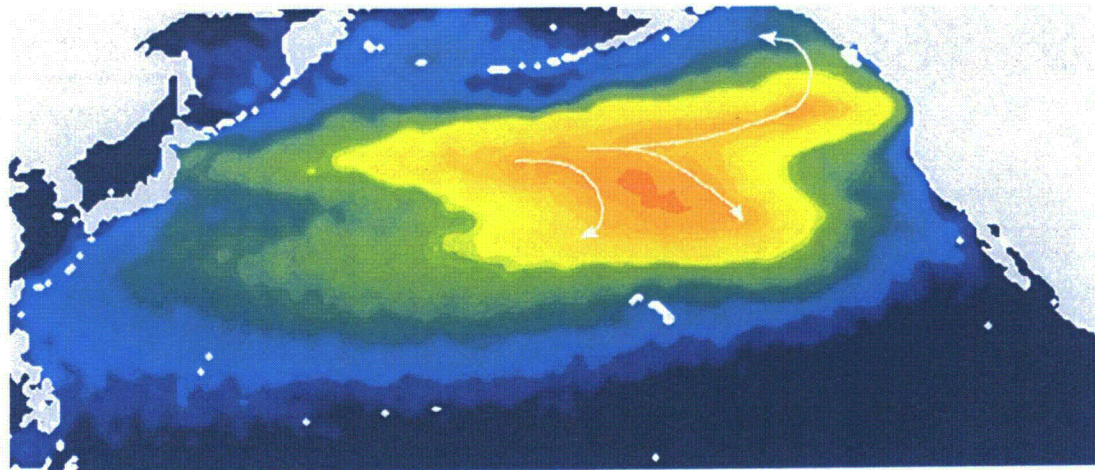
- **Cs-137 modeled range of activity is 2-30 Bq/m<sup>3</sup> maximum in seawater along coast**
  - This is 0.002 to 0.03 Bq/L
  - Lasts about 6 years
  - Compare to background of 1-3 Bq/m<sup>3</sup>; MCL = 7400 Bq/m<sup>3</sup>
- **Drinking water MCL is based on 4 mrem/yr total body dose or most affected organ;**
  - Cs-137 = 7.4 Bq/L = 200 pCi/L = 4mrem/yr
  - Sr-90 = 0.3 Bq/L = 8 pCi/L = 4 mrem/yr
  - Assumes radionuclide is alone; if multiple radionuclides the allowed concentration decreases so the sum = 4 mrem/yr
- **Modeled upper concentration in seawater (0.03 Bq/L) of Cs-137 is 247 times below the MCL.**

# Modeled Seawater Transport of Cs-137 from Fukushima (Rossi et al)

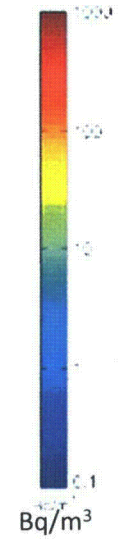
Cs-137 MCL = 7400 Bq/m<sup>3</sup>



April, 2012

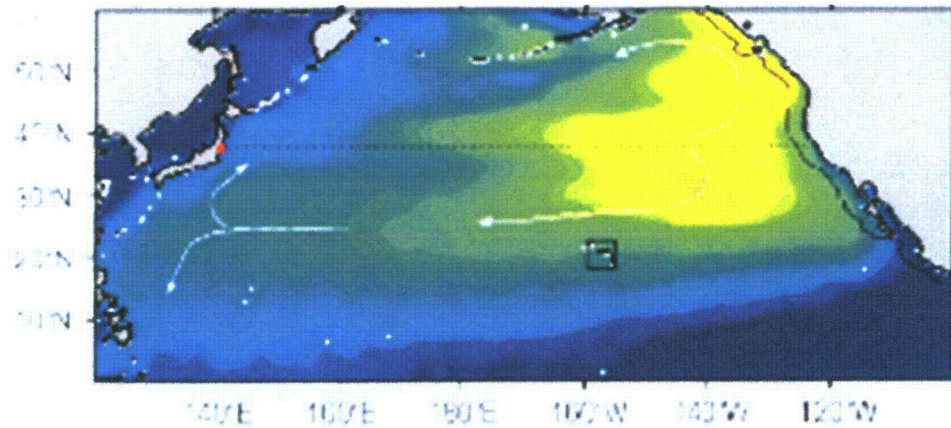


April, 2014

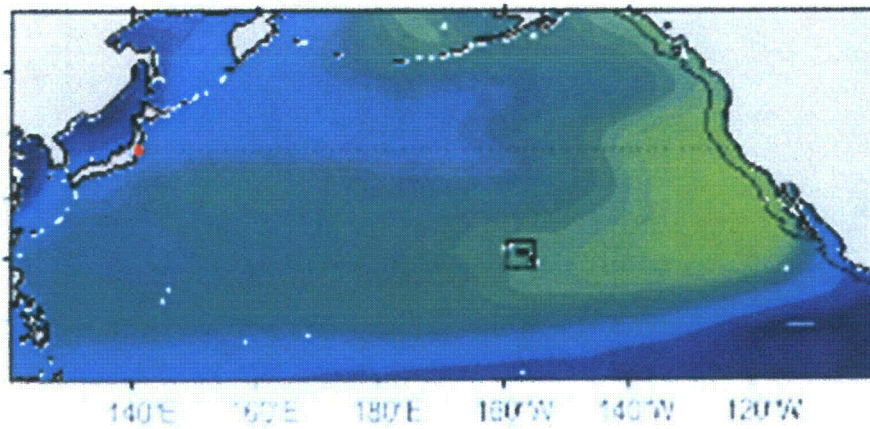




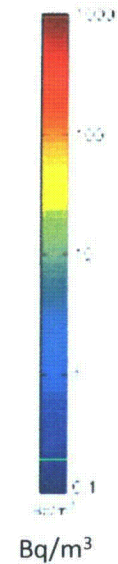
# Modeled Seawater Transport of Cs-137 from Fukushima (Rossi et al)



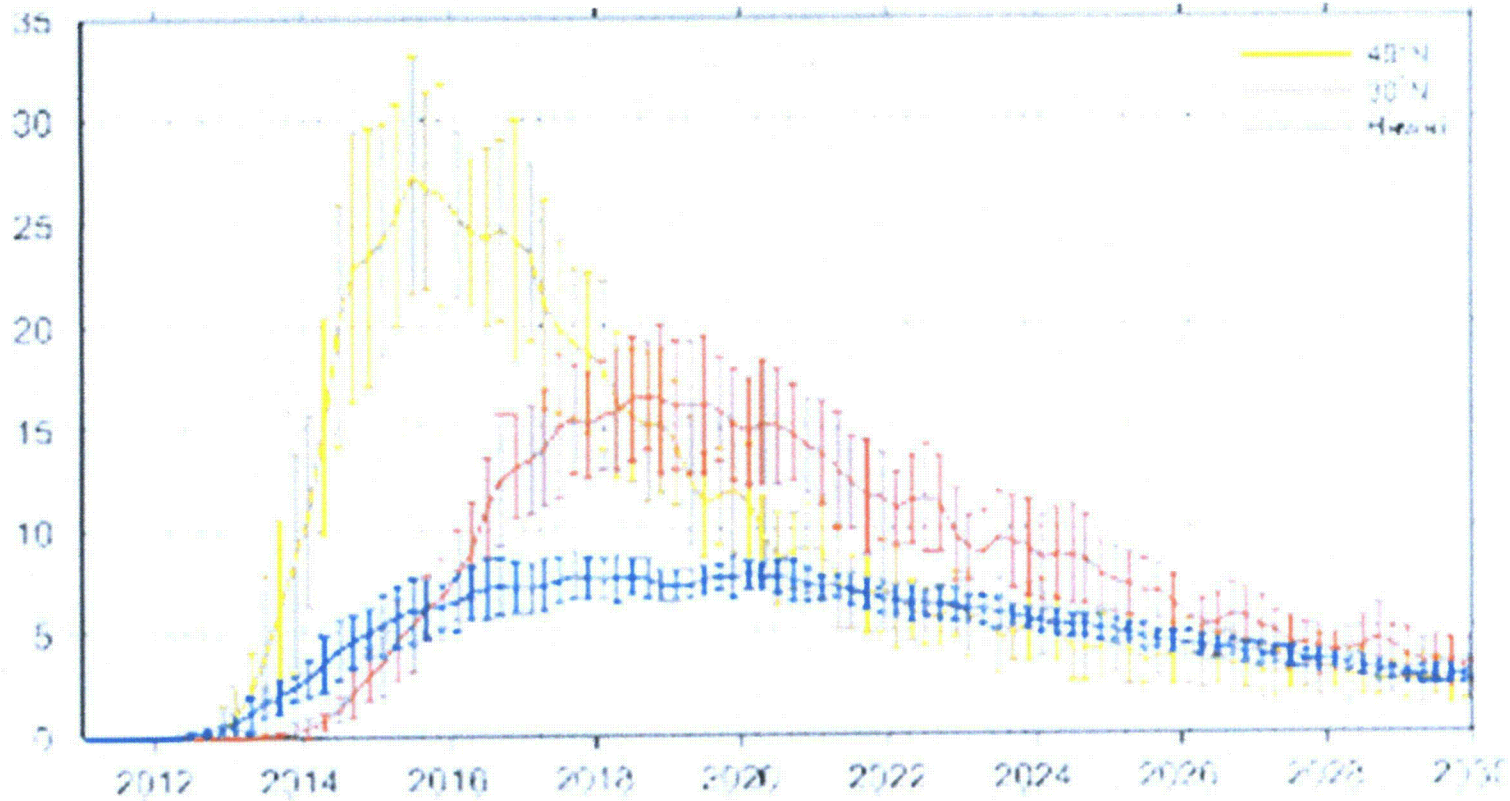
April, 2016



April, 2021

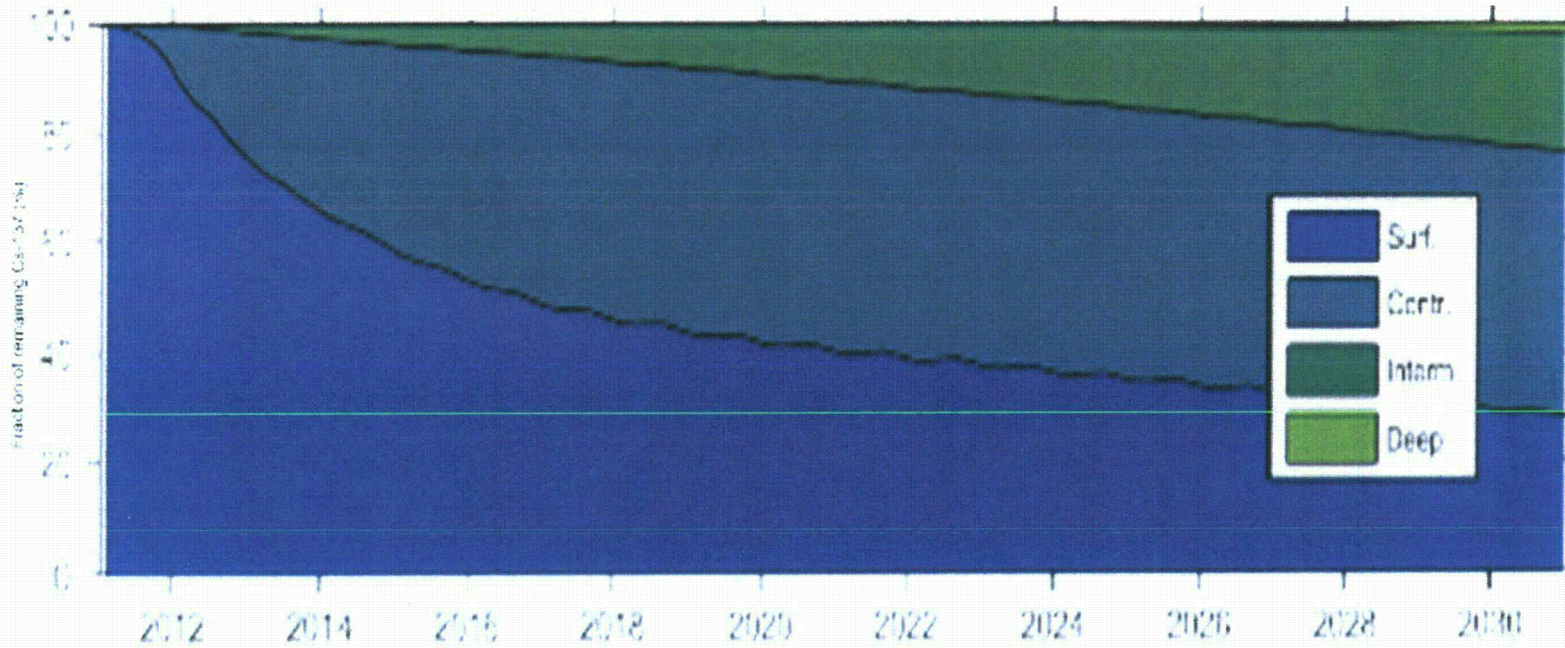


Surface Cs-137 (Bq/m<sup>3</sup>) at continental shelf locations,  
average across a 300 km wide shelf (Rossi et al)

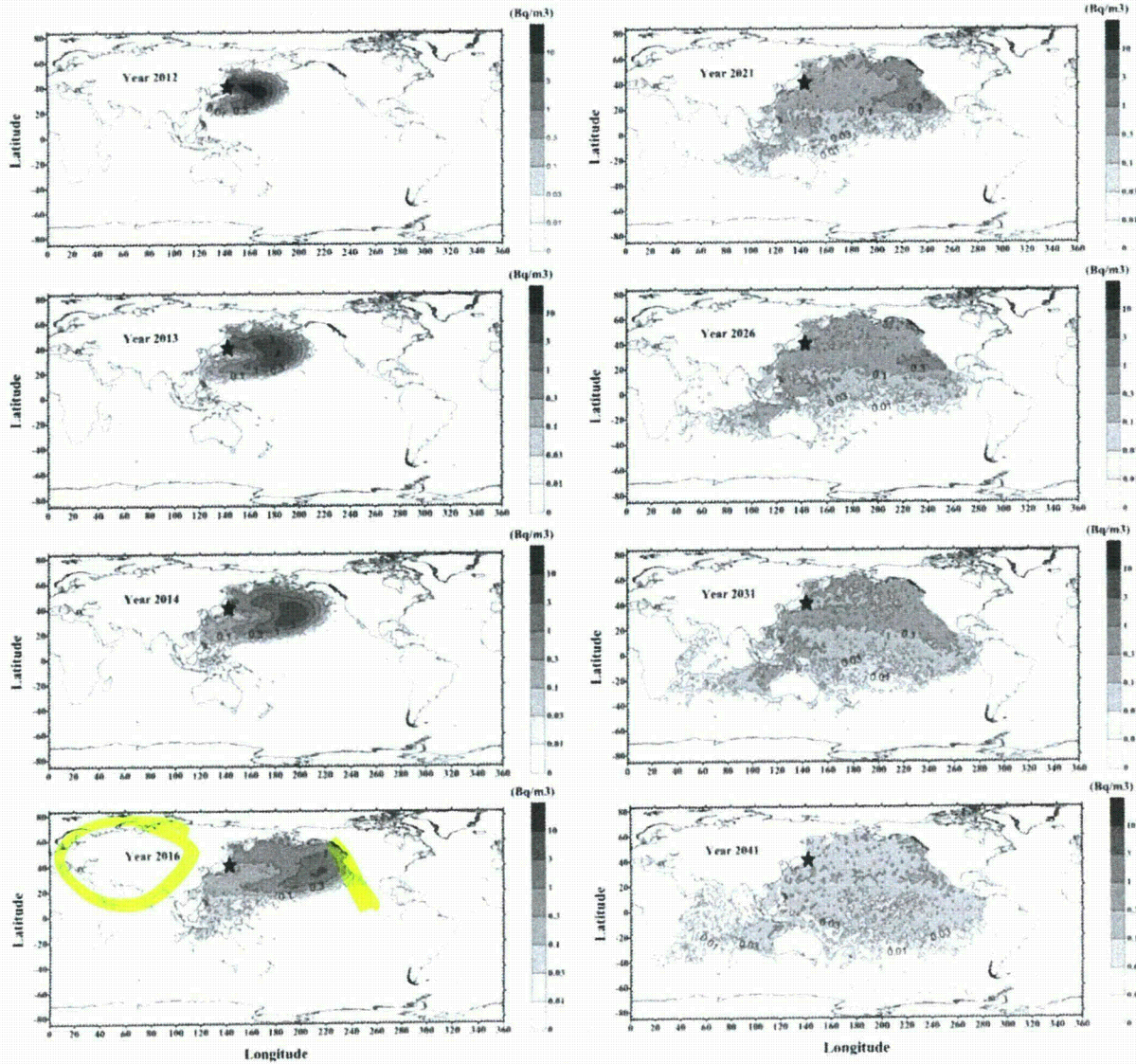


49° N is Vancouver...30° N is Southern California

# % remaining of Cs-137 with Depth and Time (Rossi et al)



# Modeled Cs-137 transport (Nakano & Povinec)



# Distributions in the Pacific of Cs-137

## Comparisons

- Nakano estimate slower movement of Cs-137 than Rossi et al.
  - All are similar
- Estimate of maximum Cs-137:
  - Rossi, 10-30 Bq/m<sup>3</sup>
  - Nakano less than 3 Bq/m<sup>3</sup>
  - Behrens, 2Bq/m<sup>3</sup>
  - Tolman, 2 Bq/m<sup>3</sup>
- Activity will distribute into deeper water with concentrations equal to those at the surface down to 1000m, in 10 to 30 years.
- Source term used by Nakano is 9 PBq; includes airborne and aqueous. Source term used by Rossi is 22 PBq; does not include airborne. Due to large dispersed fallout area, they think it is low enough (10%) to not matter.

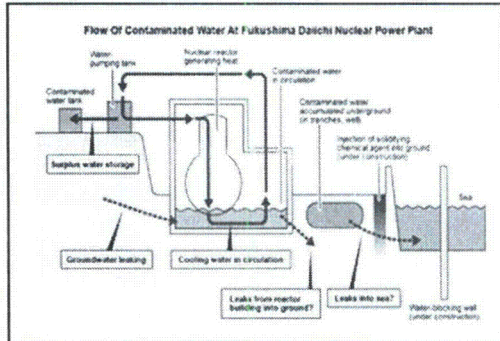
## References

- Rossi et al, 2013, *Multi-decadal projections of surface and interior pathways of the Fukushima Cesium-137 radioactive plume*, Deep-Sea Research I, Vol. 80, pp. 37-46.
- Nakano and Povinec, 2012, *Long-Term Simulations of <sup>137</sup>Cs Dispersion from the Fukushima Accident in the World Ocean*, Journal of Environmental Radioactivity, Vol. 111, pp. 109-115.
- Behrens, et al, 2012, Model simulations on the long-term dispersal of cs-137 released into the Pacific Ocean off Fukushima, Environmental Research Letters, Vol. 7, pp. 1-10.
- Hendrick Tolman, NOAA, personal communication, Sept. 30, 2013.

# 10-28-13 Fukushima Update

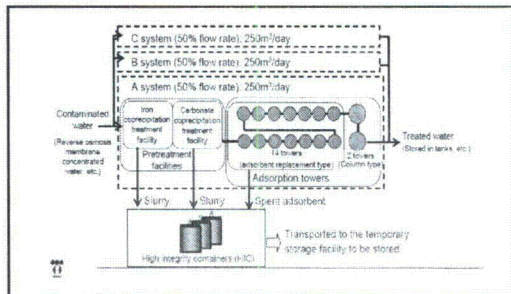
## Review:

### Water Management



### Water Flow Path

- 800 tons per day ground water flows through site
- 800 tons per day treated to remove salt and Cs
- 400 tons per day to cool reactors
- 400 tons per day to storage
- 400 tons per day to the ocean



### Advanced Liquid Processing System (ALPS)

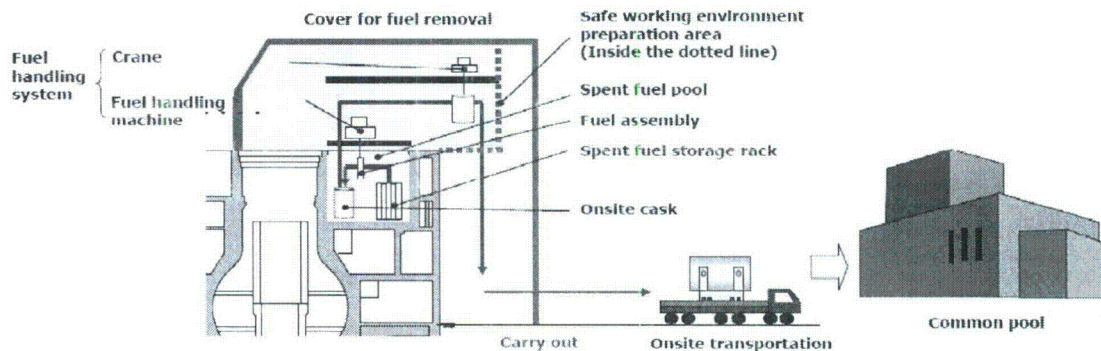
- Does not remove Tritium
- Not in operation-corrosion/operational issues
- Repairing ALPS
- Procuring Alternate System

### Water Storage Tanks

- 350,000 tons of highly contaminated water stored in 1000 above ground tanks
- 350 tons leaked from faulty tank in August - compromised ground water bypass system
- Overfilled tank in September - potential migration to ocean

### Unit 4

- Fuel transfer to common pool is to begin in early November.

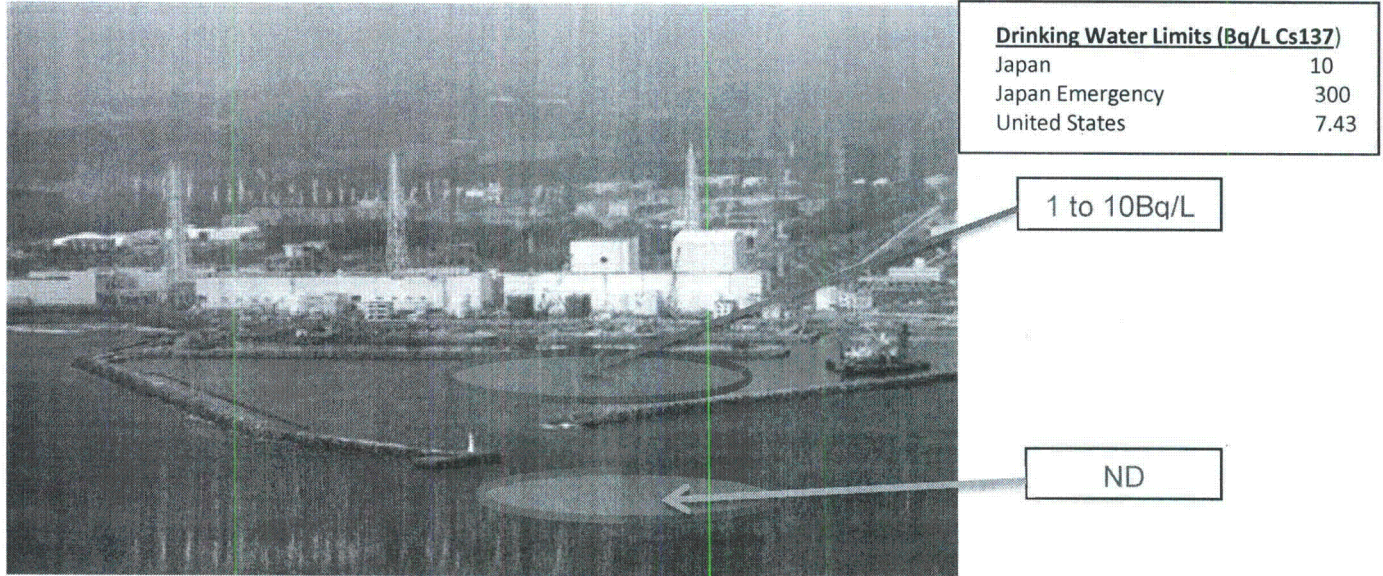


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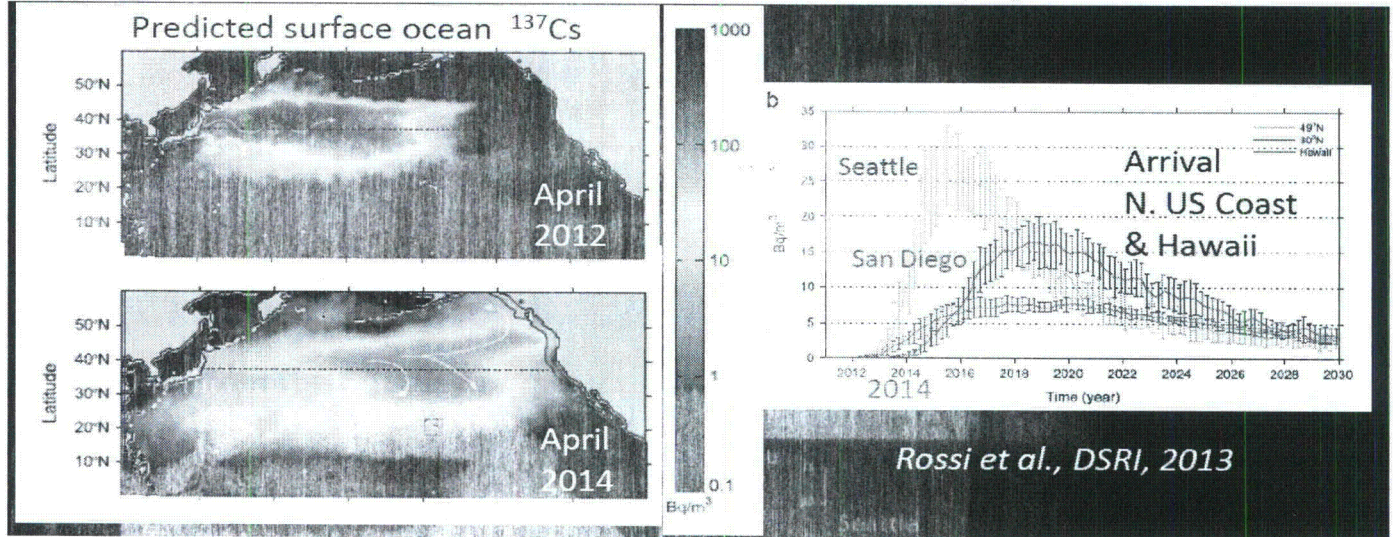
# 10-28-13 Fukushima Update

## Oceanic Contamination

- Fukushima Port (measurements in Bq/L)



- Radioactive water plume headed toward the US (measurements in Bq/m<sup>3</sup>)



(WHOI)

### New Since Last Update:

## Worker Contamination

- October 9, 2013: Six workers were contaminated during maintenance on the water treatment system. The wrong pipe was removed and eleven workers were sprayed. Five were protected by their clothing; six received skin contamination. All were decontaminated with no internal contamination. All leaking water was contained. (TEPCO)



# 10-28-13 Fukushima Update

## Oceanic Contamination

- October 8, 2013: Ocean water 1km east of the Fukushima port had Cs 137 sample results of 1.4Bq/L. Previous sample results were below the detectable limit of 0.50Bq/L. (The regulatory release limit is 90Bq/L. The drinking water limit is 10Bq/L for Japan and 7.43Bq/L for the US.) Nothing detectable found at other oceanic monitoring sites. (TEPCO)

October 22, 2013: TEPCO reported a second sample at this same sample site above the minimum detectable limit. TEPCO is investigating to find cause. (NHK)

- October 24, 2013: TEPCO discovered high gross beta in drainage channels near the tank farms. TEPCO postulates that rain washed fallout from the accident two and a half years ago into the channels. TEPCO has commenced removing the contaminated water and reports that seawater activity near channel outfalls is below detectable limits. (TEPCO)

## Remediation

- October 14-21: IAEA Mission on remediation of large contaminated areas off-site of the Fukushima Daiichi Nuclear Power Plant. IAEA provided highlights and advice. (IAEA)
- October 15, 2013: NEI hosted a workshop for the International Research Institute for Nuclear Decommissioning (IRID). In August 2013, Japan established the IRID, a new research body to bring together international experts experienced in the decommissioning nuclear power plants. Plans call for IRID to set up a research facility near the Fukushima Dai-ichi plant. The IRID is chaired by Hajimu Yamana from the Research Reactor Institute at Kyoto University and will eventually include hundreds of experts from several organizations including national research institutes, utilities and manufacturers.

The workshop was held to discuss:

1. Accumulation of contaminated water (storage tanks)
2. Treatment of contaminated water (tritium)
3. Removal of radioactive materials from the seawater in the harbor
4. Management of contaminated water inside the buildings
5. Management measures to block groundwater from flowing into the buildings
6. Understanding the groundwater flow

Tammy Way, Department of Energy NE and Joyce Connery, White House National Security, are NEI's US government contacts for the IRID. The NRC was not invited to participate in the IRID. (NEI)

## Seismic Activity

- 15:14 UTC October 19, 2013: Miyagi Prefecture experienced an offshore earthquake magnitude 4.9, no tsunami warning, no trouble, no emergency measures deployed. (NRA)

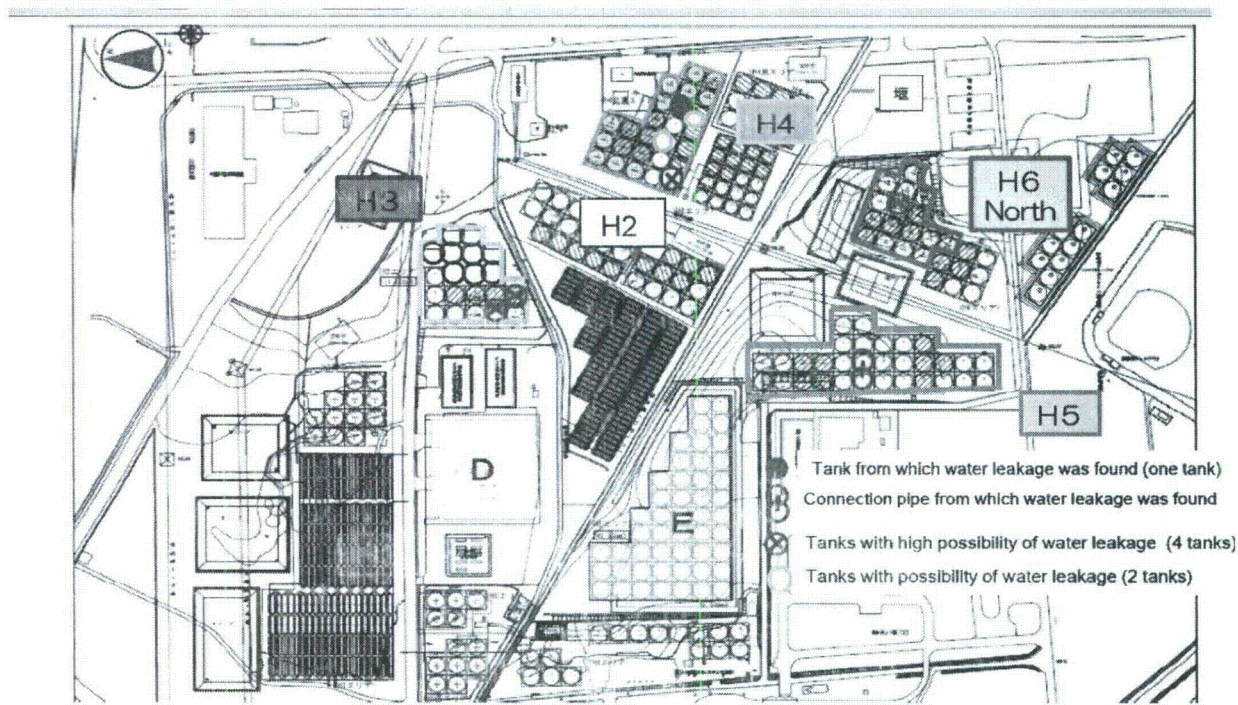
## 10-28-13 Fukushima Update

- 01:07 UTC October 20, 2013: Ibaraki Prefecture experienced an offshore earthquake magnitude 4.4, no tsunami warning, no trouble, no emergency measures deployed. (NRA)

### Typhoons

- October 18, 2013: After typhoon 26 passed through, results at the sample well 20 meters from the tank that leaked 350 tons at storage area H4 last August, increased to 400,000Bq/L Sr90 from previous day sample of 61Bq/L. TEPCO is investigating to determine cause of step change. (TEPCO)
- October 21, 2013-Before all the rainwater in the berms surrounding the storage tanks could be sampled and stored following typhoon 26, typhoon 27 passed over and overflowed some of the berms. Sr90 levels up to 710Bq/L were found outside tank area H2 (discharge limit for Sr90 is 30Bq/L). Some water may have reached the ocean. Berm heights have been increased to 30 cm. (TEPCO)
- October 23, 2013: TEPCO has asked for and received permission from the NRA to use underground reservoirs to store rain water pumped from the berms around the tank farms. The reservoirs were abandoned last April due to leaks and faulty design. Another typhoon is coming and TEPCO has no other options. (NHK)

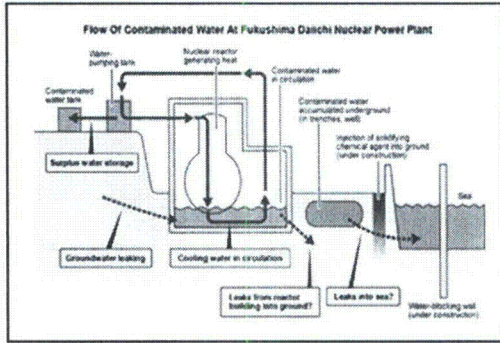
### Location of Storage Tanks



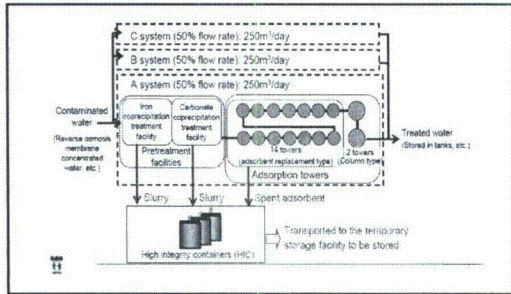
Modified by the NRA, Original illustrated by TEPCO

# 11-18-13 Fukushima Update

## Water Management



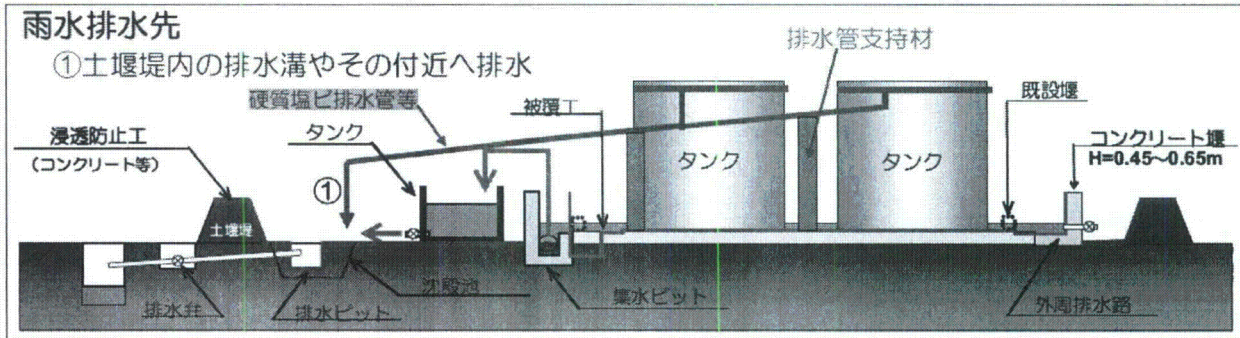
- ### Water Flow Path
- 800 tons per day ground water flows through site
  - 800 tons per day treated to remove salt and Cs
  - 400 tons per day to cool reactors
  - 400 tons per day to storage
  - 400 tons per day to the ocean



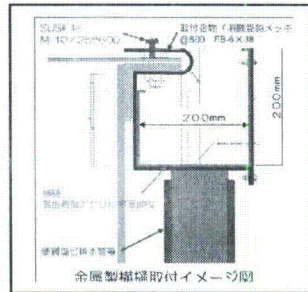
- ### Advanced Liquid Processing System (ALPS)
- A train-running 250T/day
  - B train-Late November
  - C train-confirming corrosion countermeasures
  - All 3 trains are deficient in removing Co-60, Ru-106 and Sb-125
  - Procuring Alternate System

## Water Storage Tanks

- 350,000 tons of highly contaminated water stored in 1000 above ground tanks



- Pad sealant, tank gutters, berm height doubled, radar tank level detectors, rain water tank, surrounding dike, letdown valve to ditch.



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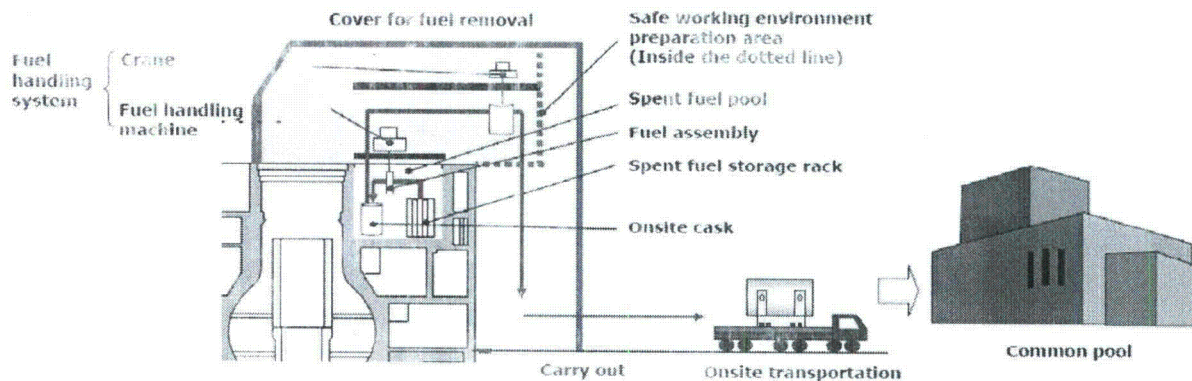
# 11-18-13 Fukushima Update



- Reroute ditch to harbor instead of ocean

## Unit 4 Fuel Removal

- Fuel transfer to common pool began Monday November 18, 2013.
- 1331 used bundles, 202 new bundles, 2 transfer casks-22 fuel bundle capacity,
- 1 week to transfer 1 cask-approximately 70 transfers-over 1 year to complete



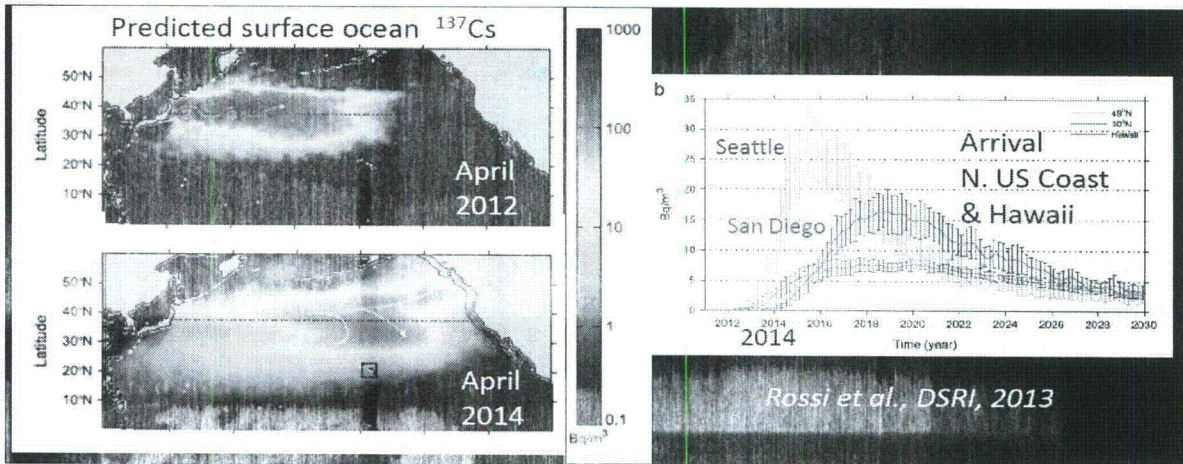
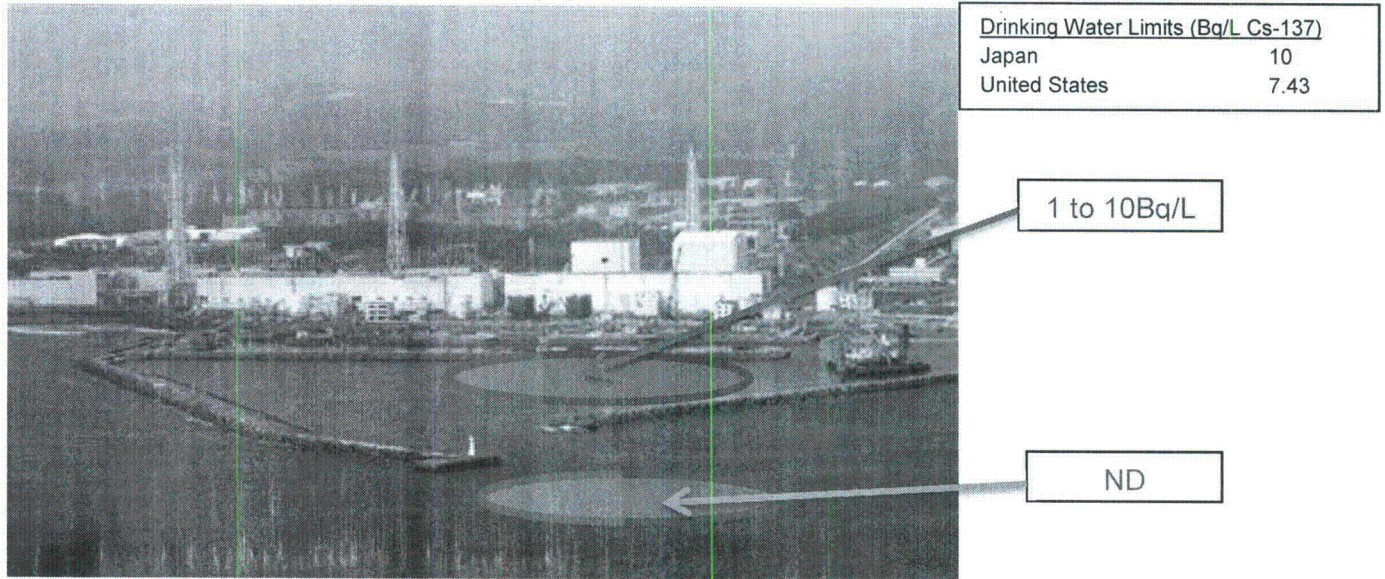
## Seismic Activity

- 02:00 UTC November 15, 2013 in the eastern offing of Aomori Prefecture, Japan, magnitude 5.2, no tsunami warning, no trouble, no emergency measures deployed.
- 11:44 UTC November 16, 2013 Ciba Prefecture, Japan, magnitude 5.4, no tsunami warning, no trouble, no emergency measures deployed.

# 11-18-13 Fukushima Update

## Oceanic Contamination

- Fukushima Port (measurements in Bq/L)



(WHOI)

- Rossi -timing is correct but magnitude 2 to 10 times higher than other predictions-Buesseler
- Dr. Douglas Dasher, a researcher at the University of Alaska, Fairbanks, Marine Science Institute, told the Canadian Broadcasting Corp. that he fears radiation in Alaskan waters could reach levels once caused by Cold War atomic testing.

## Areas of Cooperation between DOE and TEPCO (11/1/13 Secretary Moniz visit to Fukushima)

1. Prevention of groundwater contamination, medium and long-term monitoring, safety assessment
2. Water sealing technology for interior of reactor buildings (grouting technology)
3. Waste treatment and disposal for decommissioning site
4. Fuel debris removal, storage and disposal
5. Contaminated water treatment



# **Water Situation at Fukushima**

(As of September 20, 2013)

## **What is the current issue?**

## **What are the health effects?**

## **How did the leaks occur?**

## **What is being done to address the situation?**

## **What is the United States doing?**

## **Where can I go to get more information?**

## **What is the current issue?**

Over the past three months, radiation measured within the plant site in the water near the unit 2 trench at the site has been increasing. The increase in radiation in the water is caused by contaminated water traveling underground to the sea. Sources of the contaminated water include: 1) a trench near the bay (the radioactive water has since been removed (8/30)), and 2) water contaminated by the accident and continued cooling of the damaged cores leaking directly from the reactor buildings. In addition, at least one of the tanks storing highly contaminated water is leaking—that leak has been rated a three on the International Nuclear Event Scale. The Japanese government will be providing financial and technical assistance to TEPCO, the utility.

## **What are the health effects?**

Available evidence leads the NRC to conclude the Fukushima situation will not affect U.S. public health. For the last six months, radioactive Cesium levels where the Fukushima harbor meets the ocean have been below 10 Bq/L, which is the World Health Organization drinking water standard. The U.S. Environmental Protection Agency's (EPA) limit is 7.41 Bq/L. Seawater sampling at points 30 to 200 km out to sea from Fukushima shows very low Cesium 137 concentrations; typically below .004 Bq/L, compared to pre-accident concentrations of around 0.003 Bq/L. Concentrations nearer to the coast tend to be somewhat higher (about .01-0.2 Bq/L), but still well below EPA drinking water standards.

To date, there is no evidence that radionuclides from the Fukushima incident are present in the U.S. food supply at levels that would pose a public health concern. The Food and Drug Administration (FDA) monitors the safety of FDA-regulated food, including seafood. For information about FDA efforts to ensure the safety of the U.S. food supply, please see: <http://www.fda.gov/newsevents/publichealthfocus/ucm247403.htm>

## **How did the leaks occur?**

Understanding how water is managed at Fukushima helps explain how these leaks are occurring. There are several factors contributing to the water situation. These include:

- Circulating water to cool the reactors
- Ground water flow into and leaking out of the basements of the reactor and turbine buildings
- Accident water left in trenches
- Leaking storage tanks containing highly contaminated water

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### **Circulating water to cool the reactors**

TEPCO pumps approximately 800 tons/day of highly contaminated waste water out of the reactor building/turbine building basements. This water is desalinated and then filtered to remove radioactive cesium. About 400 tons/day is pumped back to cool the reactors, becoming contaminated again as it flows through reactor core debris, before flowing back to the reactor building/turbine building basements. The rest of the water, 400 tons/day, containing high concentrations of Strontium-90 and tritium, is pumped to the ever growing storage tank farm.

### **Ground water flow into and out of the basements of the reactor and turbine buildings**

The structures of the reactor and turbine buildings were damaged in the earthquake and the subsequent nuclear event. Therefore, groundwater is able to enter the basements of those buildings. TEPCO intentionally keeps the level of the water in the basements (the water pumped in to cool the reactors plus the water leaking in) lower than the water table on the outside of the basements so that it is easier for the groundwater to flow in than for the contaminated water to flow out. The groundwater that enters into the basement accounts for the approximately 400 tons/day more water that TEPCO pumps out of the basements than it pumps in in order to cool the reactors. Once the groundwater is in the basement, it mixes with the now-contaminated cooling water.

Some of the contaminated water leaks out of the basements into the soil and the groundwater, despite the outside water table being higher. This contaminated water includes radioactive cesium, strontium, and tritium. Cesium moves very slowly in groundwater, since the soil adsorbs (holds on its surface) the Cesium. Strontium is adsorbed less than cesium and moves faster, while tritium remains with the groundwater as it flows toward the harbor. As will be discussed below, TEPCO has plans to impede the flow of groundwater.

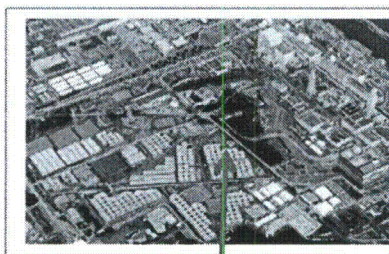
### **Accident water left in trenches**

A second source of ocean contamination may be the trenches, U shaped concrete tunnels where pipes and electrical cables run between the sea water pumps and the turbine buildings. These trenches flooded during the accident on March 11, 2011. The Unit One trench was flooded with tsunami water and contains very little radioactivity. The Unit Two trench was flooded with highly contaminated accident water. Until the recent increase in the radioactivity measured in the harbor near the trench, TEPCO had believed the water in the unit 2 trench was contained. On Aug. 30, 2013, TEPCO pumped the water from the unit 2 trench to the turbine building basement and will continue monitoring to determine if this arrests the increasing release of radioactive materials to the Fukushima harbor.

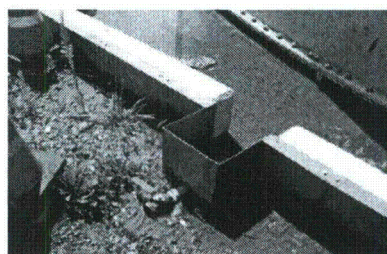


### **Leaking storage tanks containing highly contaminated water**

The storage tanks holding the excess, contaminated water pumped out of the reactor building are also a concern. One of those tanks, Tank No. 5, leaked roughly 300 tons of highly contaminated water through an open berm drain valve to the surrounding soil. TEPCO is digging up soil to determine the extent of water migration and inspecting other tanks to determine if there are other leaks. The Japanese Nuclear Regulatory Authority (JNRA) declared this event a level 3, serious incident, on the International Nuclear and Radiological Event Scale based on the amount of radioactive material released from the storage tank. The Japan Nuclear Regulatory Authority released a public report on September 5, 2013, in which they describe the current situation of contaminated water leakage and possible issues with the storage tanks. The report may be found here: <http://www.nsr.go.jp/english/index.html#Highlights>. The tank farm's radioactive strontium levels represent a very significant potential contamination source, so Japanese officials are developing a system to remove the strontium from the stored water.



No. 5 Tank



Berm

### **What is being done to address the situation?**

TEPCO and the government of Japan are taking several actions to address the issues. The utility is trying to limit the flow of water to the ocean. They have pumped the highly contaminated water out of the potentially leaking trench. They are inspecting the other storage tanks to determine if there are any other leaks. They also have plans to remove the radioactivity from the stored water, but the system is not yet operational.

To limit the flow of water to the ocean, they are completing a steel wall at the edge of the harbor to block ground water. They are also injecting sodium silicate (liquid glass) into the soil to form an additional groundwater-blocking wall. Water trapped behind these walls will be pumped out and treated to limit the amount of radioactive contamination reaching the ocean. TEPCO plans to start operation of a ground water bypass system to pump up ground water before it reaches the reactor buildings/turbine buildings and pump it directly to the ocean. TEPCO plans to restart a sub drain system to pump and treat ground water from directly below the turbine buildings. There are also plans to construct, with Japanese Government support, a subterranean frozen soil wall around Units 1 through 4 to prevent ground water from mixing with highly contaminated water in the reactor building/turbine building basements.

An Advanced Liquid Processing System (ALPS) is being built that will remove all the radioactive elements except tritium from the highly contaminated water that is being stored in the tanks. This system will be able to process 750 tons of water per day and is currently expected to start operating in 2015.

### **What is the United States doing?**

The NRC continues to regularly discuss the situation with JNRA (Japanese Nuclear Regulatory Authority) and TEPCO, and stands ready to support JNRA if asked. In addition, the NRC is communicating routinely with other federal and state agencies.

The Department of Energy has been providing assistance to the government of Japan since 2011. For more information on their activities, please see <http://energy.gov/em/articles/em-leads-successful-workshop-supporting-fukushima-cleanup>.

The Food and Drug Administration (FDA) monitors the safety of FDA-regulated food, including seafood. For more information, please see: <http://www.fda.gov/newsevents/publichealthfocus/ucm247403.htm>.

NOAA (National Oceanic and Atmospheric Administration) is responsible for modeling and monitoring the movement of marine debris related to the tsunami in Japan. The NOAA Marine Debris Program is working with federal, state, and local partners to collect data, assess the debris, and reduce possible impacts to our natural resources and coastal communities. For more information, please visit <http://marinedebris.noaa.gov/tsunamidebris/>.

The Environmental Protection Agency (EPA) continues to monitor the situation and interface with other federal agencies. For EPA's RadNet program, which monitors radioactivity levels in the environment, please see <http://www.epa.gov/radnet/>.

### **Where can I go to get more information?**

In addition to the websites above, you may get information from the English-language versions of two Japanese government websites:

Japanese Nuclear Regulatory Authority-  
<http://www.nsr.go.jp/english/>

Japan's Ministry of Economy, Trade, and Industry  
<http://www.meti.go.jp/english/>

Links to Publicly Available Documents Relating to the  
Confinement of Groundwater and Radioactive Water  
at the Fukushima Dai-ichi Power Plants  
(as of 12/30/2013)

**Fukushima Information Portal**

<https://fdada.info/index>

Best organized collection of TEPCO documents in English. This page contains current and historical TEPCO documents, presentations, and photos. Specifically,

- ***Reduce radioactivity dosage and mitigate sea water contamination***  
<https://fdada.info/currentstatus/decommissioning-3>
- ***Improvement of site environment for facilitation of work***  
<https://fdada.info/currentstatus/decommissioning-7>

**TEPCO, Measures for Water Leakage**

<http://www.tepco.co.jp/en/nu/fukushima-np/water/index-e.html>

This page contains current TEPCO presentations, photos, and videos (in English).

**TEPCO, Photos and Videos Library, Mitigation of Radioactive Materials**

<http://photo.tepco.co.jp/en/cat1/03-e.html>

This page contains current and historical photos and links to associated presentations.

**GoJ, Prime Minister's Inter-Ministerial Council for Contaminated Water and Decommissioning Issues**

[http://www.kantei.go.jp/foreign/96\\_abe/decisions/2013/osensui\\_e.html](http://www.kantei.go.jp/foreign/96_abe/decisions/2013/osensui_e.html)

This page contains overviews of policy information on contaminated water issues (no presentations).

**GoJ/METI, Mid-and-Long-Term Roadmap towards the Decommissioning of TEPCO's Fukushima Daiichi Nuclear Power Station Units 1-4**

<http://www.meti.go.jp/english/earthquake/nuclear/decommissioning/index.html>

This webpage is a subset of a large collection of GoJ-generated documents. This page contains current and historical documents, press releases, and presentations relating to the decommissioning Roadmap. Note that the Roadmap towards decommissioning replaced the Roadmap towards restoration in December 2011. Specifically,

- ***Contaminated Water Issue***: for current information  
<http://www.meti.go.jp/english/earthquake/nuclear/decommissioning/index.html#cw>
- ***Mid-and-Long-Term Roadmap*** (towards Decommissioning): for historical information  
<http://www.meti.go.jp/english/earthquake/nuclear/decommissioning/index.html#roadmap>

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- **Progress Status Reports (monthly)**: provides the monthly progress status and future challenges of mid-and-long-term Roadmap towards decommissioning  
[http://www.meti.go.jp/english/earthquake/nuclear/decommissioning/index.html#progress\\_status](http://www.meti.go.jp/english/earthquake/nuclear/decommissioning/index.html#progress_status)

**GoJ/METI, Roadmap for Immediate Actions for the Verification of and Restoration from the Accident at Fukushima Dai-ichi Nuclear Power Station, TEPCO**

<http://www.meti.go.jp/english/earthquake/nuclear/roadmap/restoration.html>

This page contains historical documents and presentations relating to the restoration Roadmap. Note that the Roadmap towards decommissioning replaced the Roadmap towards restoration in December 2011.

**TEPCO, Mid-and-long-Term Roadmap towards the Decommissioning of Fukushima Daiichi Nuclear Power Units 1-4**

<http://www.tepco.co.jp/en/nu/fukushima-np/roadmap/conference-e.html>

This page contains most (all) document's and presentations provided in the GoJ/METI webpages relating to the roadmaps (decommissioning and restorations), in addition to other TEPCO presentations.

**Japan Nuclear Regulatory Authority (NRA) Working Group on Contaminated Water Countermeasures of the Supervision and Evaluation Committee for the Specified Nuclear Power Facilities**

[http://www.nsr.go.jp/committee/yuushikisya/tokutei\\_kanshi\\_wg/](http://www.nsr.go.jp/committee/yuushikisya/tokutei_kanshi_wg/)

This page contains presentations before the NRA working group (in Japanese only).

**International Research Institute for Nuclear Decommissioning**

<http://www.irid.or.jp/en/index.html>

Specifically,

- **Request For Information for Addressing the Contaminated Water Issue**  
<http://irid.or.jp/cw/>

**IAEA, Fukushima Nuclear Accident**

<http://www.iaea.org/newscenter/focus/fukushima/>

This webpage contains IAEA documents and presentations made by Japanese delegations at IAEA-sponsored meetings and workshops. Specifically,

- IAEA International Peer Review Mission on Mid-and-Long-Term Roadmap Towards Decommissioning of TEPCO's Fukushima Daiichi Nuclear Power Station Units 1-4 (25 November-4 December 2013), Preliminary Summary Report, 4 December 2013  
<http://www.iaea.org/newscenter/focus/fukushima/missionreport041213.pdf>

- IAEA International Peer Review Mission on Mid-and-Long-Term Roadmap Towards Decommissioning of TEPCO's Fukushima Daiichi Nuclear Power Station Units 1-4 (15-22 April 2013), Mission Report, 23 May 2013  
<http://www.iaea.org/newscenter/focus/fukushima/missionreport230513.pdf>
- Fukushima Ministerial Conference on Nuclear Safety (15-17 December 2012), IAEA Board Report, 6 February 2013  
<http://www.iaea.org/Publications/Documents/Board/2013/govinf2013-2.pdf>
- International Experts' Meeting to Discuss Post-Accident Decommissioning and Remediation, 28 January - 1 February 2013, Vienna, Austria (Presentations)  
<http://www.iaea.org/newscenter/news/2013/postaccident.html>
- The Fukushima Ministerial Conference on Nuclear Safety, 15–17 December 2012, Fukushima Prefecture, Japan (Presentations)  
<http://www.iaea.org/newscenter/news/2012/fukushconference.html>
- International Symposium on Decommissioning of TEPCO's Fukushima Daiichi Nuclear Power Plant Unit 1-4, March 14, 2012, Tokyo, Japan (with GoJ, TEPCO) (Presentations)  
[http://www.meti.go.jp/english/earthquake/nuclear/decommissioning/20120315\\_01.html](http://www.meti.go.jp/english/earthquake/nuclear/decommissioning/20120315_01.html)

## TEPCO Documents Regarding Water Confinement Issues (as of 12/19/2013)

### Fourth On-Site Coordination Meeting on Contaminated Water Issues (12/12/2013)

- 12/12/2013 1. Status of Onsite Work Related to Contaminated Water Issues  
(only in Japanese)  
[http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/l131212\\_03-j.pdf](http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/l131212_03-j.pdf)
- 12/12/2013 2. Status of Measures on Contaminated Water Issues  
(only in Japanese)  
[http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/l131212\\_05-j.pdf](http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/l131212_05-j.pdf)
- 12/12/2013 3. Water Leakage Monitoring by Radiation Detection by Plastic Scintillation Fiber  
(only in Japanese)  
[http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/l131212\\_06-j.pdf](http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/l131212_06-j.pdf)
- 12/12/2013 4. Reinforcing Project Management Capability  
(only in Japanese)  
[http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/l131212\\_07-j.pdf](http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/l131212_07-j.pdf)

### Eleventh Gov't Meeting on Contaminated Water Issues (12/6/2013)

- 12/06/2013 1. Preventive and Multi-layered Measures for Contaminated Water Issues (summary)  
(only in Japanese)  
[http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/c131210\\_03-j.pdf](http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/c131210_03-j.pdf)
- 12/06/2013 2. Preventive and Multi-layered Measures for Contaminated Water Issues (full report: 105 MB file)  
(only in Japanese)  
[http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/c131210\\_04-j.pdf](http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/c131210_04-j.pdf)
- 12/06/2013 3. Groundwater Flow Model by JAEA  
(only in Japanese)  
[http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/c131210\\_05-j.pdf](http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/c131210_05-j.pdf)
- 12/06/2013 4. IAEA Press Release on Completion of Peer Review of Decommissioning Plan  
[http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/c131210\\_06-j.pdf](http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/c131210_06-j.pdf)
- 12/06/2013 5. IAEA Preliminary Summary Report on Peer Review of Decommissioning Plan  
[http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/c131210\\_07-j.pdf](http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/c131210_07-j.pdf)
- 12/06/2013 6. Establishment of Task Force on Tritiated Water  
(only in Japanese)  
[http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/c131210\\_09-j.pdf](http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/c131210_09-j.pdf)

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**Tenth Gov't Meeting on Contaminated Water Issues (12/3/2013)**

- 12/03/2013 1. Preventive and Multi-layered Measures for Contaminated Water Issues (English Summary)  
[http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/c131203\\_04-j.pdf](http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/c131203_04-j.pdf)
- 12/03/2013 2. Preventive and Multi-layered Measures for Contaminated Water Issues (Full Document)  
(only in Japanese)  
[http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/c131203\\_06-j.pdf](http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/c131203_06-j.pdf)

**Tenth Working-level Meeting of Council on Promotion of 1F Decommissioning (11/28/2013)**

- 11/28/2013 1. Plant Status  
(only in Japanese)  
[http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/d131128\\_04-j.pdf](http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/d131128_04-j.pdf)  
(page 5/15) Water Storage Status
- 11/28/2013 2. Summary Status of Roadmap  
(only in Japanese)  
[http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/d131128\\_05-j.pdf](http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/d131128_05-j.pdf)
- 11/28/2013 3. Status of Individual Projects  
(only in Japanese)  
[http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/d131128\\_06-j.pdf](http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/d131128_06-j.pdf)  
(page 61/242-71/242) Processing Contaminated Water in Units 2 and 3 Seawater Piping Trench
- 11/28/2013 4. R&D Activities of International Research Institute for Nuclear Decommissioning (IRID)  
(only in Japanese)  
[http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/d131128\\_07-j.pdf](http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/d131128_07-j.pdf)

**Ninth Gov't-TEPCO Meeting on Contaminated Water Issues (11/15/2013)**

- 11/15/2013 1. Update from Subgroups  
(only in Japanese)  
[http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/c131115\\_04-j.pdf](http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/c131115_04-j.pdf)
- 11/15/2013 2. Proposals in Response to Request for Information Regarding Contaminated Water Issues  
(only in Japanese)  
[http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/c131115\\_05-j.pdf](http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/c131115_05-j.pdf)
- 11/15/2013 3. Report from TEPCO  
(only in Japanese)  
[http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/c131115\\_06-j.pdf](http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/c131115_06-j.pdf)

**Third On-Site Coordination Meeting on Contaminated Water Issues (11/11/2013)**

- 11/11/2013 1. Status of Onsite Work Related to Contaminated Water Issues  
(only in Japanese)

[http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/l131111\\_03-j.pdf](http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/l131111_03-j.pdf)

11/11/2013

2. Issues Management List  
(only in Japanese)

[http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/l131111\\_05-j.pdf](http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/l131111_05-j.pdf)

11/08/2013

**Urgent Safety Measures at Fukushima Daiichi (11/8/2013)**

(only in Japanese)

[http://www.tepco.co.jp/cc/press/betu13\\_j/images/131108j0102.pdf](http://www.tepco.co.jp/cc/press/betu13_j/images/131108j0102.pdf)

(page 11/34 to 16/34) Measures against rainwater

(page 17/34 to 22/34) Cause and measures for tank water leakage

10/31/2013

**Ninth Working-level Meeting of Gov't-TEPCO-Industry Council on Promotion of 1F Decommissioning (10/31/2013)**

1. Plant Status

(only in Japanese)

[http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/d131031\\_04-j.pdf](http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/d131031_04-j.pdf)

10/31/2013

2. Summary Status of Roadmap

(only in Japanese)

[http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/d131031\\_05-j.pdf](http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/d131031_05-j.pdf)

10/31/2013

3. Status of Individual Projects

(only in Japanese)

[http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/d131031\\_06-j.pdf](http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/d131031_06-j.pdf)

(page 50/232) Managing rainwater in weir of tank farms

(page 61/232) Ice wall plan

10/25/2013

**Eighth Gov't-TEPCO Meeting on Contaminated Water Issues (10/25/2013)**

1. Overview of Contaminated Water-Related Risks and Actions to be Summarized by Year-end

(only in Japanese)

[http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/c131025\\_03-j.pdf](http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/c131025_03-j.pdf)

10/25/2013

2. Seven Hundred Seventy Nine Responses to Request for Information on Contaminated Water Issues

(only in Japanese)

[http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/c131025\\_04-j.pdf](http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/c131025_04-j.pdf)

10/25/2013

3. On-site Efforts

(only in Japanese)

[http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/l131009\\_05-j.pdf](http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/l131009_05-j.pdf)

10/15/2013

**Eighth NRA Working Group Meeting on Contaminated Water Issues (10/15/2013)**

1. Investigation Status on Groundwater Contamination Near Bank Protection

[http://www.nsr.go.jp/committee/yuushikisya/tokutei\\_kanshi\\_wg/data/0008\\_01.pdf](http://www.nsr.go.jp/committee/yuushikisya/tokutei_kanshi_wg/data/0008_01.pdf)



(only in Japanese)

10/15/2013 2. Investigation Status on Leakage from Partially-treated Water Tank  
[http://www.nsr.go.jp/committee/yuushikisya/tokutei\\_kanshi\\_wg/data/0008\\_02.pdf](http://www.nsr.go.jp/committee/yuushikisya/tokutei_kanshi_wg/data/0008_02.pdf)  
(only in Japanese)

10/15/2013 3. Tentative Dischargeable Contamination Level  
(only in Japanese)  
[http://www.nsr.go.jp/committee/yuushikisya/tokutei\\_kanshi\\_wg/data/0008\\_05.pdf](http://www.nsr.go.jp/committee/yuushikisya/tokutei_kanshi_wg/data/0008_05.pdf)

**Ninth Working-level Meeting of Gov't-TEPCO-Industry Council on Promotion of 1F Decommissioning (10/31/2013)**

10/31/2013 1. Plant Status  
(only in Japanese)  
[http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/d131031\\_04-j.pdf](http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/d131031_04-j.pdf)

10/31/2013 2. Summary Status of Roadmap  
(only in Japanese)  
[http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/d131031\\_05-j.pdf](http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/d131031_05-j.pdf)

10/31/2013 3. Status of Individual Projects  
(only in Japanese)  
[http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/d131031\\_06-j.pdf](http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/d131031_06-j.pdf)  
(page 50/232) Managing rainwater in weir of tank farms  
(page 61/232) Ice wall plan

10/08/2013 **Leak Paths Identified at Bottom of H4 Area Tank #5 (10/8/2013)**  
(only in Japanese)  
[http://www.tepco.co.jp/nu/fukushima-np/handouts/2013/images/handouts\\_131008\\_03-j.pdf](http://www.tepco.co.jp/nu/fukushima-np/handouts/2013/images/handouts_131008_03-j.pdf)

**Second On-Site Coordination Meeting on Contaminated Water Issues (10/9/2013)**

10/09/2013 1. Current Status Regarding H4 Area Tank Leakage Detection, Seawater/Groundwater Contamination, Emergency Measures, ALPS, Subdrain System  
(only in Japanese)  
[http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/l131009\\_03-j.pdf](http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/l131009_03-j.pdf)

10/09/2013 2. Revamping Contaminated Water Management  
(only in Japanese)  
[http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/l131009\\_04-j.pdf](http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/l131009_04-j.pdf)

10/09/2013 3. Contaminated Water Issues, Countermeasures and Progress  
(only in Japanese)  
[http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/l131009\\_05-j.pdf](http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/l131009_05-j.pdf)

**Seventh NRA Working Group Meeting on Contaminated Water Issues (9/30/2013)**

- 09/30/2013 1. Investigation Status on Leakage from Partially-treated Water Tank  
(only in Japanese)  
[http://www.nsr.go.jp/committee/yuushikisya/tokutei\\_kanshi\\_wg/data/0007\\_01.pdf](http://www.nsr.go.jp/committee/yuushikisya/tokutei_kanshi_wg/data/0007_01.pdf)
- 09/30/2013 2. Investigation Status on Groundwater Contamination Near Bank Protection  
(only in Japanese)  
[http://www.nsr.go.jp/committee/yuushikisya/tokutei\\_kanshi\\_wg/data/0007\\_02.pdf](http://www.nsr.go.jp/committee/yuushikisya/tokutei_kanshi_wg/data/0007_02.pdf)
- 09/30/2013 3. Glitch Found in Train C of ALPS  
(only in Japanese)  
[http://www.nsr.go.jp/committee/yuushikisya/tokutei\\_kanshi\\_wg/data/0007\\_03.pdf](http://www.nsr.go.jp/committee/yuushikisya/tokutei_kanshi_wg/data/0007_03.pdf)

**Current Status and Countermeasures Against Contaminated Water Issues (9/30/2013)**

- 09/30/2013 1. Summary  
[http://www.tepco.co.jp/en/nu/fukushima-np/water/images/130930\\_01.pdf](http://www.tepco.co.jp/en/nu/fukushima-np/water/images/130930_01.pdf)
- 09/30/2013 2. Fundamental Measures  
[http://www.tepco.co.jp/en/nu/fukushima-np/water/images/130930\\_02.pdf](http://www.tepco.co.jp/en/nu/fukushima-np/water/images/130930_02.pdf)
- 09/30/2013 3. Emergency Measures  
[http://www.tepco.co.jp/en/nu/fukushima-np/water/images/130930\\_03.pdf](http://www.tepco.co.jp/en/nu/fukushima-np/water/images/130930_03.pdf)
- 09/30/2013 4. Current Status of H4 Area Tank #5 Leakage  
[http://www.tepco.co.jp/en/nu/fukushima-np/water/images/130930\\_04.pdf](http://www.tepco.co.jp/en/nu/fukushima-np/water/images/130930_04.pdf)
- 09/30/2013 5. Risk Reduction Measures  
[http://www.tepco.co.jp/en/nu/fukushima-np/water/images/130930\\_05.pdf](http://www.tepco.co.jp/en/nu/fukushima-np/water/images/130930_05.pdf)

**Eighth Working-level Meeting of Gov't-TEPCO-Industry Council on Promotion of 1F Decommissioning (9/26/2013)**

- 09/26/2013 1. Plant Status  
(only in Japanese)  
[http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/d130926\\_04-j.pdf](http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/d130926_04-j.pdf)
- 09/26/2013 2. Summary Status of Roadmap  
(only in Japanese)  
[http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/d130926\\_05-j.pdf](http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/d130926_05-j.pdf)
- 09/26/2013 3. Status of Individual Projects  
(only in Japanese)  
[http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/d130926\\_07-j.pdf](http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/d130926_07-j.pdf)

**Seventh Gov't-TEPCO Meeting on Contaminated Water Issues (9/27/2013)**

- 09/27/2013 1. Identification of Risks Related to Contaminated Water and Examination of Countermeasures  
(only in Japanese)  
[http://www.meti.go.jp/english/earthquake/nuclear/decommissioning/pdf/20130927\\_001a.pdf](http://www.meti.go.jp/english/earthquake/nuclear/decommissioning/pdf/20130927_001a.pdf)
- 09/27/2013 2. On-site Progress Related to Contaminated Water Issues  
(only in Japanese)  
[http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/c130927\\_05-j.pdf](http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/c130927_05-j.pdf)
- 09/19/2013 **H4 Area Tank #5 being Dismantled (9/19/21013)**  
(only in Japanese)  
[http://www.tepco.co.jp/nu/fukushima-np/handouts/2013/images/handouts\\_130919\\_04-j.pdf](http://www.tepco.co.jp/nu/fukushima-np/handouts/2013/images/handouts_130919_04-j.pdf)
- 09/19/2013 **Response to Prime Minister's Requests Regarding Actions Related to Contaminated Water Issues (9/19/2013)**  
[http://www.tepco.co.jp/en/press/corp-com/release/2013/1230730\\_5130.html](http://www.tepco.co.jp/en/press/corp-com/release/2013/1230730_5130.html)
- 09/12/2013 **Sixth NRA Working Group Meeting on Contaminated Water Issues (9/12/2013)**  
1. Investigation Status on Leakage from Partially-treated Water Tank  
(only in Japanese)  
[http://www.nsr.go.jp/committee/yuushikisya/tokutei\\_kanshi\\_wg/data/0006\\_05r.pdf](http://www.nsr.go.jp/committee/yuushikisya/tokutei_kanshi_wg/data/0006_05r.pdf)
- 09/12/2013 2. Investigation Status on Groundwater Contamination Near Bank Protection  
(only in Japanese)  
[http://www.nsr.go.jp/committee/yuushikisya/tokutei\\_kanshi\\_wg/data/0006\\_06.pdf](http://www.nsr.go.jp/committee/yuushikisya/tokutei_kanshi_wg/data/0006_06.pdf)
- 09/13/2013 **Sixth Gov't-TEPCO Meeting on Contaminated Water Issues (9/13/2013)**  
1. Framework for Worldwide Technology Solicitation Through IRID  
(only in Japanese)  
[http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/c130913\\_04-j.pdf](http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/c130913_04-j.pdf)
- 09/13/2013 2. Examples of Technologies Subject to Solicitation Through IRID  
(only in Japanese)  
[http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/c130913\\_05-j.pdf](http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/c130913_05-j.pdf)
- 09/13/2013 3. Fundamental Countermeasures for Contaminated Water Issues  
(only in Japanese)  
[http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/c130913\\_07-j.pdf](http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/c130913_07-j.pdf)
- 09/13/2013 4. Investigation Status on Leakage from Partially-treated Water Tank  
(only in Japanese)  
[http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/c130913\\_08-j.pdf](http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/c130913_08-j.pdf)
- 09/13/2013 5. Investigation Status on Groundwater Contamination Near Bank Protection  
(only in Japanese)

[http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/c130913\\_09-j.pdf](http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/c130913_09-j.pdf)

- 09/13/2013      **6. METI Minister Motegi's Presentation on Basic Policy for Decommissioning and Contaminated Water Issues (only in Japanese)**  
[http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/c130913\\_13-j.pdf](http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/c130913_13-j.pdf)
- 09/13/2013      **History of Studies Related to Implementation of Underground Barrier (9/13/2013)**  
(only in Japanese)  
[http://www.tepco.co.jp/nu/fukushima-np/handouts/2013/images/handouts\\_130913\\_06-j.pdf](http://www.tepco.co.jp/nu/fukushima-np/handouts/2013/images/handouts_130913_06-j.pdf)
- 09/13/2013      **Overview of Contaminated Water Issues and Countermeasures (9/13/2013)**  
[http://www.tepco.co.jp/en/nu/fukushima-np/handouts/2013/images/handouts\\_130913\\_01-e.pdf](http://www.tepco.co.jp/en/nu/fukushima-np/handouts/2013/images/handouts_130913_01-e.pdf)
- 09/17/2013      **Accumulated Rainwater Discharged from Dam Surrounding Partially-treated Contaminated Water Tanks (9/17/2013)**  
<http://www.tepco.co.jp/en/nu/fukushima-np/water/13091701-e.html>
- 09/18/2013      **Radioactivity in Water Samples from Various Locations of Water Treatment System (9/18/2013)**  
[http://www.tepco.co.jp/en/nu/fukushima-np/f1/smp/2013/images/water\\_130918-e.pdf](http://www.tepco.co.jp/en/nu/fukushima-np/f1/smp/2013/images/water_130918-e.pdf)
- 09/19/2013      **H4 Area Tank #5 being Dismantled (9/19/2013)**  
(only in Japanese)  
[http://www.tepco.co.jp/nu/fukushima-np/handouts/2013/images/handouts\\_130919\\_04-j.pdf](http://www.tepco.co.jp/nu/fukushima-np/handouts/2013/images/handouts_130919_04-j.pdf)
- 09/19/2013      **Response to Prime Minister's Requests Regarding Actions Related to Contaminated Water Issues (9/19/2013)**  
[http://www.tepco.co.jp/en/press/corp-com/release/2013/1230730\\_5130.html](http://www.tepco.co.jp/en/press/corp-com/release/2013/1230730_5130.html)
- 09/06/2013      **Installation of Water Level Monitoring System in Tank Farms (9/6/2013)**  
[http://www.tepco.co.jp/en/nu/fukushima-np/handouts/2013/images/handouts\\_130906\\_09-e.pdf](http://www.tepco.co.jp/en/nu/fukushima-np/handouts/2013/images/handouts_130906_09-e.pdf)
- 09/12/2013      **Investigation of Partially-Treated Contaminated Water Leakage from H4 Area Tank (9/12/2013)**  
(only in Japanese)  
[http://www.tepco.co.jp/nu/fukushima-np/handouts/2013/images/handouts\\_130912\\_05-j.pdf](http://www.tepco.co.jp/nu/fukushima-np/handouts/2013/images/handouts_130912_05-j.pdf)
- 09/12/2013      **Status of Groundwater Contamination Near Bank Protection and Countermeasures (9/12/2013)**  
(only in Japanese)  
[http://www.tepco.co.jp/nu/fukushima-np/handouts/2013/images/handouts\\_130912\\_06-j.pdf](http://www.tepco.co.jp/nu/fukushima-np/handouts/2013/images/handouts_130912_06-j.pdf)
- 09/12/2013      **Radioactivity in H4 Area #5 Tank (9/12/2013)**  
[http://www.tepco.co.jp/en/nu/fukushima-np/f1/smp/2013/images/south\\_discharge\\_130912-2-e.pdf](http://www.tepco.co.jp/en/nu/fukushima-np/f1/smp/2013/images/south_discharge_130912-2-e.pdf)
- 09/11/2013      **Gross-beta and Tritium Detected from Groundwater Near Leakage from H4 Area Tank (9/11/2013)**  
[http://www.tepco.co.jp/en/nu/fukushima-np/f1/smp/2013/images/south\\_discharge\\_130911-3-e.pdf](http://www.tepco.co.jp/en/nu/fukushima-np/f1/smp/2013/images/south_discharge_130911-3-e.pdf)

09/10/2013 **Mr. Lake Barrett to Advise TEPCO on Contaminated Water Issues (9/10/2013)**  
[http://www.tepco.co.jp/en/press/corp-com/release/2013/1230443\\_5130.html](http://www.tepco.co.jp/en/press/corp-com/release/2013/1230443_5130.html)

09/09/2013 **Current Status on Contaminated Water Issues (9/9/2013)**  
(only in Japanese)  
[http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/1130909\\_04-j.pdf](http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/1130909_04-j.pdf)

09/04/2013 **Groundwater Inflow Location Identified at Unit 1 Turbine Building and HTI Building (9/4/2013)**  
[http://www.tepco.co.jp/en/nu/fukushima-np/handouts/2013/images/handouts\\_130904\\_07-e.pdf](http://www.tepco.co.jp/en/nu/fukushima-np/handouts/2013/images/handouts_130904_07-e.pdf)

09/04/2013 1. Video Clip (Turbine Building)  
<http://www.tepco.co.jp/en/news/library/movie-01e.html?bcpid=59368209002&bclid=347242463002&bctid=590448354002>

09/04/2013 2. Video Clip (HTI Building)  
<http://www.tepco.co.jp/en/news/library/movie-01e.html?bcpid=59368209002&bclid=347242463002&bctid=590448355002>

09/04/2013 **Highly Contaminated Water Storage and Treatment Status (9/4/2013)**  
[http://www.tepco.co.jp/en/press/corp-com/release/betu13\\_e/images/130904e0301.pdf](http://www.tepco.co.jp/en/press/corp-com/release/betu13_e/images/130904e0301.pdf)

**Contaminated Groundwater Issues Near the Port**

08/30/2013 1. Status on Contaminated Groundwater Issues and Estimate of Sr/Cs Leakage into Sea (8/30/2013)  
(only in Japanese)  
[http://www.nsr.go.jp/committee/yuushikisya/tokutei\\_kanshi\\_wg/data/0005\\_01.pdf](http://www.nsr.go.jp/committee/yuushikisya/tokutei_kanshi_wg/data/0005_01.pdf)

09/04/2013 2. Latest and Highest Results of Groundwater Contamination Near the Port (9/4/2013)  
[http://www.tepco.co.jp/en/nu/fukushima-np/f1/smp/2013/images/2tb-east\\_13090403-e.pdf](http://www.tepco.co.jp/en/nu/fukushima-np/f1/smp/2013/images/2tb-east_13090403-e.pdf)

**Partially-Treated Contaminated Water Leakage from Tanks**

08/30/2013 1. Status on Partially-Treated Contaminated Water Leakage from H4 Area Tank (8/30/2013)  
(only in Japanese)  
[http://www.nsr.go.jp/committee/yuushikisya/tokutei\\_kanshi\\_wg/data/0005\\_02.pdf](http://www.nsr.go.jp/committee/yuushikisya/tokutei_kanshi_wg/data/0005_02.pdf)

09/01/2013 2. The 1,800 mSv/h Dose Rate Observed Near Tank was Mostly Beta-Radiation (9/1/2013)  
[http://www.tepco.co.jp/en/announcements/2013/1230191\\_5502.html](http://www.tepco.co.jp/en/announcements/2013/1230191_5502.html)

09/02/2013 3. H3, 4, 5 Area Tank Patrol Results (9/2/2013)  
[http://www.tepco.co.jp/en/nu/fukushima-np/handouts/2013/images/handouts\\_130902\\_04-e.pdf](http://www.tepco.co.jp/en/nu/fukushima-np/handouts/2013/images/handouts_130902_04-e.pdf)

09/02/2013 4. H3 Area Tank Patrol Results (9/2/2013)  
[http://www.tepco.co.jp/en/nu/fukushima-np/handouts/2013/images/handouts\\_130902\\_05-e.pdf](http://www.tepco.co.jp/en/nu/fukushima-np/handouts/2013/images/handouts_130902_05-e.pdf)

09/04/2013 5. Video Clip of Tank Patrol (9/4/2013)  
<http://photo.tepco.co.jp/en/date/2013/201309-e/130904-01e.html>

- 09/05/2013 6. Contamination Survey Results Related to H4 Area Tank Leakage (9/5/2013)  
[http://www.tepco.co.jp/en/nu/fukushima-np/f1/smp/2013/images/south\\_discharge\\_130905-1-e.pdf](http://www.tepco.co.jp/en/nu/fukushima-np/f1/smp/2013/images/south_discharge_130905-1-e.pdf)
- 09/05/2013 7. Possible Groundwater Contamination Due to H4 Area Tank Leakage (9/5/2013)  
[http://www.tepco.co.jp/en/press/corp-com/release/2013/1230333\\_5130.html](http://www.tepco.co.jp/en/press/corp-com/release/2013/1230333_5130.html)
- 09/05/2013 8. Effective Shielding of Beta-Radiation at H3 Area Tank (9/5/2013)  
(only in Japanese)  
[http://www.tepco.co.jp/nu/fukushima-np/handouts/2013/images/handouts\\_130905\\_01-j.pdf](http://www.tepco.co.jp/nu/fukushima-np/handouts/2013/images/handouts_130905_01-j.pdf)
- 09/03/2013 **Presentations on Contaminated Water Issues to the Local Fisheries Association (9/3/2013)**  
(only in Japanese)  
[http://www.tepco.co.jp/nu/fukushima-np/handouts/2013/images/handouts\\_130903\\_04-j.pdf](http://www.tepco.co.jp/nu/fukushima-np/handouts/2013/images/handouts_130903_04-j.pdf)  
[http://www.tepco.co.jp/nu/fukushima-np/handouts/2013/images/handouts\\_130903\\_03-j.pdf](http://www.tepco.co.jp/nu/fukushima-np/handouts/2013/images/handouts_130903_03-j.pdf)  
[http://www.tepco.co.jp/nu/fukushima-np/handouts/2013/images/handouts\\_130903\\_01-j.pdf](http://www.tepco.co.jp/nu/fukushima-np/handouts/2013/images/handouts_130903_01-j.pdf)  
[http://www.tepco.co.jp/nu/fukushima-np/handouts/2013/images/handouts\\_130903\\_02-j.pdf](http://www.tepco.co.jp/nu/fukushima-np/handouts/2013/images/handouts_130903_02-j.pdf)
- 09/03/2013 **Government Announces "Basic Policy on Contaminated Water Issues" (9/3/2013)**  
[http://www.meti.go.jp/english/earthquake/nuclear/decommissioning/pdf/20130904\\_01a.pdf](http://www.meti.go.jp/english/earthquake/nuclear/decommissioning/pdf/20130904_01a.pdf)
- 08/29/2013 **Seventh Working-level Meeting of Gov't-TEPCO-Industry Council on Promotion of 1F Decommissioning (8/29/2013)**
- 08/29/2013 1. Plant Status  
(only in Japanese)  
[http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/d130829\\_04-j.pdf](http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/d130829_04-j.pdf)
- 08/29/2013 2. Summary Status of Roadmap  
(only in Japanese)  
[http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/d130829\\_05-j.pdf](http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/d130829_05-j.pdf)
- 08/29/2013 3. Status of Individual Projects  
(only in Japanese)  
[http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/d130829\\_06-j.pdf](http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/d130829_06-j.pdf)
- 08/29/2013 4. Establishment of International Research Institute for Nuclear Decommissioning (IRID)  
(only in Japanese)  
[http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/d130829\\_08-j.pdf](http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/d130829_08-j.pdf)
- 08/28/2013 **NRA Revises INES Scale to 3 for H4 Area Tank Water Leakage Event (8/28/2013)**  
(only in Japanese)  
<http://www.nsr.go.jp/activity/bousai/trouble/20130828-1.html>
- 08/28/2013 1. IAEA's Comments Regarding Applicability of INES to This Event

<http://www.nsr.go.jp/activity/bousai/trouble/data/20130828-1.pdf>

- 08/27/2013 **Status on Partially-Treated Contaminated Water Leakage from H4 Area Tank (8/27/2013)**  
(only in Japanese)  
[http://www.tepco.co.jp/nu/fukushima-np/handouts/2013/images/handouts\\_130827\\_04-j.pdf](http://www.tepco.co.jp/nu/fukushima-np/handouts/2013/images/handouts_130827_04-j.pdf)
- 08/27/2013 **Status on Contaminated Groundwater Issues and Estimate of Sr/Cs Leakage into Sea (8/27/2013)**  
(only in Japanese)  
[http://www.tepco.co.jp/nu/fukushima-np/handouts/2013/images/handouts\\_130827\\_05-j.pdf](http://www.tepco.co.jp/nu/fukushima-np/handouts/2013/images/handouts_130827_05-j.pdf)
- 08/26/2013 **Establishment of "Contaminated Water and Tank Task Force" and Risk Mitigation Actions (8/26/2013)**  
(only in Japanese)  
[http://www.tepco.co.jp/nu/fukushima-np/handouts/2013/images/handouts\\_130826\\_07-j.pdf](http://www.tepco.co.jp/nu/fukushima-np/handouts/2013/images/handouts_130826_07-j.pdf)
- 08/23/2013 **Sampling Results Along Potential Leakage Paths of Contaminated Water from H4 Area Tank (8/23/2013)**  
[http://www.tepco.co.jp/en/nu/fukushima-np/f1/smp/2013/images/south\\_discharge\\_130823-1e.pdf](http://www.tepco.co.jp/en/nu/fukushima-np/f1/smp/2013/images/south_discharge_130823-1e.pdf)
- 08/22/2013 **Summary Status and Countermeasures on Contaminated Groundwater Issues:  
Presented to the Local Fisheries Association (8/22/2013)**  
(only in Japanese)  
[http://www.tepco.co.jp/nu/fukushima-np/handouts/2013/images/handouts\\_130822\\_02-j.pdf](http://www.tepco.co.jp/nu/fukushima-np/handouts/2013/images/handouts_130822_02-j.pdf)  
[http://www.tepco.co.jp/nu/fukushima-np/handouts/2013/images/handouts\\_130822\\_03-j.pdf](http://www.tepco.co.jp/nu/fukushima-np/handouts/2013/images/handouts_130822_03-j.pdf)
- 08/22/2013 **Inspection Results of All Bolt-Fastened "Flange Type" Tanks (8/22/2013)**  
[http://www.tepco.co.jp/en/nu/fukushima-np/handouts/2013/images/handouts\\_130822\\_02-e.pdf](http://www.tepco.co.jp/en/nu/fukushima-np/handouts/2013/images/handouts_130822_02-e.pdf)
- 08/21/2013 **Status and Countermeasures on Contaminated Groundwater Issues: Presented to the NRA Working Group (8/21/2013)**  
(only in Japanese; 78 pages/10 MB file)  
[http://www.tepco.co.jp/nu/fukushima-np/handouts/2013/images/handouts\\_130821\\_10-j.pdf](http://www.tepco.co.jp/nu/fukushima-np/handouts/2013/images/handouts_130821_10-j.pdf)
- 08/21/2013 **Contaminated Water Leakage from H4 Area Tank (8/21/2013)**  
[http://www.tepco.co.jp/en/nu/fukushima-np/handouts/2013/images/handouts\\_130821\\_01-e.pdf](http://www.tepco.co.jp/en/nu/fukushima-np/handouts/2013/images/handouts_130821_01-e.pdf)
- 08/21/2013 **Contaminated Water Leakage from H4 Area Tank: Detailed Material Presented to the NRA Working Group (8/21/2013)**  
(only in Japanese)  
[http://www.tepco.co.jp/nu/fukushima-np/handouts/2013/images/handouts\\_130821\\_12-j.pdf](http://www.tepco.co.jp/nu/fukushima-np/handouts/2013/images/handouts_130821_12-j.pdf)
- 08/21/2013 **Discussion at the NRA Commission Meeting Regarding INES Scale of H4 Area Tank Water Leakage (8/21/2013)**  
(only in Japanese)  
[http://www.nsr.go.jp/committee/kisei/data/0019\\_08r.pdf](http://www.nsr.go.jp/committee/kisei/data/0019_08r.pdf)
- 08/12/2013 **Status and Countermeasures on Contaminated Groundwater Issues (8/12/2013)**  
(only in Japanese)

[http://www.tepco.co.jp/nu/fukushima-np/handouts/2013/images/handouts\\_130812\\_03-j.pdf](http://www.tepco.co.jp/nu/fukushima-np/handouts/2013/images/handouts_130812_03-j.pdf)

08/08/2013 **Summary Status and Countermeasures on Contaminated Groundwater Issues (8/8/2013)**  
[http://www.meti.go.jp/english/earthquake/nuclear/decommissioning/pdf/20130808\\_01.pdf](http://www.meti.go.jp/english/earthquake/nuclear/decommissioning/pdf/20130808_01.pdf)

07/26/2013 **Issues Related to Public Announcement of Contaminated Water Leakage into 1F Port (7/26/2013)**  
[http://www.tepco.co.jp/en/press/corp-com/release/2013/1229317\\_5130.html](http://www.tepco.co.jp/en/press/corp-com/release/2013/1229317_5130.html)

07/25/2013 **Groundwater Contamination Issue Near the Sea and Countermeasures (7/25/2013)**  
(only in Japanese)  
[http://www.meti.go.jp/earthquake/nuclear/pdf/130725/130725\\_01x.pdf](http://www.meti.go.jp/earthquake/nuclear/pdf/130725/130725_01x.pdf)

07/22/2013 **Status and Countermeasures on Contaminated Groundwater Issues (7/22/2013)**  
[http://www.tepco.co.jp/en/nu/fukushima-np/handouts/2013/images/handouts\\_130722\\_07-e.pdf](http://www.tepco.co.jp/en/nu/fukushima-np/handouts/2013/images/handouts_130722_07-e.pdf)

07/17/2013 **Video Clip on Chemical Injection for Ground Improvement at Bank Protection between Units 1 and 2 (7/17/2013)**  
<http://www.tepco.co.jp/en/news/library/movie-01e.html?bcpid=59368209002&bclid=347242463002&bctid=546505066002>

07/11/2013 **Sampling Results of Unit 3 Trench Vertical Shaft A (7/11/2013)**  
(only in Japanese)  
[http://www.tepco.co.jp/nu/fukushima-np/handouts/2013/images/handouts\\_130711\\_04-j.pdf](http://www.tepco.co.jp/nu/fukushima-np/handouts/2013/images/handouts_130711_04-j.pdf)

07/10/2013 **Sampling Results of Ground Water Near Bank Protection, etc. (7/10/2013)**  
[http://www.tepco.co.jp/en/nu/fukushima-np/f1/smp/2013/images/2tb-east\\_13071003-e.pdf](http://www.tepco.co.jp/en/nu/fukushima-np/f1/smp/2013/images/2tb-east_13071003-e.pdf)

07/09/2013 **Ground Improvement of Bank Protection by Chemical Injection (7/9/2013)**  
[http://www.tepco.co.jp/en/nu/fukushima-np/handouts/2013/images/handouts\\_130709\\_03-e.pdf](http://www.tepco.co.jp/en/nu/fukushima-np/handouts/2013/images/handouts_130709_03-e.pdf)

06/27/2013 **Fifth Meeting of Gov't-TEPCO-Industry Council on Promotion of 1F Decommissioning (6/27/2013)**  
1. Mid-to-Long-Term Roadmap towards Decommissioning of 1F (summary)  
[http://www.meti.go.jp/english/press/2013/pdf/0627\\_01a.pdf](http://www.meti.go.jp/english/press/2013/pdf/0627_01a.pdf)

06/27/2013 2. Mid-to-Long-Term Roadmap towards Decommissioning of 1F (full document)  
(only in Japanese)  
[http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/t130627\\_04-j.pdf](http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/t130627_04-j.pdf)

06/27/2013 3. Status of Establishing International Technology Development Partnership  
(only in Japanese)  
[http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/t130627\\_10-j.pdf](http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/t130627_10-j.pdf)

06/19/2013 **High Concentration of Tritium Detected in Ground Water Near the Ocean (6/19/2013)**  
[http://www.tepco.co.jp/en/nu/fukushima-np/handouts/2013/images/handouts\\_130619\\_03-e.pdf](http://www.tepco.co.jp/en/nu/fukushima-np/handouts/2013/images/handouts_130619_03-e.pdf)



- 06/13/2013 **Briefing Material on Contaminated Water Treatment and Ground Water Bypass for the Local Fisheries Cooperative (6/13/2013)**  
(only in Japanese)  
[http://www.tepco.co.jp/nu/fukushima-np/handouts/2013/images/handouts\\_130613\\_03-j.pdf](http://www.tepco.co.jp/nu/fukushima-np/handouts/2013/images/handouts_130613_03-j.pdf)
- 06/10/2013 **Fourth Working-level Meeting of Gov't-TEPCO-Industry Council on Promotion of 1F Decommissioning (6/10/2013)**  
1. Discussion Paper on Revising the Mid-to-Long Term Roadmap Towards Decommissioning  
(only in Japanese)  
[http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/t130610\\_04-j.pdf](http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/t130610_04-j.pdf)
- 06/10/2013 2. Major Schedules in the Discussion Paper  
(only in Japanese)  
[http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/t130610\\_06-j.pdf](http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/t130610_06-j.pdf)
- 05/30/2013 **Third Meeting of Contaminated Water Treatment Committee (5/30/2013)**  
1. Countermeasures to Mitigate Ground Water Ingress  
(only in Japanese)  
[http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/c130530\\_03-j.pdf](http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/c130530_03-j.pdf)
- 05/30/2013 2. Various Topics  
(only in Japanese)  
[http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/c130530\\_05-j.pdf](http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/c130530_05-j.pdf)
- 05/30/2013 **Third Working-level Meeting of Gov't-TEPCO-Industry Council on Promotion of 1F Decommissioning (5/30/2013)**  
1. Plant Status  
(only in Japanese)  
[http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/d130530\\_03-j.pdf](http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/d130530_03-j.pdf)
- 05/30/2013 2. Summary Status of Roadmap  
(only in Japanese)  
[http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/d130530\\_04-j.pdf](http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/d130530_04-j.pdf)
- 05/30/2013 3. Status of Individual Projects  
(only in Japanese)  
[http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/d130530\\_05-j.pdf](http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/d130530_05-j.pdf)
- 05/21/2013 **4th Meeting of Gov't-TEPCO-Industry Council on Promotion of 1F Decommissioning (5/21/2013)**  
(only in Japanese)  
[http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/t130522\\_01-j.pdf](http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/t130522_01-j.pdf)
- 05/23/2013 **Final Report of IAEA Peer Review Mission on Mid-and-Long-Term Roadmap Towards Decommissioning (5/23/2013)**  
<http://www.meti.go.jp/press/2013/05/20130523001/20130523001-4.pdf>
- 05/16/2013 **Progress of Emergency Response H/Q for 1F Reliability Improvement (5/16/2013)**

(only in Japanese)

[http://www.tepco.co.jp/nu/fukushima-np/handouts/2013/images/handouts\\_130516\\_03-j.pdf](http://www.tepco.co.jp/nu/fukushima-np/handouts/2013/images/handouts_130516_03-j.pdf)

**Second Meeting of Contaminated Water Treatment Committee (5/16/2013)**

05/16/2013

1. Study on Fundamental Measures to Prevent Groundwater Ingress

(only in Japanese)

[http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/c130516\\_03-j.pdf](http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/c130516_03-j.pdf)

05/16/2013

2. Contaminated Water Leakage from Underground Reservoirs Considered to be Much Less than Initial Estimate

(only in Japanese)

[http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/c130516\\_04-j.pdf](http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/c130516_04-j.pdf)

05/16/2013

3. Measures to Reduce Contaminated Water

(only in Japanese)

[http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/c130516\\_05-j.pdf](http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/c130516_05-j.pdf)

05/13/2013

**Status of Ground Water Bypass System Explained to Local Fisheries Cooperative (5/13/2013)**

[http://www.tepco.co.jp/en/nu/fukushima-np/handouts/2013/images/handouts\\_130513\\_06-e.pdf](http://www.tepco.co.jp/en/nu/fukushima-np/handouts/2013/images/handouts_130513_06-e.pdf)

04/26/2013

**Status of Ground Water Bypass System (4/26/2013)**

[http://www.tepco.co.jp/en/nu/fukushima-np/handouts/2013/images/handouts\\_130426\\_09-e.pdf](http://www.tepco.co.jp/en/nu/fukushima-np/handouts/2013/images/handouts_130426_09-e.pdf)

05/02/2013

**Investigation Plan for Underground Reservoirs (5/2/2013)**

[http://www.tepco.co.jp/en/nu/fukushima-np/handouts/2013/images/handouts\\_130502\\_08-e.pdf](http://www.tepco.co.jp/en/nu/fukushima-np/handouts/2013/images/handouts_130502_08-e.pdf)

05/02/2013

**Progress of Water Transfer from Underground Reservoirs (5/2/2013)**

[http://www.tepco.co.jp/en/nu/fukushima-np/handouts/2013/images/handouts\\_130502\\_07-e.pdf](http://www.tepco.co.jp/en/nu/fukushima-np/handouts/2013/images/handouts_130502_07-e.pdf)

04/26/2013

**2nd Working-level Meeting of Gov't-TEPCO-Industry Council on Promotion of 1F Decommissioning (4/26/2013)**

1. Plant Status

(only in Japanese)

[http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/d130426\\_03-j.pdf](http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/d130426_03-j.pdf)

2. Summary Status of Roadmap

(only in Japanese)

[http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/d130426\\_04-j.pdf](http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/d130426_04-j.pdf)

3. Status of Individual Projects

(only in Japanese)

[http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/d130426\\_05-j.pdf](http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/d130426_05-j.pdf)

4. Status of Leakage from Underground Reservoirs

(only in Japanese)

[http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/d130426\\_07-j.pdf](http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/d130426_07-j.pdf)

04/26/2013

**1st Meeting of Contaminated Water Treatment Committee (4/26/2013)**

1. Short-term Actions

(only in Japanese)

[http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/c130426\\_04-j.pdf](http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/c130426_04-j.pdf)

2. Permanent Measures to Stop Ground Water Ingress

(only in Japanese)

[http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/c130426\\_05-j.pdf](http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/c130426_05-j.pdf)

3. Tritium Treatment Methodologies

(only in Japanese)

[http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/c130426\\_06-j.pdf](http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/c130426_06-j.pdf)

04/19/2013

**3rd Meeting of Gov't-TEPCO-Industry Council on Promotion of 1F Decommissioning (4/19/2013)**

(only in Japanese)

[http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/t130419\\_01-j.pdf](http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/t130419_01-j.pdf)

04/19/2013

**History on Installation of Underground Reservoirs and Estimated Cause of Leakage (4/19/2013)**

[http://www.tepco.co.jp/nu/fukushima-np/handouts/2013/images/handouts\\_130419\\_05-j.pdf](http://www.tepco.co.jp/nu/fukushima-np/handouts/2013/images/handouts_130419_05-j.pdf)

04/19/2013

**Response to Inquiries from Regulatory Oversight Committee Regarding Water Issues (4/19/2013)**

[http://www.tepco.co.jp/en/nu/fukushima-np/handouts/2013/images/handouts\\_130419\\_07-e.pdf](http://www.tepco.co.jp/en/nu/fukushima-np/handouts/2013/images/handouts_130419_07-e.pdf)

04/25/2013

**Work Status Related to Underground Reservoir Leakage (4/25/2013)**

[http://www.tepco.co.jp/en/nu/fukushima-np/handouts/2013/images/handouts\\_130425\\_03-e.pdf](http://www.tepco.co.jp/en/nu/fukushima-np/handouts/2013/images/handouts_130425_03-e.pdf)

04/02/2013

**2nd Meeting of Gov't-TEPCO-Industry Council on Promotion of 1F Decommissioning (4/2/2013)**

(only in Japanese)

[http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/t130402\\_01-j.pdf](http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/t130402_01-j.pdf)

04/02/2013

**Progress Status of Sea-side Impermeable Wall Construction (4/2/2013)**

[http://www.tepco.co.jp/en/nu/fukushima-np/handouts/2013/images/handouts\\_130402\\_01-e.pdf](http://www.tepco.co.jp/en/nu/fukushima-np/handouts/2013/images/handouts_130402_01-e.pdf)

03/28/2013

**1st Working-level Meeting of Gov't-TEPCO-Industry Council on Promotion of 1F Decommissioning (3/28/2013)**

(only in Japanese; 9.6 MB; 160 pages)

[http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/d130328\\_05-j.pdf](http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/d130328_05-j.pdf)

03/27/2013

**Progress Status of Groundwater Bypass System Construction (3/27/2013)**

[http://www.tepco.co.jp/en/nu/fukushima-np/handouts/2013/images/handouts\\_130327\\_03-e.pdf](http://www.tepco.co.jp/en/nu/fukushima-np/handouts/2013/images/handouts_130327_03-e.pdf)

**First Meeting of Gov't-TEPCO-Industry Council on Promotion of Fukushima Daiichi Decommissioning (3/7/2013)**

03/07/2013 1. Agenda and Discussion  
(only in Japanese)  
[http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/t130307\\_01-j.pdf](http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/t130307_01-j.pdf)

03/07/2013 2. Progress Status towards Decommissioning  
(only in Japanese: 12 MB, 246 pages)  
[http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/d130307\\_01-j.pdf](http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/d130307_01-j.pdf)

01/28/2013 **Construction Status of Ground Water Bypass System (Jan. 28)**  
[http://www.tepco.co.jp/en/nu/fukushima-np/handouts/2013/images/handouts\\_130128\\_04-e.pdf](http://www.tepco.co.jp/en/nu/fukushima-np/handouts/2013/images/handouts_130128_04-e.pdf)

12/25/2013 **13th Gov't-TEPCO Joint Meeting on Mid-to-Long Term Actions (Dec. 25)**  
1. Current Plant Parameter  
(Only in Japanese)  
[http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/m121225\\_04-j.pdf](http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/m121225_04-j.pdf)

12/25/2013 2. Specific Topics  
(Only in Japanese)  
[http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/m121225\\_05-j.pdf](http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/m121225_05-j.pdf)  
Ground Water Bypass Demonstration Test (p. 28-30)

12/03/2012 **12th Gov't-TEPCO Joint Meeting on Mid-to-Long Term Actions (Dec. 3)**  
1. Status of Underground Water Bypass Work  
(Only in Japanese)  
[http://www.meti.go.jp/earthquake/nuclear/pdf/121203/121203\\_02n.pdf](http://www.meti.go.jp/earthquake/nuclear/pdf/121203/121203_02n.pdf)

10/22/2012 **11th Gov't-TEPCO Joint Meeting on Mid-to-Long Term Actions (Oct. 22)**  
1. Storage status of accumulated water  
(Only in Japanese)  
[http://www.meti.go.jp/earthquake/nuclear/pdf/121022/121022\\_01e.pdf](http://www.meti.go.jp/earthquake/nuclear/pdf/121022/121022_01e.pdf)

10/22/2012 2. Mid-to-long-term plan for on-site decontamination  
(Only in Japanese)  
[http://www.meti.go.jp/earthquake/nuclear/pdf/121022/121022\\_01q.pdf](http://www.meti.go.jp/earthquake/nuclear/pdf/121022/121022_01q.pdf)

10/22/2012 3. Status of Mid-to-long-term Roadmap towards decommissioning  
(Only in Japanese)  
[http://www.meti.go.jp/earthquake/nuclear/pdf/121022/121022\\_01ee.pdf](http://www.meti.go.jp/earthquake/nuclear/pdf/121022/121022_01ee.pdf)

09/24/2012 **Gov't-TEPCO Joint Meeting on Mid-to-Long Term Actions (Sept. 24)**  
1. Storage status of accumulated water  
(Only in Japanese)  
[http://www.meti.go.jp/earthquake/nuclear/pdf/120924/120924\\_01e.pdf](http://www.meti.go.jp/earthquake/nuclear/pdf/120924/120924_01e.pdf)

09/24/2012 2. Ground water bypass system installation status  
(Only in Japanese)  
[http://www.meti.go.jp/earthquake/nuclear/pdf/120924/120924\\_01n.pdf](http://www.meti.go.jp/earthquake/nuclear/pdf/120924/120924_01n.pdf)

09/24/2012 3. Additional water tanks installation plan  
(Only in Japanese)  
[http://www.meti.go.jp/earthquake/nuclear/pdf/120924/120924\\_01p.pdf](http://www.meti.go.jp/earthquake/nuclear/pdf/120924/120924_01p.pdf)

09/24/2012 4. Radionuclides analyses results of contaminated water  
(Only in Japanese)  
[http://www.meti.go.jp/earthquake/nuclear/pdf/120924/120924\\_01jj.pdf](http://www.meti.go.jp/earthquake/nuclear/pdf/120924/120924_01jj.pdf)

09/24/2012 5. Status of Mid-to-long-term Roadmap towards decommissioning  
(Only in Japanese)  
[http://www.meti.go.jp/earthquake/nuclear/pdf/120924/120924\\_01kk.pdf](http://www.meti.go.jp/earthquake/nuclear/pdf/120924/120924_01kk.pdf)

09/06/2012 **National Academy of Sciences Fukushima Lessons-learned Committee meeting (Sept. 6)**  
<http://www.tvworldwide.com/events/nas/120906/>

08/27/2012 **Gov't-TEPCO Joint Meeting on Mid-to-Long Term Actions (Aug. 27)**  
(Only in Japanese)  
[http://www.meti.go.jp/earthquake/nuclear/20120827\\_01.html](http://www.meti.go.jp/earthquake/nuclear/20120827_01.html)

08/27/2012 1. Groundwater bypass plan  
(Only in Japanese)  
[http://www.meti.go.jp/earthquake/nuclear/pdf/120827/120827\\_01n.pdf](http://www.meti.go.jp/earthquake/nuclear/pdf/120827/120827_01n.pdf)

08/27/2012 2. Contaminated water accumulation simulation and additional installation of tanks  
(Only in Japanese)  
[http://www.meti.go.jp/earthquake/nuclear/pdf/120827/120827\\_01p.pdf](http://www.meti.go.jp/earthquake/nuclear/pdf/120827/120827_01p.pdf)

07/30/2012 **Government-TEPCO Joint Committee meeting on Mid-to-long term actions (July 30)**  
1. Status of port-related works  
(only in Japanese)  
[http://www.meti.go.jp/earthquake/nuclear/pdf/120730/120730\\_01p.pdf](http://www.meti.go.jp/earthquake/nuclear/pdf/120730/120730_01p.pdf)

07/30/2012 2. Status for Mid-to-Long Term Roadmap towards decommissioning  
(only in Japanese)  
[http://www.meti.go.jp/earthquake/nuclear/pdf/120730/120730\\_01gg.pdf](http://www.meti.go.jp/earthquake/nuclear/pdf/120730/120730_01gg.pdf)

07/24/2012 **Implementation Plan on Reliability Improvement Measures at Fukushima Daiichi (July 24)**  
(only in Japanese; 300 pages)

[http://www.tepco.co.jp/en/press/corp-com/release/2012/1206826\\_1870.html](http://www.tepco.co.jp/en/press/corp-com/release/2012/1206826_1870.html)

**TEPCO presentations at a METI-hosted Technical Workshop on Fukushima accident**

07/23/2012

1. Overall status of Fukushima Daiichi (July 23)

(only in Japanese)

[http://www.tepco.co.jp/nu/fukushima-np/images/handouts\\_120723\\_04-j.pdf](http://www.tepco.co.jp/nu/fukushima-np/images/handouts_120723_04-j.pdf)

07/23/2012

2. R&D plan towards decommissioning of Units 1-4 (July 23)

(only in Japanese)

[http://www.tepco.co.jp/nu/fukushima-np/images/handouts\\_120723\\_05-j.pdf](http://www.tepco.co.jp/nu/fukushima-np/images/handouts_120723_05-j.pdf)

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