

Supplemental information for selection the Implementing Measure

Appended Table 6 of the Enforcement Regulation of the Soil Contamination Countermeasures Act (Related to Article 36)

Land	Instructed Measures	Action for Removal, etc. of Pollution, specified by the Ordinance of the Ministry of the Environment Referred to in Article 7, Paragraph (1), Item (i) of the Act ¹
1 Land where the state of contamination of the soil by the specified hazardous substances does not conform to the Soil Leachate Standard ² and no groundwater contamination has occurred due to the contamination of the soil by the specified hazardous substances.	To measure the quality of groundwater on the said land (hereinafter referred to as " Measurement of Groundwater Quality " ³).	In accordance with the state of contamination of the soil of the land listed in the first column of the following paragraphs to paragraph (6), the measures of instruction specified in the second column of these paragraphs and the Action for Removal, etc. of pollution specified in the third column of these paragraphs, respectively.
2 Land where the state of contamination of soil by a Class I Designated Hazardous Substance of soil does not conform to the Soil Leachate Standards and where groundwater pollution has occurred due to the contamination of said soil by the Class I Designated Hazardous Substance.	To install a structure for prevention of groundwater leaching on the side of the area with non-compliant soil ⁴ to the depth of the shallowest of the impermeable layers* (hereinafter referred to as " In-situ Containment ") or to excavate non-compliant soil from the land, installing a structure to prevent groundwater from leaching	(a) Installation of a structure on the land to prevent the spread of groundwater contamination (hereinafter referred to as " Prevention of the spread of Groundwater Contamination ") (b) Removing non-compliant soil from the land or removing designated hazardous substances in the non-compliant soil (hereinafter referred to as " Removal of Soil Contamination ") (c) Measurement of Groundwater Quality (Limited to the case that the status of the Class I Designated Hazardous Substances contamination of the soil and groundwater of said

¹ The text of the Article is introduced in Appendix 2.

² Standards and Classification of Designated Hazardous Substances, and other information are introduced in Appendix 1.

³ The conceptual figures of the measures are arranged in Appendix 4.

⁴ Soil in a state of contamination that does not conform to the Soil Leachate Standard or the Soil Concentration Standard

	<p>into the land, and backfilling the excavated non-compliant soil into the structure (hereinafter referred to as "Barrier Containment").</p> <p>* a layer of five meters or more in thickness and with a hydraulic conductivity of less than one hundred nanometers per second (in the case of bedrock, a Lugeon value of one) or a layer of equivalent or greater impermeability. The same shall apply hereinafter</p>	<p>land are confirmed not exceed the Target Soil Leachate Amount** and the Target Groundwater Concentration***, from the results of the status of soil contamination grasping the extent and depth and others of non-compliant soil of the said land and the required information for the preparation of the Plan for Decontamination, etc., that are grasped through the methods of the soil sampling and measurement by boring and other methods.)</p> <p>** The amount of the Designated Hazardous Substance (limited to the amount of the said Designated Hazardous Substance that conforms to the Second Soil Leachate Standard as measured by the method specified by the Minister of the Environment in Article 6, paragraph (3), item (iv)⁵), which is dissolved in the test solution adding water to the soil of the land where is a point at a downstream of groundwater from the said land and upstream from the point specified in each item of Article 30⁶ concerning to the designation of the Area which require Action, and where is the inside of the Area which require Action to be determined to conform to the Groundwater Standard, at the point to evaluated the conformation to the Groundwater Standards after the Implementing Measures (hereinafter referred to as "Assessment Point". The same shall apply hereinafter.)⁷.</p>
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⁵ The text of the Article is introduced in Appendix 2.

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⁷ Supplemental explanation is introduced in Appendix 3.

		*** The amount of Designated Hazardous Substances which is detected from the groundwater of the land where is the inside of the said Area which require Action to be determined to conform to the Groundwater Standards at the Assessment Point ⁸ .
3 Land where the state of contamination of the soil by the Class II Designated Hazardous Substances does not conform to the Second Soil Leachate Standard and where groundwater pollution has occurred due to the contamination of the said soil by the Class II Designated Hazardous Substances.	In-situ Containment or Barrier Containment	(a) Excavation of non-compliant soil from the said land, installation of a structure with the necessary watertightness and durability on the said land, and backfilling of the excavated non-compliant soil inside the structure (hereinafter referred to as " Interception Works Containment ") (b) Prevention of the spread of Groundwater Contamination (c) Removal of Soil Contamination
4 Land where the state of contamination of soil by a Class II Designated Hazardous Substance does not conform to the Soil Leachate Standards and where groundwater pollution has occurred due to the contamination of the said soil by a Class II Designated Hazardous Substance (excluding land listed in the preceding item)	In-situ Containment or Barrier Containment	(a) Changing the properties of non-compliant soil not to dissolve the specified hazardous substances into water (hereinafter referred to as " Insolubilisation ") (b) Interception Works Containment (c) Prevention of the spread of Groundwater Contamination (d) Removal of Soil Contamination (e) Measurement of Groundwater Quality (Limited to the case that the status of the Class II Designated Hazardous Substances contamination of the soil and groundwater of said land are confirmed not exceed the Target Soil Leachate Amount and the Target Groundwater Concentration, from the results of the status of soil contamination grasping the extent and depth and others

⁸ Supplemental explanation is introduced in Appendix 3.

		of non-compliant soil of the said land and the required information for the preparation of the Plan for Decontamination, etc., that are grasped through the methods of the soil sampling and measurement by boring and other methods.)
5 Land where the state of contamination of the soil by the Class III Designated Hazardous Substances does not conform to the Second Soil leachate Standard and where groundwater pollution has occurred due to the contamination of the said soil by the Class III Designated Hazardous Substances.	Interception Works Containment	(a) Prevention of the spread of Groundwater Contamination (b) Removal of Soil Contamination
6 Land where the state of contamination of the soil by the Class III Designated Hazardous Substances does not conform to the Soil Leachate Standards and where groundwater pollution has occurred due to the contamination of the said soil by the Class III Designated Hazardous Substances (excluding land listed in the preceding item).	In-situ Containment or Barrier Containment	(a) Interception Works Containment (b) Prevention of the spread of Groundwater Contamination (c) Removal of Soil Contamination (d) Measurement of Groundwater Quality (Limited to the case that the status of the Class III Designated Hazardous Substances contamination of the soil and groundwater of said land are confirmed not exceed the Target Soil Leachate Amount and the Target Groundwater Concentration, from the results of the status of soil contamination grasping the extent and depth and others of non-compliant soil of the said land and the required information for the preparation of the Plan for Decontamination, etc., that are grasped through the methods of the soil sampling and measurement by boring and other methods.)
7 Land where the state of contamination of soil by Class II	Removal of Soil Contamination	(a) To be paved (hereinafter referred to as " Paving ")

<p>Designated Hazardous Substances does not conform to the Soil Concentration Standards (limited to the land used as the site of a sandbox or a garden site routinely used by infants for playing with sand or soil, or as the site of facilities where infants are allowed to play outdoors in an amusement park or other play facilities, and where frequent changes to the Form or Nature of the land are found to hinder the securing of the effects of the measures prescribed in the following item or item (9))</p>		<p>(b) To make it inaccessible to persons (hereinafter referred to as "Keep Out").</p>
<p>8 Land where the state of contamination of the soil by Class II Designated Hazardous Substances does not conform to the Soil Concentration Standards (Limited to the Land in an area where a building is built which has a part, at a height of up to 50 centimeters above the ground surface, of exclusively used for residential purposes, in the building which is currently mainly used for residential purposes, and only if it is found that raising the</p>	<p>To lower the ground surface by excavation of soil and cover it with soil other than non-compliant soil (hereinafter referred to as "Soil Replacement").</p>	<p>(a) Paving (b) Off-Limit (c) Removal of Soil Contamination</p>

<p>ground surface by 50 centimeters is likely to cause significant hindrance to the daily lives of the people living in the said building. And excluding land listed in the preceding item.)</p>		
<p>9 Land where the state of contamination of soil by Class II Designated Hazardous Substances does not conform to the Soil Concentration Standards (excluding land listed in the preceding two items).</p>	<p>To cover with soil other than non-compliant soil (hereinafter referred to as "Fill")</p>	<ul style="list-style-type: none"> (a) Paving (b) Off-Limit (c) Soil Replacement (d) Removal of Soil Contamination

Appendix-1, Designated Hazardous Substance and its standard

Designated Hazardous Substance and its standard are determined from risks such as (1) ingestion of ground water (corresponding to Soil Leachate Standard), (2) direct ingestion (corresponding to Soil Concentration Standard).

Soil Leachate Standard is set for all Designated Hazardous Substance, but Soil Concentration Standard is set for only 9 substances (class II: heavy metals) in Designated Hazardous Substances.

Second leachate standards are the level when, because of the high intensity of contamination of said land, the concentrations of leachate are to be reduced to the level by the Action for removal, etc.

Designated hazardous substance		Designation standard			Soil Environmental Standard	
		Soil Leachate Standard	Second Soil Leachate Standard	Soil Concentration Standard		Groundwater Standard
Class I (VOCs)	Chloroethylene	≤ 0.002mg / L	≤ 0.02mg / L		≤ 0.002mg / L	≤ 0.002mg / L
	Carbon tetrachloride	≤ 0.002mg / L	≤ 0.02mg / L		≤ 0.002mg / L	≤ 0.002mg / L
	1,2 – Dichloroethane	≤ 0.004mg / L	≤ 0.04mg / L		≤ 0.004mg / L	≤ 0.004mg / L
	1,1 – Dichloroethylene	≤ 0.1mg / L	≤ 1mg / L		≤ 0.1mg / L	≤ 0.1mg / L
	1,2 – Dichloroethylene	≤ 0.04mg / L	≤ 0.4mg / L		≤ 0.04mg / L	≤ 0.04mg / L
	1,3 – Dichloropropene *	≤ 0.002mg / L	≤ 0.02mg / L		≤ 0.002mg / L	≤ 0.002mg / L
	Dichloromethane	≤ 0.02mg / L	≤ 0.2mg / L		≤ 0.02mg / L	≤ 0.02mg / L
	Tetrachloroethylene	≤ 0.01mg / L	≤ 0.1mg / L		≤ 0.01mg / L	≤ 0.01mg / L
	1,1,1 – Trichloroethane	≤ 1mg / L	≤ 3mg / L		≤ 1mg / L	≤ 1mg / L
	1,1,2 – Trichloroethane	≤ 0.006mg / L	≤ 0.06mg / L		≤ 0.006mg / L	≤ 0.006mg / L
	Trichloroethylene	≤ 0.03mg / L	≤ 0.3mg / L		≤ 0.03mg / L	≤ 0.03mg / L
	Benzene	≤ 0.01mg / L	≤ 0.1mg / L		≤ 0.01mg / L	≤ 0.01mg / L
Class II (Heavy Metals, etc.)	Cadmium and its compounds	≤ 0.01mg / L as Cd	≤ 0.3mg / L as Cd	≤ 150mg / kg	≤ 0.01mg / L as Cd	≤ 0.01mg / L as Cd ** Rice at Agricultural land ≤ 0.4mg / kg
	Hexavalent Chromium compounds	≤ 0.05mg / L as Cr ⁺⁶	≤ 1.5mg / L as Cr ⁺⁶	≤ 250mg / kg	≤ 0.05mg / L as Cr ⁺⁶	≤ 0.05mg / L as Cr ⁺⁶ **
	Cyanides compounds	< detection limit	< 1mg / L as CN	As isolated cyanides ≤ 50mg / kg	< detection limit	< detection limit

	Mercury and its compounds	≤ 0.0005mg / L as Hg & Alkyl Mercury less than detection limit	≤ 0.005mg / L as Hg & Alkyl Mercury less than detection limit	≤ 15mg / kg	≤ 0.0005mg / L as Hg & Alkyl Mercury less than detection limit	≤ 0.0005mg / L as Hg **
	Alkyl Mercury	—	—	—	—	< detection limit
	Selenium and its compounds	≤ 0.01mg / L as Se	≤ 0.3mg / L as Se	≤ 150mg / kg	≤ 0.01mg / L as Se	≤ 0.01mg / L as Se **
	Lead and its compounds	≤ 0.01mg / L as Pb	≤ 0.3mg / L as Pb	≤ 150mg / kg	≤ 0.01mg / L as Pb	≤ 0.01mg / L as Pb **
	Arsenic and its compounds	≤ 0.01mg / L as As	≤ 0.3mg / L as As	≤ 150mg / kg	≤ 0.01mg / L as As	≤ 0.01mg / L as As ** Soil at Agricultural Land (limit to paddy field) < 15mg / kg
	Copper	—	—	—	—	Soil at Agricultural Land (limit to paddy field) < 15mg / kg
	Fluorine and its compounds	≤ 0.8mg / L as F	≤ 24mg / L as F	≤ 4000mg / kg	≤ 0.8mg / L as F	≤ 0.8mg / L as F **
	Boron and its compounds	≤ 1mg / L as B	≤ 30mg / L as B	≤ 4000mg / kg	≤ 1mg / L as B	≤ 1mg / L as B **
Class III (Agro-chemicals and PCBs)	Simazine	≤ 0.003mg / L	≤ 0.03mg / L	/	≤ 0.003mg / L	≤ 0.003mg / L
	Thiuram	≤ 0.006mg / L	≤ 0.006mg / L		≤ 0.006mg / L	≤ 0.006mg / L
	Thiobencarb	≤ 0.02mg / L	≤ 0.2mg / L		≤ 0.02mg / L	≤ 0.02mg / L
	PCB	<detection limit	<0.003mg/L		<detection limit	<detection limit
	Organic phosphorus compounds	<detection limit	<1mg/L		< detection limit	< detection limit
	1,4-Dioxane	—	—	—	—	≤ 0.05mg / L
	Nitrate-nitrogen and Nitrite-nitrogen	—	—	—	—	—

* The concentration of 1,2-dichloroethylene shall be the sum of the concentration of the cis and the concentration of the trans form.

** Among the environmental conditions, the values of cadmium, lead, hexavalent chromium, arsenic, total mercury, selenium, fluorine and boron in the test solution are 0.03 mg, 0.03 mg, 0.15 mg, 0.03 mg, 0.0015 mg, 0.03 mg, 2.4 mg and 3 mg per litre in the test solution respectively, if the contaminated soil is far from the groundwater surface and the concentration of these substances in the groundwater in its current condition does not exceed 0.01 mg, 0.01 mg, 0.05 mg, 0.01 mg, 0.0005 mg, 0.01 mg, 0.8 mg and 1 mg per litre of groundwater, respectively.

Standards of Cadmium and its compound and Trichloroethylene will be amended as follows from April 1st, 2021.

Designated hazardous substance	Designation standard				Soil Environmental Standard
	Soil Leachate Standard	Second Soil Leachate Standard	Soil Concentration Standard	Groundwater Standard	
Cadmium and its compounds	≤ 0.003mg / L as Cd	≤ 0.09mg / L as Cd	≤ 45mg / kg	≤ 0.003mg / L as Cd	≤ 0.003mg / L as Cd *** Rice at Agricultural land ≤ 0.4mg / kg
Trichloroethylene	≤ 0.01mg / L	≤ 0.1mg / L		≤ 0.01mg / L	≤ 0.01mg / L

*** The values of cadmium in the test solution are 0.09 mg per litre in the test solution respectively, if the contaminated soil is far from the groundwater surface and the concentration of these substances in the groundwater in its current condition does not exceed 0.003 mg.

Appendix 2 Related Act and Ordinances

The followings are translated by the secretariat of the project and **are not official ones**.

1. Article 7, Paragraph (1), Item (i) (the Soil Contamination Countermeasures Act)

(Submission, etc. of Plan for Decontamination, etc.)

Article 7 (1) When a prefectural governor has made a designation under paragraph (1) of the preceding Article, he/she, only to the extent necessary to prevent harm to human health due to contamination, shall indicate, to the Owner, etc. of the Area which require Action, measures, etc. such as removal of pollution to be taken in the area and the reasons for that, the deadline for taking measures, the location of the area requiring measures, the deadline for submitting the plan, etc., and instruct to create a plan containing the following terms (hereinafter referred to as a "Plan for Decontamination, etc.") and to submit it to the prefectural governor.; provided, however, that where it is clear that a person other than the Owner, etc. of said site has caused the contamination, and where it is appropriate to cause said person (hereinafter including his successor by inheritance, merger, or split) to take an Action for Removal, etc. and where the Owner, etc. has no objection to such action, the governor shall so instruct the person who caused the contamination.

- (i) Measures taken by the landowner, etc. that is taken from among Action for Removal, etc. of pollution specified by the prefectural governor and Action for Removal, etc. of pollution specified by the Ordinance of the Ministry of the Environment which are considered to have an effect equivalent to or greater than those specified by the prefectural governor. (hereinafter referred to as the "Implementing Measures")
- (ii) The scheduled time of commencement and scheduled time of completion of the Implementing Measures
- (iii) Other matters specified by an Ordinance of the Ministry of the Environment (Details are omitted here but will be translated and provided separately).

2. Method specified by the Minister of the Environment in Article 6, paragraph (3), item (iv) (Enforcement Regulation of the Soil Contamination Countermeasures Act)

Article 6, paragraph (3);

(3) The method of soil leachate investigation shall be as follows

- (i) Where the location of the potentially contaminated area at the sampling point is obvious (except where the potentially contaminated area is at the same location as the ground surface), the soil up to 50 centimeters deep from the location of the place where the threat of contamination has occurred (limited to soil up to 10 meters deep from the ground surface), and In the case where the location of the potentially contaminated site is the same as that of the ground surface, or where the location of the potentially contaminated site is unknown, the soil from the ground surface to a depth of 5 cm (hereinafter referred to as "surface soil") and soil from a depth of 5 cm to 50 cm shall be collected. However, in the case of conducting a soil contamination survey based on an order under Article 3, paragraph (8) or Article 4, paragraph (3) of the Act, or in the case of conducting a soil contamination survey based on paragraph (2) of the same Article, and if the soil is located at a depth of more than one meter below the maximum depth of change of form, the soil may not be collected.
- (ii) In the case where surface soil and soil from a depth of 5 to 50 centimeters have been sampled pursuant to the provisions of the main clause of the preceding item, said soil shall be mixed by the same weight.
- (iii) In the case where two or more unit plots within a 30-meter grid are sample collection, etc. plots pursuant to the provisions of Article 4, paragraph 3, item 2(b), the soil collected pursuant to the provisions of item 1 pertaining to said two or more unit plots (in the case prescribed in the preceding item, the soil mixed pursuant to the provisions of the same item) shall be mixed by the same weight, respectively.
- (iv) Measuring the amount of the substance subject to sampling, etc. dissolved into the test solution containing water added to the soil sampled or mixed pursuant to the provisions of the preceding three items in the manner prescribed by the Minister of the Environment. (The manner is provided by other material.)

3 Each item of Article 30 (Enforcement Regulation of the Soil Contamination Countermeasures Act)

(Requirements relating to the use of groundwater)

Article 30 The requirements specified by an Ordinance of the Ministry of the Environment set forth in Article 3, item (i) (a) of the Enforcement Order, in view from the ground water flow, etc., are, in case the groundwater pollution (which means that the Designated Hazardous Substances detected in groundwater do not conform to the groundwater standards. The same shall apply hereinafter) may occurs, that any of following each point is located in the area where is the threat of spread of ground water.

- (i) Strainers of wells, intakes of pumping machines and other intakes of groundwater which are used or are certain to be used for the purpose of human consumption of ground water.
- (ii) Intakes of water intake facilities which is used, or is certain to be used, for the purpose of taking ground water as for raw water for the water supply business in Article 3, paragraph (2) of the Water Supply Business Act

(Act No. 67 of 1947) (excluding water supply businesses that use only tap water supplied by a water supply business operator prescribed in paragraph (5) of the said Article), the water supply business prescribed in paragraph (4) of the said Article or the dedicated water supply business prescribed in paragraph (6) of the said Article.

- (iii) Strainers of wells, intakes of pumping machines, and other intakes of groundwater which are supposed to be used for human drinking at the time of disaster based on the Prefectural Disaster Prevention Plan, etc. set forth in Article 40, paragraph 1 of the Disaster Countermeasures Basic Act (Act No. 223 of 1961)
- (iv) A point in a public water body where, as mainly cause of the spring of groundwater that does not conform to the groundwater standards, the pollution of water quality, that does not ensure the standards set forth in Article 16, paragraph (1) of the Basic Environment Act (Act No. 91 of 1993) for environmental conditions pertaining to water pollution, occurs or is certain to occur.

The followings are the articles of Act and ordinance related to the above texts. The articles of the Water Supply Business Act, the Disaster Countermeasures Basic Act and the Basic Environment Act are omitted.

4. Article 3, paragraph (8) and Article 4, paragraph (3) (the Soil Contamination Countermeasures Act)

(Investigation of Land Used as a Site for a Plant or Workplace of a Defunct Specified Facility which used Hazardous Substances)

- Article 3** (1) Any person who is the owner, manager, or occupier (hereinafter referred to as the "Owner, etc.") of the site of a plant or workplace pertaining to a Specified Facility which used Hazardous Substances (a Specified Facility as provided in Article 2, paragraph (2) of the Water Pollution Control Act (Act No. 138 of 1970) (hereinafter referred to as a "Specified Facility" in the paragraph (3)) in which any of the substances listed in paragraph (2), item (i) of said Article (limited to Designated Hazardous Substances) are manufactured, used and processed; the same shall apply hereinafter), whose use was abolished, and who has installed the Specified Facility or has received notification from the prefectural governor pursuant to the following paragraph, shall have a person designated by the Minister of Environment or the prefectural governor conduct an investigation into the situation of soil contamination of the land by Designated Hazardous Substances in the manner prescribed by Ordinance of the Ministry of the Environment, and shall report the results of said investigation to the governor. However, the foregoing requirement shall not apply to any person who has received confirmation from the governor, as provided by Ordinance of the Ministry of the Environment, that there are no threats to the scheduled use of said site and that no harm to human health will be caused by soil contamination by Designated Hazardous Substances.
- (2) The designation set forth in the preceding paragraph shall be made by the Minister of the Environment in the case of designating a person who intends to conduct a soil contamination status survey and the survey set forth in Article 16, paragraph (1) (hereinafter referred to as the "Soil Contamination Status Survey, etc.") in the area of two or more prefectures, and by the prefectural governor in the case of designating a person who intends to conduct the Soil Contamination Status Survey, etc. in the area of one prefecture.
 - (3) A prefectural governor who receives notification of termination of the use of a Specified Facility (limited to a Specified Facility which uses hazardous substances) under Article 10 of the Water Pollution Control Act, or who discovers such termination, shall notify any existing Owner, etc. of the site other than the person who has installed such Specified Facility which used hazardous substances, of the termination and any other information prescribed by Ordinance of the Ministry of the Environment, in accordance with an Ordinance of the Ministry of the Environment.
 - (4) - (6) Omitted here.
 - (7) When the owner, etc. of the land related to the confirmation of the proviso of paragraph 1, for the said confirmed land, excavate the land or change to the form or nature of land (hereinafter referred to as "Changes to the Form or Nature of Land"), or let others to change, he/she submit, in advance, by the Ordinance of the Ministry of the Environment, the location of the Change to the Form or Nature of said Land, the scheduled start date, and other matters specified by the Ordinance of the Ministry of the Environment to prefectural governor. However, this does not apply to the following acts:
 - (i) Actions of a light nature and other actions, specified by the Ordinance of the Ministry of the Environment
 - (ii) Actions to be taken as emergency measures necessary for an emergency disaster.
 - (8) When the prefectural governor has received a submission pursuant to the provision of the preceding paragraph, he/she shall, pursuant to the provisions of an Ordinance of the Ministry of the Environment, order the owner, etc. of the said land to let a person designated by the Minister of the Environment or the prefectural governor set forth in paragraph (1) (hereinafter referred to as the "Designated Investigation Institution"), to investigate the status of contamination of the soil of said land by the Designated Hazardous Substance by the method

specified by an Ordinance of the Ministry of the Environment set forth in the same paragraph , and to report the results to the prefectural governor.

(Investigation in the Case of Changes to the Form or Nature of Land Threatened by Soil Contamination)

Article 4 A person who intends to carry out a change to the target land, the area of which is larger than the scale specified by an Ordinance of the Ministry of the Environment, as to the Change to the Form or Nature of Land, , shall submit, no later than 30 days prior to the date of commencement of the Change to the Form or Nature of said Land, by the Ordinance of the Ministry of Environment, the location of the Change to the Form or Nature of said Land, the scheduled start date, and other matters specified by the Ordinance of the Ministry of the Environment to prefectural governor. However, this does not apply to the following acts:

- (i) Change to the Form or Nature of Land with regard to the land pertaining to the confirmation set forth in the proviso of paragraph (1) of the preceding article
 - (ii) Actions of a light nature and other actions, specified by the Ordinance of the Ministry of the Environment
 - (iii) Actions to be taken as emergency measures necessary for an emergency disaster.
- (2) The person prescribed in the preceding paragraph may, pursuant to the provisions of an Ordinance of the Ministry of the Environment, with the consent of all the owners, etc. of the said land, have a Designated Investigation Institute investigate the status of contamination of the soil of the land concerned by the specified harmful substances by the method specified by an Ordinance of the Ministry of the Environment set forth in paragraph (1) of the preceding Article, and submit the results of the investigation together with the submission of the Change to the Form or Nature of the land pursuant to the provisions of the preceding paragraph to the prefectural governor.
- (3) When the prefectural governor, having received notification of Changes to the Form or Nature of Land under the provisions of the paragraph (1), finds that said land is threatened with being contaminated by a Designated Hazardous Substance and falls under the standards set forth in an Ordinance of the Ministry of the Environment, he/she may order the Owner, etc. of the site, by the Ordinance of the Ministry of Environment, to cause the Designated Investigation Institution to conduct an investigation of the site in the manner prescribed by the Ordinance of the Ministry of the Environment in previous article, paragraph (1), and to make a report on the results of said investigation. However, this shall not apply, by the pursuant to the provisions of the preceding paragraph, if the result of the Soil Contamination Status Survey of the said land is submitted.

Article 16, paragraph (1) is omitted.

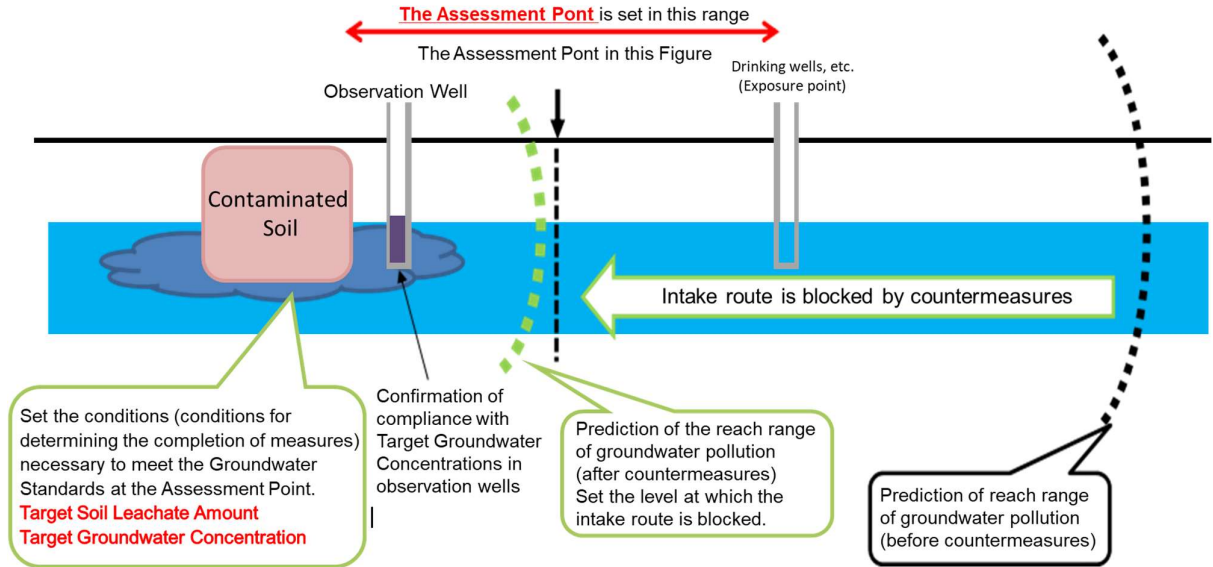
Appendix 3 The Target Soil Leachate Amount and the Target Groundwater Concentration

The completion of the Action for Removal, etc. for non-conformity to the Soil Leachate Standards does not necessarily require conformity to the Groundwater Standards in the Area which require Action, because it is considered enough if the route of exposure to humans is blocked. Therefore, the Target Soil Leachate Amount (However, it should be less than the second leaching standard.) and the Target Groundwater Concentration are set as the amount of soil leachate and the concentration of groundwater in the Area for require Action, which are the concentrations to be in compliance with the groundwater standard at the "Assessment Point" specified in Annex 6 by the Implementation Measures, and the condition of completion of the measures is that the concentrations are in compliance with these targets. Refer to the figure below.

The Monitoring of Groundwater quality, which uses the Target Leachate Amount and Target Groundwater Quality, is specified Measure by the Ordinance of the Ministry of the Environment, where the state of contamination of soil by Designated Hazardous Substance does not conform to the Soil Leachate Standards and where groundwater pollution has occurred due to the contamination of said soil by the Designated Hazardous Substance.

The Target Soil Leachate Amount and the Target groundwater Concentrations can be obtained by entering parameters such as the type of Designated Hazardous Substance, soil type and thickness of the aquifer, hydraulic gradient, scale of the non-compliant soil and distance to the Assessment Point into a tool provided by the Ministry of the Environment.

It should be noted that it is also possible to set soil leaching standards and groundwater standards as target soil leaching and target groundwater concentrations.



Concept of calculation and equation using in the tool is introduced in next page.

Concept of calculation and equation using in the tool

The assessment period for setting the conditions for completion of measures shall be 100 years from the time when the assessment is to be initiated.

1. Concept of Calculation

The concept of the calculation of the target soil leaching amount and target groundwater concentration is as follows:

(1) Target soil leaching rate

To be on the safe side, the Target Soil Leachate Amount, non-compliant soil is assumed to be distributed only in the aquifer, and the Target Soil Leachate Amount is the same as the Target Groundwater Concentration.

(2) Target groundwater concentration

From the horizontal advection and dispersion analysis of groundwater in the aquifer, the groundwater concentration in the implementing range of measures that satisfy the groundwater standard at the assessment point is obtained and this is decided to be the Target Groundwater Concentration.

2. Equation using in the Tool

The Domenico formula used in the calculation is shown below. The time unit is "year".

$c(x,0,0,100\text{years}) =$

$$\frac{c_0}{2} \exp\left[\frac{x}{2\alpha_x}(1 - \sqrt{1 + 4\lambda\alpha_x/v_x})\right] \cdot \operatorname{erfc}\left(\frac{x - 100v_x/R_d\sqrt{1 + 4\lambda\alpha_x/v_x}}{20\sqrt{\alpha_x v_x/R_d}}\right) \cdot \operatorname{erf}\left(\frac{Y}{4\sqrt{\alpha_y x}}\right) \cdot \operatorname{erf}\left(\frac{Z}{2\sqrt{\alpha_z x}}\right)$$

Here,

C_0 : Target Groundwater Concentration (mg/L)

x : Distance to the drinking well, etc. that was the designated reason (m)

λ : Constant *Only for Class I and Class III except PCB

R_d : Coefficient of delay , $R_d = 1 + \frac{1 - n_e}{n_e} \rho_s K_d = 1 + \frac{\rho_d K_d}{n_e}$

Y : Width of non-compliant soil, ...

Z : The thickness of the aquifer (m), but the maximum is 10 m

V_x : Actual flow velocity in the x direction (m / year), $V_x = ki/n_e$

α_x : Vertical dispersion length (m), as $\alpha_x = x/10$

α_y, α_z : Horizontal dispersion length (m), as $\alpha_y = \alpha_z = \alpha_x / 10$

ρ_s : Soil particle density (t/m³)

K_d : Soil-water partition coefficient (L/kg)

* In case of Class I, Class III , $K_d = f_{oc} \cdot K_{oc}$

ρ_d : Soil dry density (t/m³)

k : Permeability coefficient (m/year)

i : Hydrodynamic gradient

n_e : Effective porosity

f_{oc} : Organic carbon content

K_{oc} : Organic carbon partition coefficient (L/kg)

Appendix 4 The conceptual Figures of the measures⁹

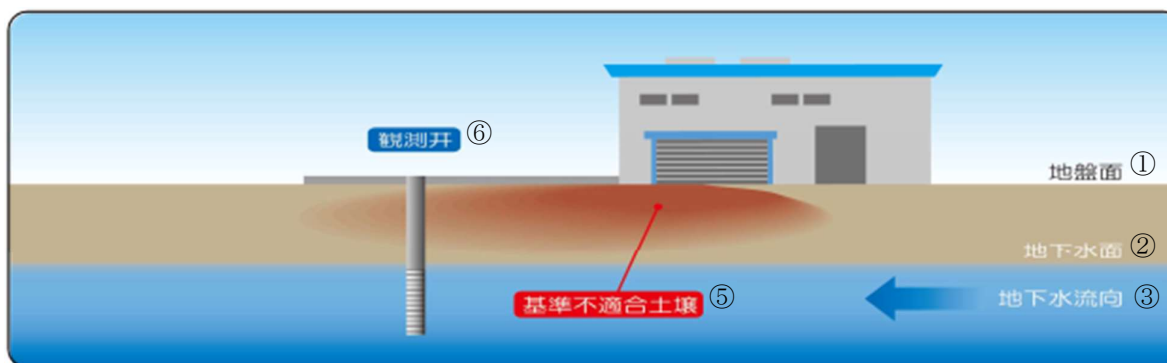
1. Measurement of Groundwater Quality

Applicable substances and areas after completion of the measures

Class I DHS	Class II DHS	Class III DHS
○	○	○

After completion of the measures
Area requiring submission at the time of change to the Form or Nature of the Land

○ Applicable to all substances △ Applicable to some substances × Not applicable — Out of Selection



- ① Ground Surface ② Groundwater Surface ③ Flow Direction of Groundwater ④ Observation Well
⑤ Non-compliant Soil

Applicable Condition: The contamination of groundwater is not observed.

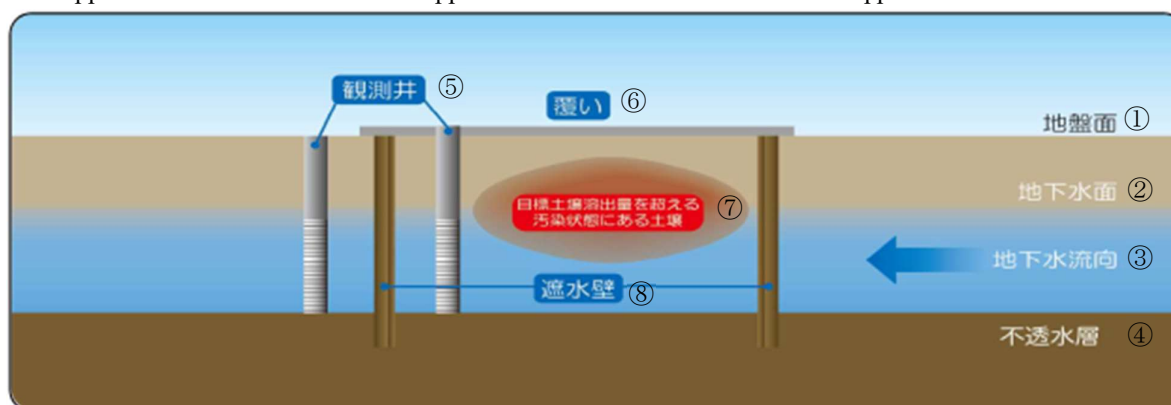
2. In-situ Containment

Applicable substances and areas after completion of the measures

Class I DHS	Class II DHS	Class III DHS
○	○	○

After completion of the measures
Area requiring submission at the time of change to the Form or Nature of the Land

○ Applicable to all substances △ Applicable to some substances × Not applicable — Out of Selection



- ① Ground Surface ② Groundwater Surface ③ Flow Direction of Groundwater
④ Impermeable Layer ⑤ Observation Well ⑥ Cover
⑦ Contaminated Soil in excess of Target Soil Leachate Amount ⑧ Impermeable Wall

⁹ Ministry of Environment; Guidebook for the improvement of in-area measures (In Japanese); <http://61.125.139.30/water/dojo/gl-man/dojogb2020.pdf>

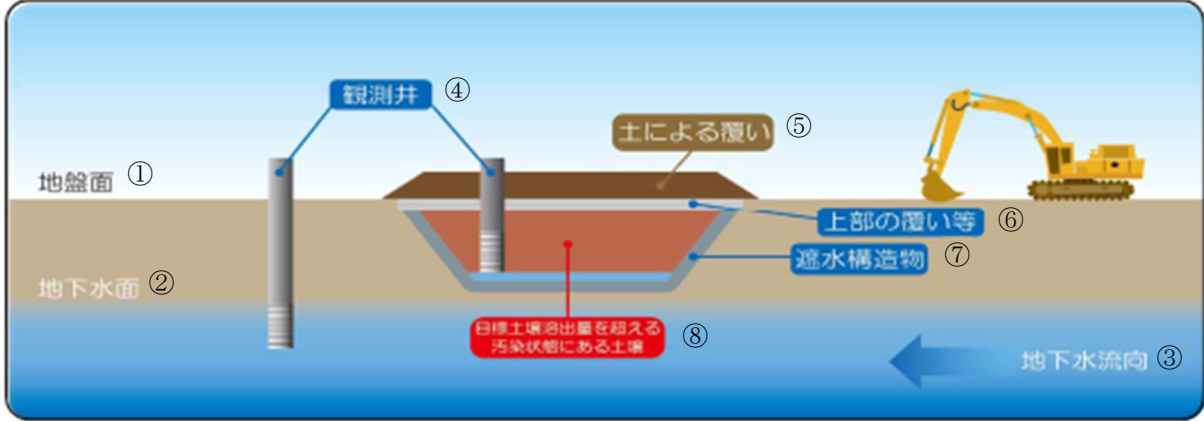
3. Barrier Containment

Applicable substances and areas after completion of the measures

Class I DHS	Class II DHS	Class III DHS
○	○	○

After completion of the measures
Area requiring submission at the time of change to the Form or Nature of the Land

○ Applicable to all substances △ Applicable to some substances × Not applicable — Out of Selection



- ① Ground Surface ② Groundwater Surface ③ Flow Direction of Groundwater
- ④ Observation Well ⑤ Soil Cover ⑥ Upper cover etc. ⑦ Impermeable Structure
- ⑧ Contaminated Soil in excess of Target Soil Leachate Amount

4. Prevention of the spread of Groundwater Contamination

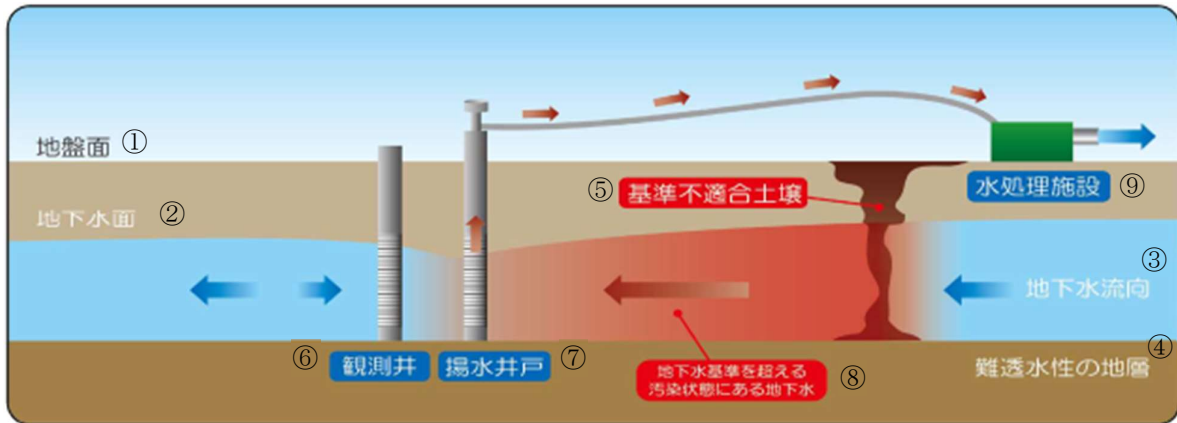
4.1 Pumping Facility

Applicable substances and areas after completion of the measures

Class I DHS	Class II DHS	Class III DHS
○	○	○

After completion of the measures
Measure not yet completed

○ Applicable to all substances △ Applicable to some substances × Not applicable — Out of Selection



- ① Ground Surface ② Groundwater Surface ③ Flow Direction of Groundwater
- ④ Hardly permeable strata ⑤ Non-Compliant Soil ⑥ Observation Well ⑦ Pumping Well
- ⑧ Contaminated Groundwater in excess of Groundwater Standards ⑨ Pumped Water Treatment Facility

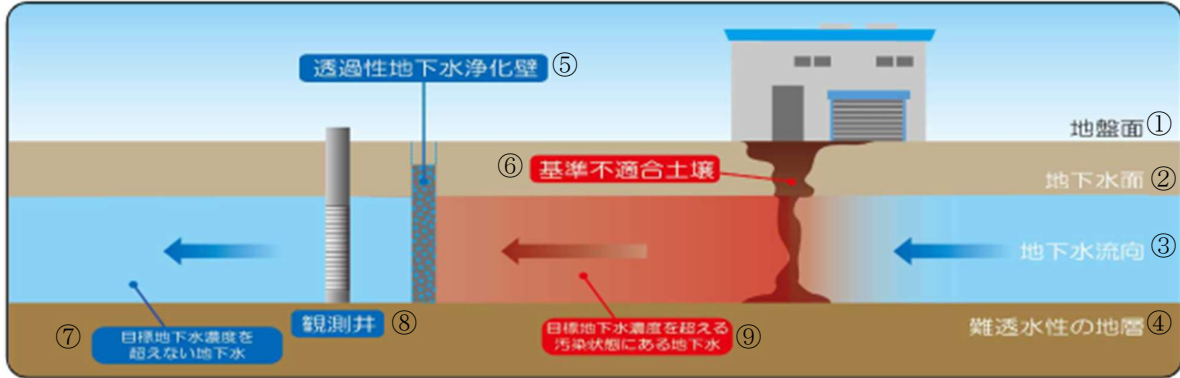
4.2 Permeable Groundwater Remediation Wall

Applicable substances and areas after completion of the measures

Class I DHS	Class II DHS	Class III DHS
○	○	○

After completion of the measures
Measure not yet completed

○ Applicable to all substances △ Applicable to some substances × Not applicable — Out of Selection



- ① Ground Surface ② Groundwater Surface ③ Flow Direction of Groundwater
- ④ Hardly Permeable Strata ⑤ Permeable Groundwater Remediation Wall ⑥ Non-Compliant Soil
- ⑦ Groundwater that does not exceed the Target Groundwater Quality ⑧ Observation Well
- ⑨ Contaminated Groundwater in excess of Groundwater Standards

5. Removal of Soil Contamination

5.1 On-site Remediation

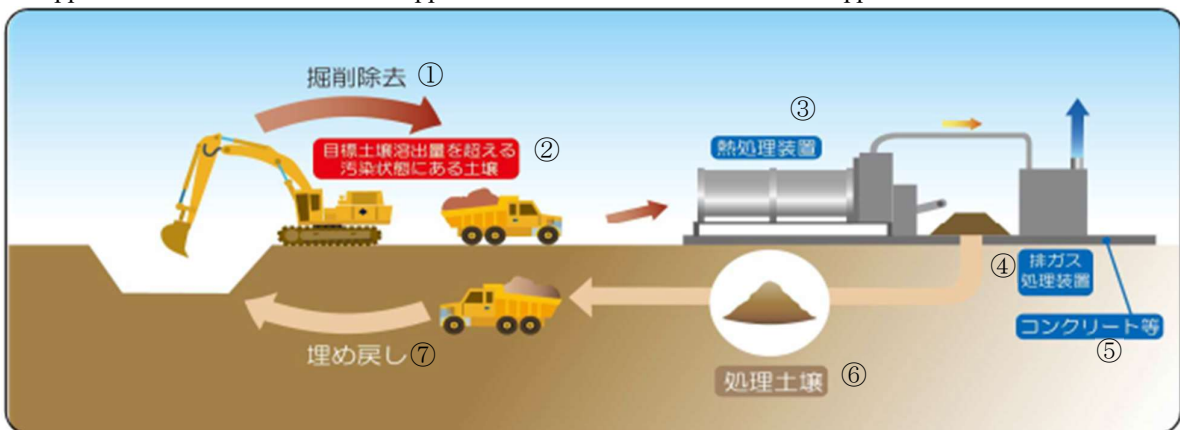
5.1.1 Heat Treatment

Applicable substances and areas after completion of the measures

Class I DHS	Class II DHS	Class III DHS
○	△ (Mercury、Cyanides compounds)	○

After completion of the measures
Area requiring submission at the time of change to the Form or Nature of the Land or Cancellation of area designation

○ Applicable to all substances △ Applicable to some substances × Not applicable — Out of Selection



- ① Excavation Removal ② Contaminated Soil in excess of Target Soil Leachate Amount
- ③ Heat Treatment Device ④ Flue Gas Treatment Facility ⑤ Concrete etc. ⑥ Treated Soil
- ⑦ Backfill

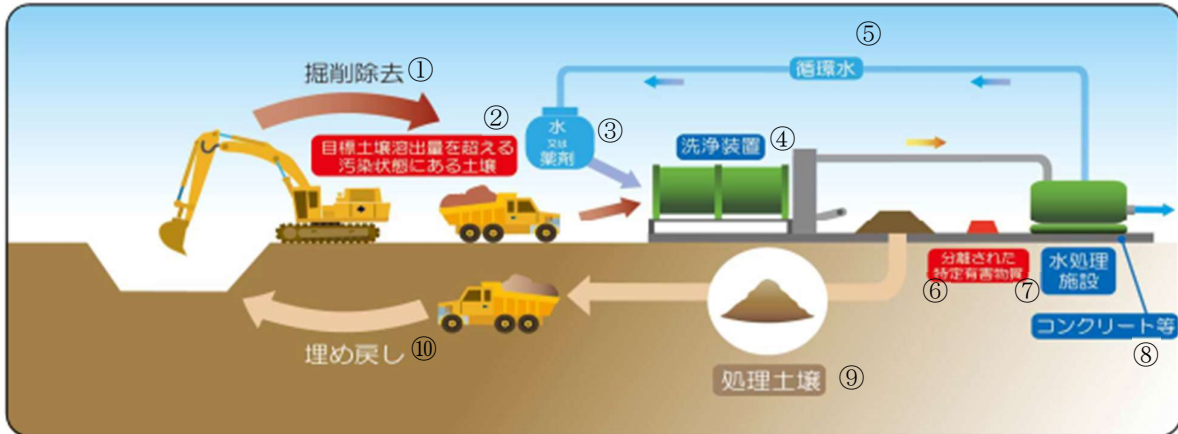
5.1.2 Washing

Applicable substances and areas after completion of the measures

Class I DHS	Class II DHS	Class III DHS
×	○	○

After completion of the measures
Area requiring submission at the time of change to the Form or Nature of the Land or Cancellation of area designation

○ Applicable to all substances △ Applicable to some substances × Not applicable – Out of Selection



- ① Excavation Removal ② Contaminated Soil in excess of Target Soil Leachate Amount
- ③ Water or Chemicals ④ Washing Device ⑤ Circulated Water
- ⑥ Separated Designated Hazardous Substances ⑦ Water Treatment Facility ⑧ Concrete etc.
- ⑨ Treated Soil ⑩ Backfill

5.1.3 Chemical Treatment

Applicable substances and areas after completion of the measures

Class I DHS	Class II DHS	Class III DHS
○	△ (Cyanides compounds)	○

After completion of the measures
Area requiring submission at the time of change to the Form or Nature of the Land or Cancellation of area designation

○ Applicable to all substances △ Applicable to some substances × Not applicable – Out of Selection



- ① Excavation Removal ② Contaminated Soil in excess of Target Soil Leachate Amount
- ③ Chemicals ④ Concrete etc. ⑤ Treated Soil ⑥ Backfill

5.1.4 Biological Treatment

Applicable substances and areas after completion of the measures

Class I DHS	Class II DHS	Class III DHS
○	△ (Cyanides compounds)	△

After completion of the measures
Area requiring submission at the time of change to the Form or Nature of the Land or Cancellation of area designation

○ Applicable to all substances △ Applicable to some substances × Not applicable — Out of Selection



- ① Excavation Removal ② Contaminated Soil in excess of Target Soil Leachate Amount
③ Nutritional substances etc. ④ Concrete etc. ⑤ Treated Soil ⑥ Backfill

5.1.5 Extraction Treatment

Applicable substances and areas after completion of the measures

Class I DHS	Class II DHS	Class III DHS
○	×	×

After completion of the measures
Area requiring submission at the time of change to the Form or Nature of the Land or Cancellation of area designation

○ Applicable to all substances △ Applicable to some substances × Not applicable — Out of Selection



- ① Excavation Removal ② Contaminated Soil in excess of Target Soil Leachate Amount
③ Calcium Oxide etc. ④ Activated Carbon Absorption Device ⑤ Concrete etc. ⑥ Treated Soil
⑦ Backfill

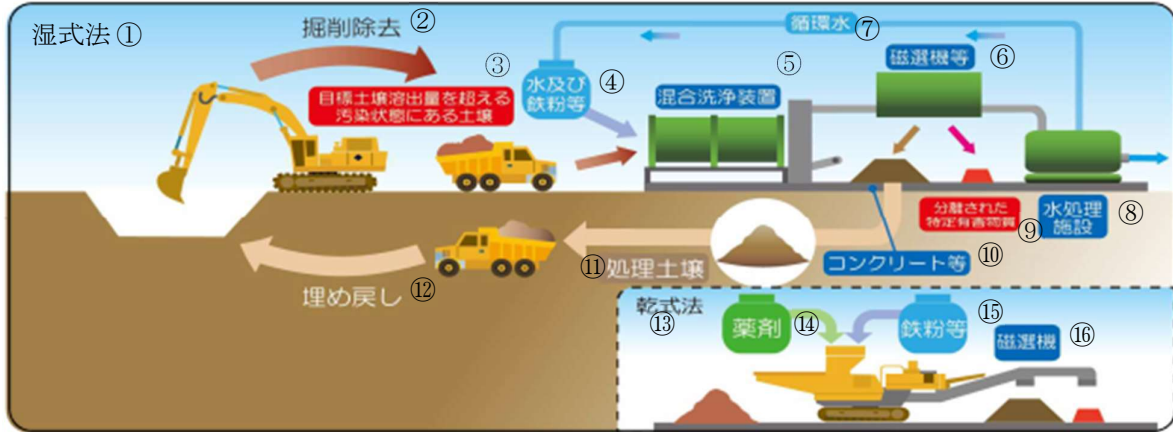
5.1.6 Magnetic Sorting

Applicable substances and areas after completion of the measures

Class I DHS	Class II DHS	Class III DHS
×	△ (Except Boron)	×

After completion of the measures
Area requiring submission at the time of change to the Form or Nature of the Land or Cancellation of area designation

○ Applicable to all substances △ Applicable to some substances × Not applicable — Out of Selection



- ① Wet Method ② Excavation Removal ③ Contaminated Soil in excess of Target Soil Leachate Amount
- ④ Water and Iron Powder etc. ⑤ Mixing and Washing Device ⑥ Magnetic Separator etc.
- ⑦ Circulated Water ⑧ Water Treatment Facility ⑨ Designated Hazardous Substances ⑩ Concrete etc.
- ⑪ Treated Soil ⑫ Backfill ⑬ Dry Method ⑭ Chemicals ⑮ Iron Powder, etc. ⑯ Magnetic separator

Note: Hazardous Substances are absorbed to iron powder and separatee by magnetic separation

5.2 In-situ Remediation

5.2.1 In-situ Extraction

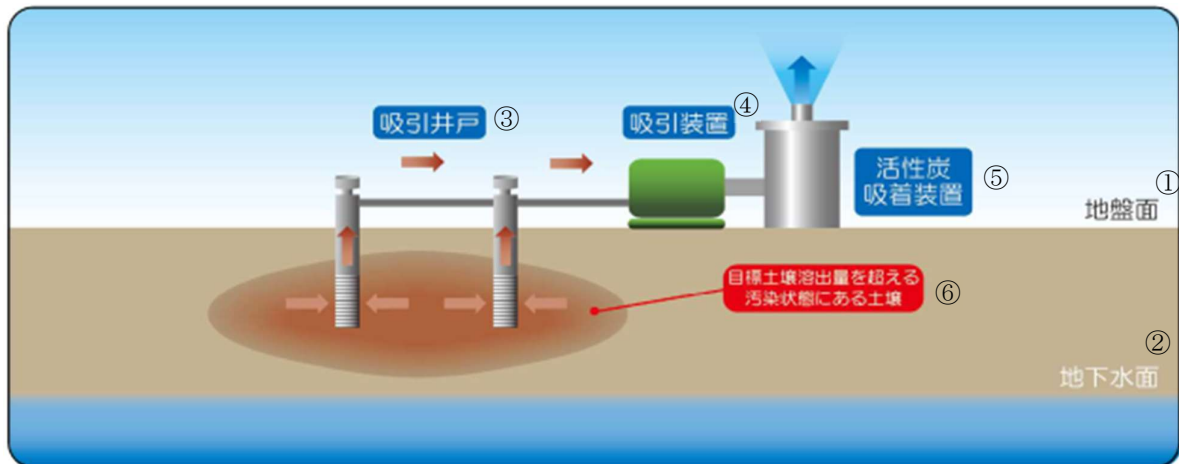
5.2.1.1 Soil Gas Suction

Applicable substances and areas after completion of the measures

Class I DHS	Class II DHS	Class III DHS
○	×	×

After completion of the measures
Area requiring submission at the time of change to the Form or Nature of the Land or Cancellation of area designation

○ Applicable to all substances △ Applicable to some substances × Not applicable — Out of Selection



- ① Ground Surface ② Groundwater Surface ③ Gas Suction Wells ④ Suction Device
- ⑤ Activated Carbon Absorption Device ⑥ Contaminated Soil in excess of Target Soil Leachate Amount

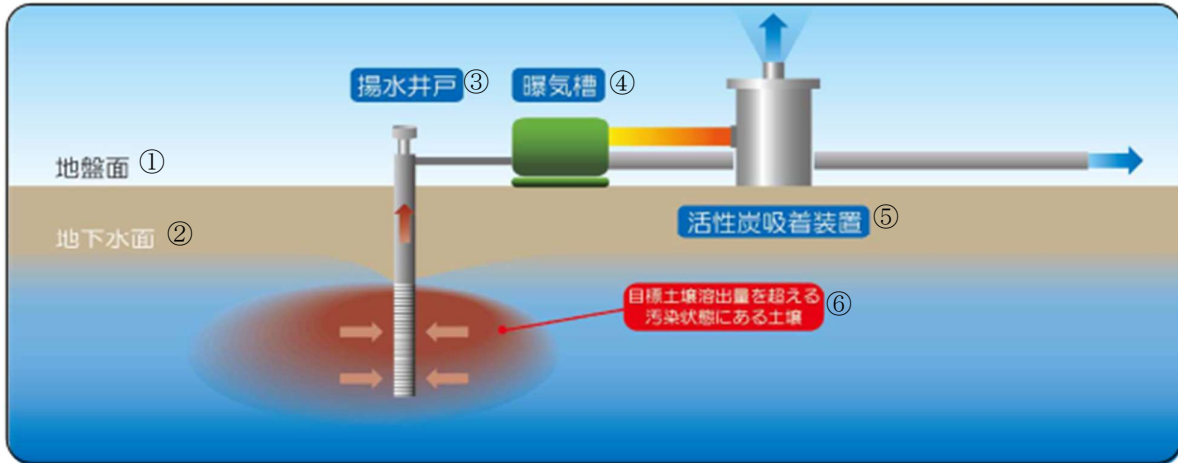
5.2.1.2 Pumping of Groundwater

Applicable substances and areas after completion of the measures

Class I DHS	Class II DHS	Class III DHS
○	○	○

After completion of the measures
Area requiring submission at the time of change to the Form or Nature of the Land or Cancellation of area designation

○ Applicable to all substances △ Applicable to some substances × Not applicable — Out of Selection



- ① Ground Surface ② Groundwater Surface ③ Gas Suction Well ④ Aeration Tank
 ⑤ Activated Carbon Absorption Device ⑥ Contaminated Soil in excess of Target Soil Leachate Amount

Note: Designated Hazardous Substances in the water are treated by Coagulation and Sedimentation, etc.

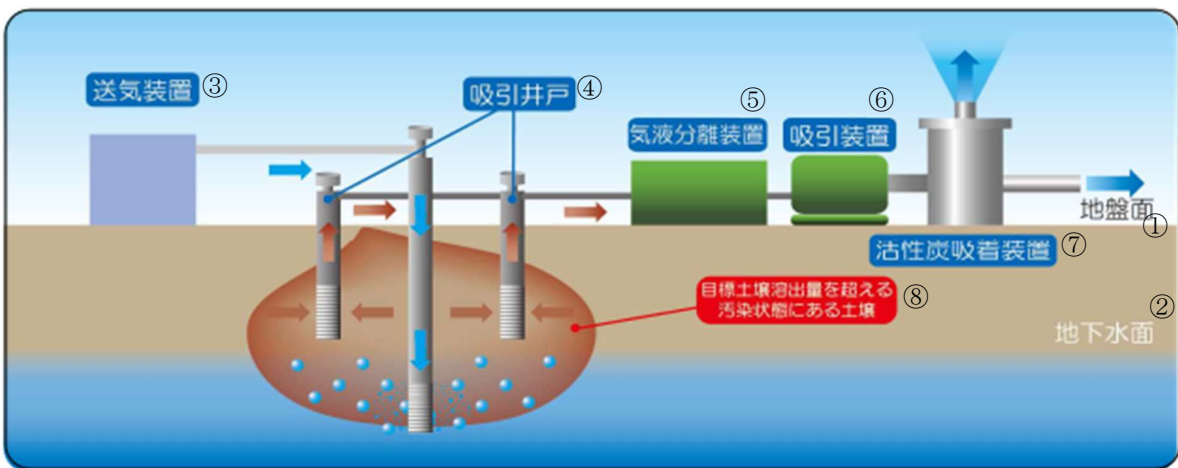
5.2.1.3 Air Sparging

Applicable substances and areas after completion of the measures

Class I DHS	Class II DHS	Class III DHS
○	×	×

After completion of the measures
Area requiring submission at the time of change to the Form or Nature of the Land or Cancellation of area designation

○ Applicable to all substances △ Applicable to some substances × Not applicable — Out of Selection



- ① Ground Surface ② Groundwater Surface ③ Air Supply Device ④ Gas Suction Wells
 ⑤ Air-Liquid Separation Device ⑥ Suction Device ⑦ Activated Carbon Absorption Device
 ⑧ Contaminated Soil in excess of Target Soil Leachate Amount

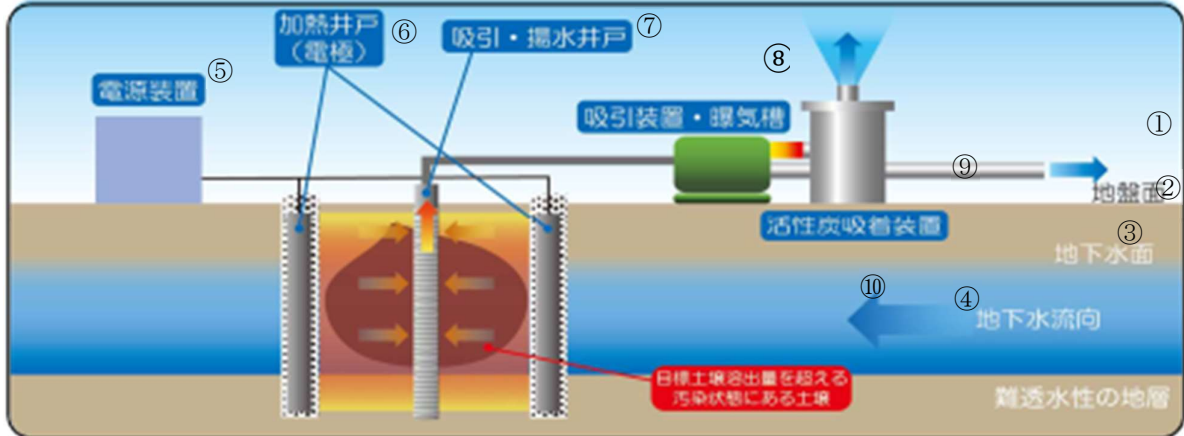
5.2.1.4 Heating and Desorption

Applicable substances and areas after completion of the measures

Class I DHS	Class II DHS	Class III DHS
○	△ (Mercury)	△ (PCB)

After completion of the measures
Area requiring submission at the time of change to the Form or Nature of the Land or Cancellation of area designation

○ Applicable to all substances △ Applicable to some substances × Not applicable – Out of Selection



- ① Ground Surface ② Groundwater Surface ③ Flow Direction of Groundwater ④ Hardly Permeable Strata ⑤ Power Supply ⑥ Heating Wells (Electrodes) ⑦ Suction and Pumping Well ⑧ Suction Device and Aeration Tank ⑨ Activated Carbon Absorption Device ⑩ Contaminated Soil in excess of Target Soil Leachate Amount

5.2.2 In-situ Decomposition

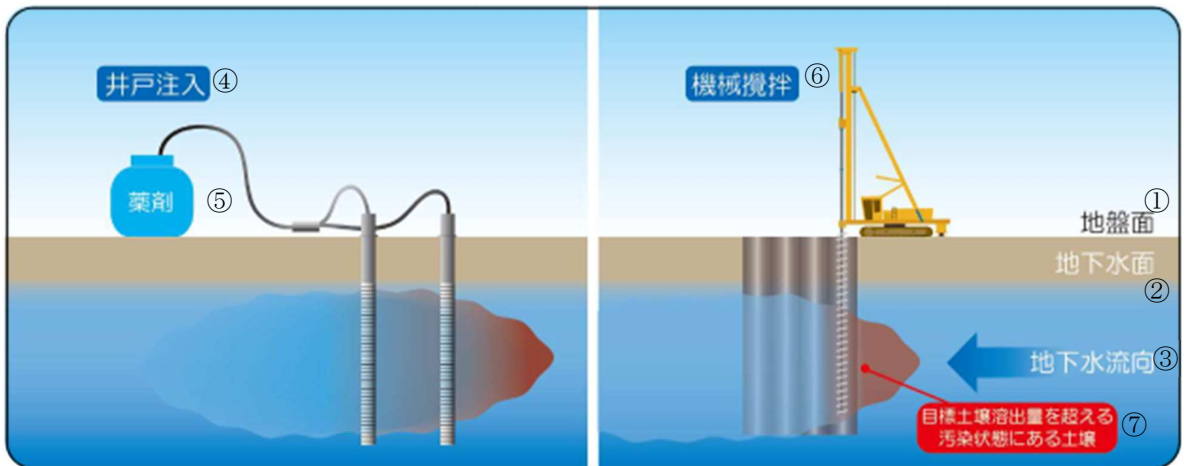
5.2.2.1 Chemical Treatment

Applicable substances and areas after completion of the measures

Class I DHS	Class II DHS	Class III DHS
○	△ (Cyanides compounds)	△

After completion of the measures
Area requiring submission at the time of change to the Form or Nature of the Land or Cancellation of area designation

○ Applicable to all substances △ Applicable to some substances × Not applicable – Out of Selection



- ① Ground Surface ② Groundwater Surface ③ Flow Direction of Groundwater ④ Well Injection ⑤ Chemicals ⑥ Mechanical Mixing ⑦ Contaminated Soil in excess of Target Soil Leachate Amount

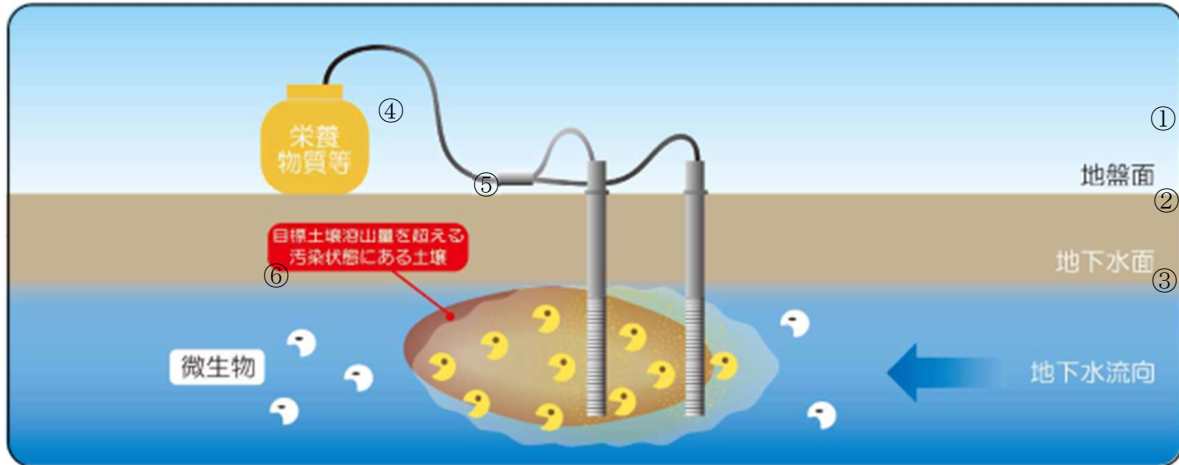
5.2.2.2 Biological Treatment

Applicable substances and areas after completion of the measures

Class I DHS	Class II DHS	Class III DHS
○	△ (Cyanides compounds)	△

After completion of the measures
Area requiring submission at the time of change to the Form or Nature of the Land or Cancellation of area designation

○ Applicable to all substances △ Applicable to some substances × Not applicable – Out of Selection



- ① Ground Surface ② Groundwater Surface ③ Flow Direction of Groundwater
 ④ Nutritional substances etc. ⑤ Contaminated Soil in excess of Target Soil Leachate Amount
 ⑥ Microorganism

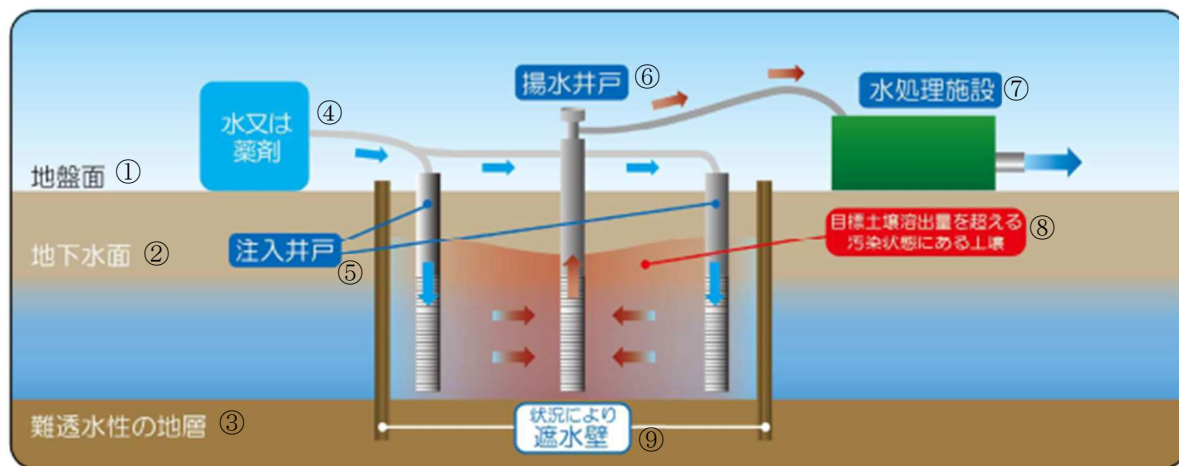
5.2.3 In-situ Soil Washing

Applicable substances and areas after completion of the measures

Class I DHS	Class II DHS	Class III DHS
○	○	○

After completion of the measures
Area requiring submission at the time of change to the Form or Nature of the Land or Cancellation of area designation

○ Applicable to all substances △ Applicable to some substances × Not applicable – Out of Selection



- ① Ground Surface ② Groundwater Surface ③ Hardly Permeable Strata ④ Water or Chemicals
 ⑤ Injection Wells ⑥ Pumping Well ⑦ Water Treatment Facility
 ⑧ Contaminated Soil in excess of Target Soil Leachate Amount
 ⑨ Impermeable Walls depending on the situation

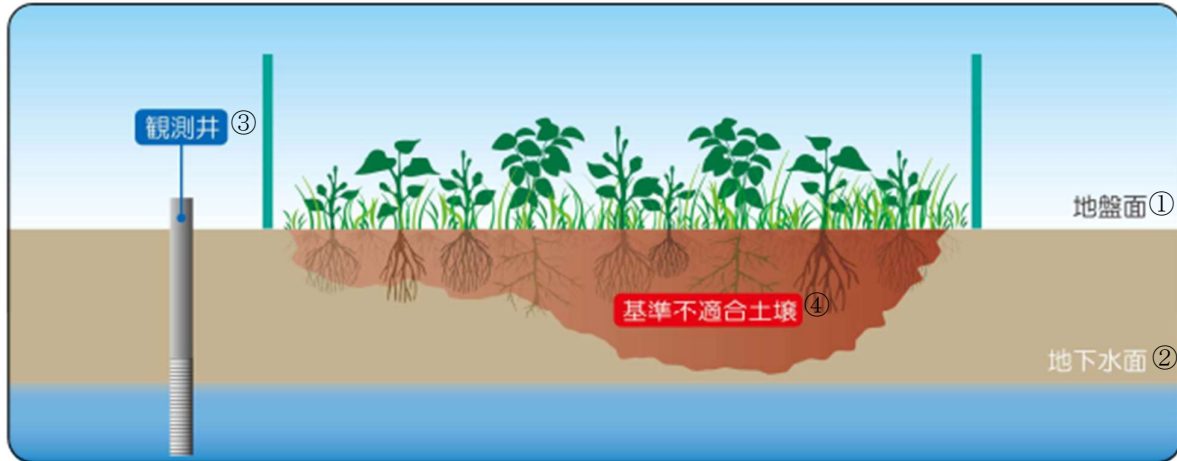
5.2.4 Phytoremediation

Applicable substances and areas after completion of the measures

Class I DHS	Class II DHS	Class III DHS
—	△	—

After completion of the measures
Cancellation of area designation

○ Applicable to all substances △ Applicable to some substances × Not applicable — Out of Selection



① Ground Surface ② Groundwater Surface ③ Observation well ④ Non-compliant Soil

Supplement: The observation wells shown in the figure above are not necessarily required for measures to address risks from direct ingestion, but are required for measures to address risks from ingestion of groundwater.

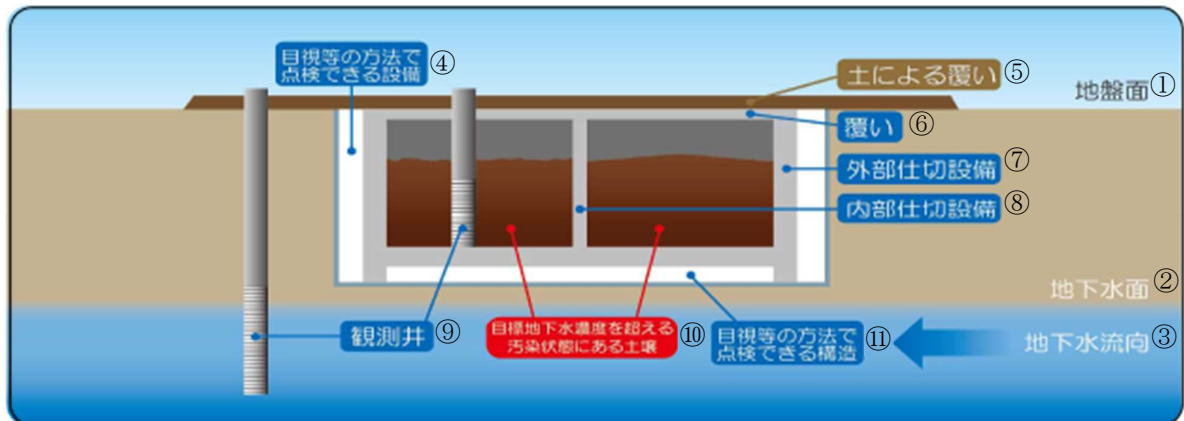
6. Interception Works Containment

Applicable substances and areas after completion of the measures

Class I DHS	Class II DHS	Class III DHS
—	○	○

After completion of the measures
Area requiring submission at the time of change to the Form or Nature of the Land

○ Applicable to all substances △ Applicable to some substances × Not applicable — Out of Selection



① Ground Surface ② Groundwater Surface ③ Hardly Permeable Strata
 ④ Equipment that can be inspected by visual or other means ⑤ Soil Cover ⑥ Cover
 ⑦ External Partitioning Equipment ⑧ Internal Partitioning Equipment ⑨ Observation Wells
 ⑩ Contaminated Soil in excess of Target Soil Leachate Amount ⑪. Structure that can be inspected by visual or other means

7. Insolubilisation

7.1 Insolubilisation and Backfill

Applicable substances and areas after completion of the measures

Class I DHS	Class II DHS	Class III DHS
—	○	—

After completion of the measures
Area requiring submission at the time of change to the Form or Nature of the Land

○ Applicable to all substances △ Applicable to some substances × Not applicable — Out of Selection



- ① Excavation Removal ② Contaminated Soil in excess of Target Soil Leachate Amount
 ③ Chemicals ④ Concrete, etc. ⑤ Treated Soil ⑥ Backfill

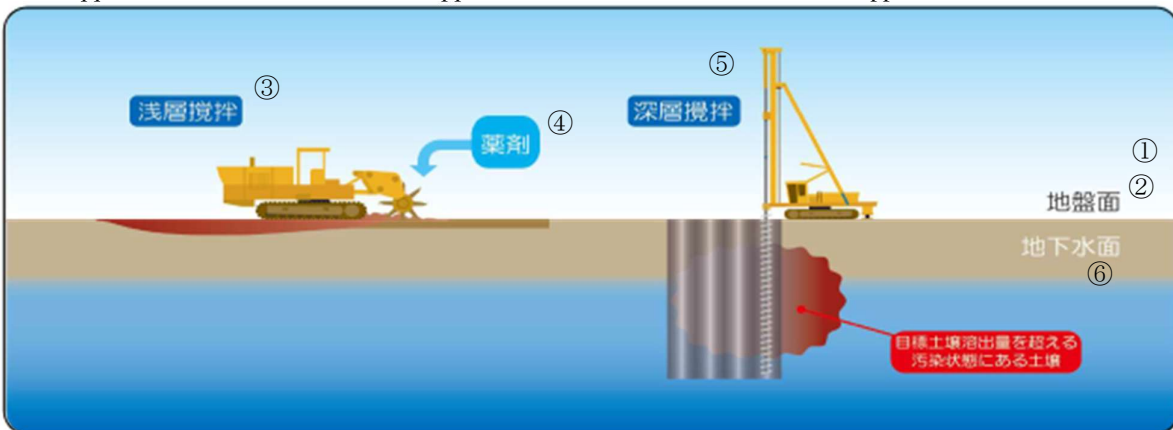
7.2 In-situ Insolubilisation

Applicable substances and areas after completion of the measures

Class I DHS	Class II DHS	Class III DHS
—	○	—

After completion of the measures
Area requiring submission at the time of change to the Form or Nature of the Land

○ Applicable to all substances △ Applicable to some substances × Not applicable — Out of Selection



- ① Ground Surface ② Groundwater Surface ③ Shallow layer Mixing ④ Chemicals
 ⑤ Deep Layer Mixing ⑥ Contaminated Soil in excess of Target Soil Leachate Amount

Applicable condition: This can not apply to the soil that exceeds the Second Soil Leachate Standards

8. Paving

Applicable substances and areas after completion of the measures

Class I DHS	Class II DHS	Class III DHS
—	○	—

After completion of the measures
Area requiring submission at the time of change to the Form or Nature of the Land

○ Applicable to all substances △ Applicable to some substances × Not applicable — Out of Selection



① Ground Surface ② Groundwater Surface ③ Pavement ④ Non-compliant Soil

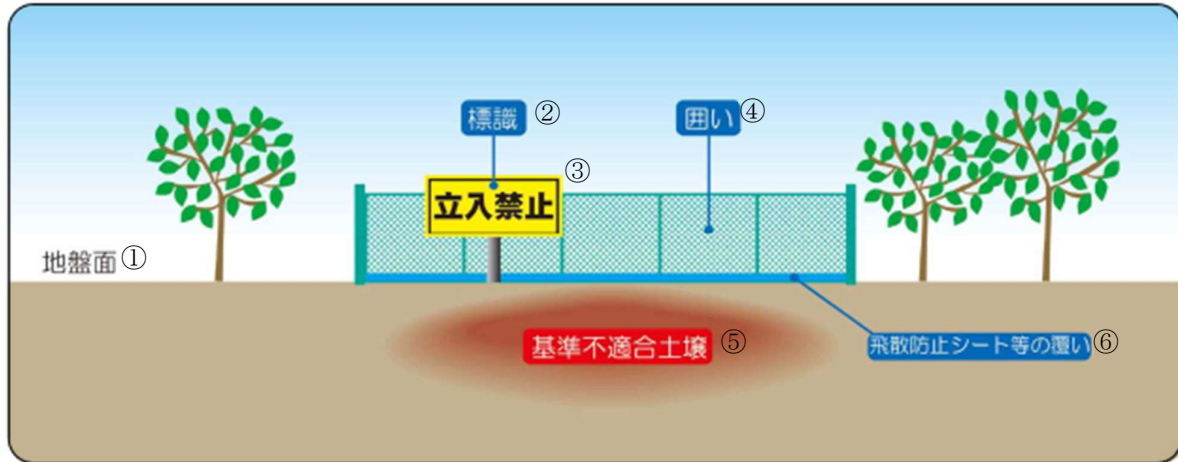
9. Keep Out

Applicable substances and areas after completion of the measures

Class I DHS	Class II DHS	Class III DHS
—	○	—

After completion of the measures
Area requiring submission at the time of change to the Form or Nature of the Land

○ Applicable to all substances △ Applicable to some substances × Not applicable — Out of Selection



① Ground Surface ② Sign Board ③ “Keep Out” ④ Fence ⑤ Non-compliant Soil

10. Soil Replacement

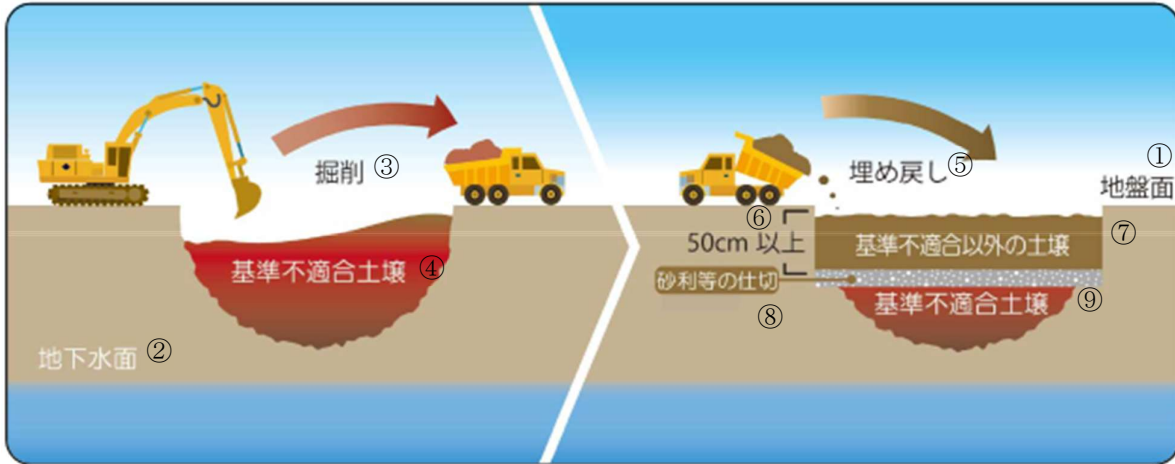
10.1 Out-of-area soil replacement

Applicable substances and areas after completion of the measures

Class I DHS	Class II DHS	Class III DHS
—	○	—

After completion of the measures
Area requiring submission at the time of change to the Form or Nature of the Land

○ Applicable to all substances △ Applicable to some substances × Not applicable — Out of Selection



- ① Ground Surface ② Groundwater Surface ③ Excavating ④ Non-Compliant Soil
 ⑤ Backfill ⑥ More than 50 cm ⑦ Soil other than Non-Compliant Soil
 ⑧ Partitioning with Gravel etc. ⑨ Non-Compliant Soil

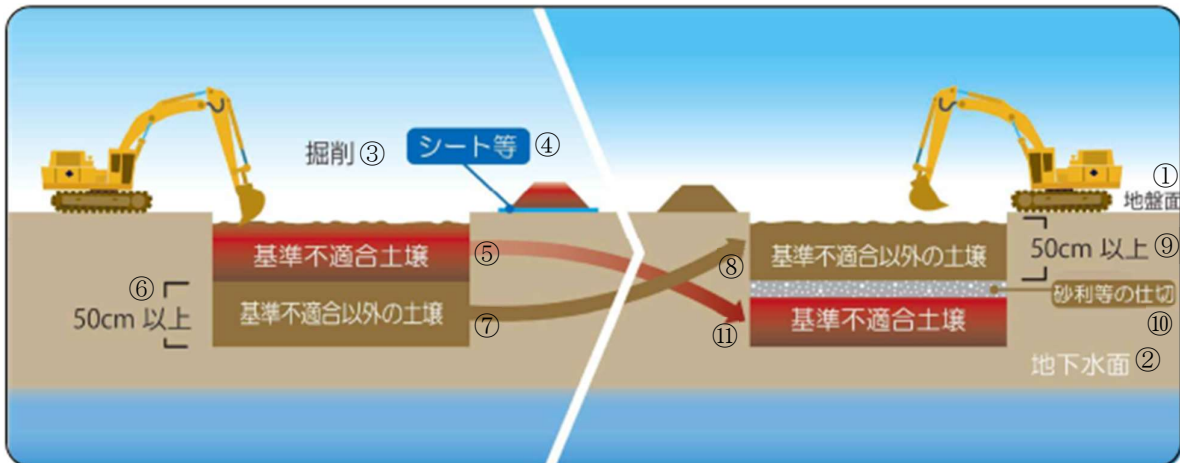
10.2 Soil replacement in the Area

Applicable substances and areas after completion of the measures

Class I DHS	Class II DHS	Class III DHS
—	○	—

After completion of the measures
Area requiring submission at the time of change to the Form or Nature of the Land

○ Applicable to all substances △ Applicable to some substances × Not applicable — Out of Selection



- ① Ground Surface ② Groundwater Surface ③ Excavating ④ Sheet etc. ⑤ Non-Compliant Soil
 ⑥ More than 50 cm ⑦ Soil other than Non-Compliant Soil ⑧ Soil other than Non-Compliant Soil
 ⑨ More than 50 cm ⑩ Partitioning with Gravel etc. ⑪ Non-Compliant Soil