

Chapter 2 Results of the Detailed Environmental Survey in FY2014

1. Purpose of the survey

The Detailed Environmental Survey is implemented to provide as required under the Chemical Substances Control Law (Law 117, 1973), the data and details required for risk assessments et al. of chemical substances prioritized for evaluations. This compiled material is intended to allow for nationwide assessments of exposure in the general environment.

2. Target chemicals

In the FY2014 Detailed Environmental Survey, 17 chemicals that were selected and designated as target chemicals. The combinations of target chemicals and the surveyed media are given below.

No.	Name	The Chemical Substances Control Law		The PRTR Law		Surveyed media			
		Before the revision	After the revision	Before the revision	After the revision	Surface water	Sedi-ment	Wild life	Air
[1]	Acrylic acid		Priority Assessment Chemical Substances	I 3	I 4	○			
[2]	<i>n</i> -Butyl acrylate	III Monitored	Priority Assessment Chemical Substances		I 7			○	
[3]	2-Aminoethanol		Priority Assessment Chemical Substances	I 16	I 20	○			○
[4]	Epichlorohydrin	II Monitored	Priority Assessment Chemical Substances	I 54	I 65				○
[5]	Glyoxal	II Monitored	Priority Assessment Chemical Substances	I 65	I 84				○
[6]	Glutaraldehyde	II Monitored		I 66	I 85				○
[7]	Chlorobenzene	III Monitored	Priority Assessment Chemical Substances	I 93	I 125	○			○
[8]	4-Chloro-2-methylphenol	III Monitored				○			
[9]	Cyclohexane		Priority Assessment Chemical Substances			○			
[10]	2,4-Dichlorophenoxy acetic acid (synonym: 2,4-D or 2,4-PA)	II Monitored III Monitored		I 131	I 175	○	○		
[11]	α -(Nonylphenyl)- ω -hydroxy poly(oxyethylene)s (polymerisation degree = 1-15) (synonym: Poly(oxyethylene) nonylphenyl ethers (polymerisation degree = 1-15))	III Monitored	Priority Assessment Chemical Substances	I 309	I 410	○			
[12]	Nonylphenols	II Monitored III Monitored		I 242	I 320	○		○	
[13]	Bis(2,2,6,6-tetramethyl-4-piperidyl)sebacate	III Monitored				○			

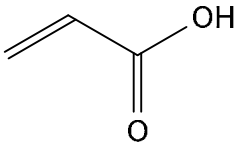
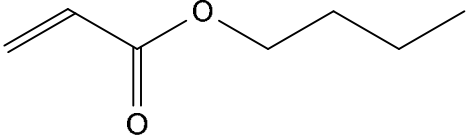
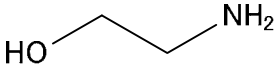
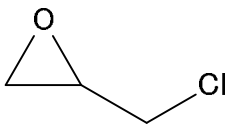
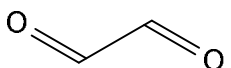
No.	Name	The Chemical Substances Control Law		The PRTR Law		Surveyed media			
		Before the revision	After the revision	Before the revision	After the revision	Surface water	Sedi-ment	Wild life	Air
[14]	4-(2-Phenylpropane-2-yl) phenol	III Monitored				○			
[15]	4,4'-(Propane-2,2-diyl) diphenol (synonym: 4,4'-Isopropylidenediphenol or Bisphenol A)	II Monitored III Monitored	Priority Assessment Chemical Substances	I 29	I 37	○	○	○	
[16]	Poly(oxyethylene) octylphenylethers (polymerisation degree = 1-10)	III Monitored		I 308	I 408	○			
[17]	Morpholine	II Monitored	Priority Assessment Chemical Substances		I 455	○			

(Note 1) "The PRTR Law" hereafter means "Act on Confirmation, etc. of Release Amounts of Specific Chemical Substances in the Environment and Promotion of Improvements to the Management Thereof (Law No. 86 of 1999)."

(Note 2) Pre-Revision "Areas as designated under the Chemical Substances Control Law" refer to those areas designated prior to the 20 May 2009 revision of the law (which went into effect on 1 April 2011), while "Post Revision Areas" refer to the areas defined as designated post-20 May 2009.

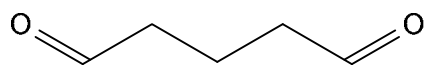
(Note 3) "Before the revision" in "The PRTR Law" means "appointments before the revision of government ordinance on November 21, 2008" and "After the revision" in "The PRTR Law" means "appointments after that revision".

Chemical and physical properties of target chemicals of the Detailed Environmental Survey are as follows.

<p>[1] Acrylic acid</p> 	<p>Molecular formula: C₃H₄O₂ CAS: 79-10-7 ENCS: 2-984 MW: 100.12 mp: 13.56°C ¹⁾ bp: 142°C ¹⁾ sw: 1,000,000mg/L ²⁾ Specific gravity: 1.0511(20°C) ¹⁾ logPow: 0.35 ³⁾</p>
<p>[2] <i>n</i>-Butyl acrylate</p> 	<p>Molecular formula: C₇H₁₂O₂ CAS: 141-32-2 ENCS: 2-989 MW: 128.17 mp: -63.6°C ¹⁾ bp: 146.6°C ¹⁾ sw: 1.4g/L(20°C) ⁴⁾ Specific gravity: 0.8898g/cm³(20°C) ¹⁾ logPow: 2.38 ⁵⁾</p>
<p>[3] 2-Aminoethanol</p> 	<p>Molecular formula: C₂H₇NO CAS: 141-43-5 ENCS: 2-301 MW: 61.08 mp: 10.4°C ¹⁾ bp: 170.3°C ¹⁾ sw: 1,000,000mg/L ²⁾ Specific gravity: 1.0180g/cm³(20°C) ¹⁾ logPow: -1.31 ⁶⁾</p>
<p>[4] Epichlorohydrin</p> 	<p>Molecular formula: C₃H₅ClO CAS: 106-89-8 ENCS: 2-275 MW: 92.52 mp: -26°C ¹⁾ bp: 111.99°C ¹⁾ sw: 70.4g/kg(20°C), 78g/kg(65°C) ¹⁾ Specific gravity: 1.1812g/cm³(20°C) ¹⁾ logPow: 0.30 ¹⁾</p>
<p>[5] Glyoxal</p> 	<p>Molecular formula: C₂H₂O₂ CAS: 107-22-2 ENCS: 2-510 MW: 58.04 mp: 15°C ¹⁾ bp: 50.4°C ¹⁾ sw: 1,000g/L(25°C) ⁶⁾ Specific gravity: 1.14g/cm³(20°C) ¹⁾ logPow: -0.85 ⁷⁾</p>

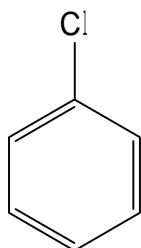
(Abbreviations) CAS: CAS registry number, ENCS: registry number in the Existing and New Chemical Substances List, MW: molecular weight, mp: melting point, bp: boiling point, SW: solubility in water, logPow: *n*-octanol-water partition coefficient, kPa: kilopascal (1 atom approximately equal to 101.3kPa).

[6] Glutaraldehyde



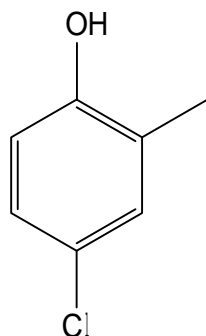
Molecular formula: $C_5H_8O_2$
CAS: 111-30-8
ENCS: 2-509
MW: 100.12
mp: $-14^\circ C$ ¹⁾
bp: $176^\circ C$ ¹⁾
sw: Uncertain
Specific gravity: 0.72 ⁶⁾
logPow: Uncertain

[7] Chlorobenzene



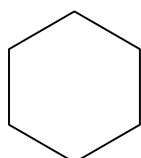
Molecular formula: C_6H_5Cl
CAS: 108-90-7
ENCS: 3-31
MW: 112.56
mp: $-45.2^\circ C$ ¹⁾
bp: $131.6^\circ C$ ¹⁾
sw: $0.50g/kg(25^\circ C)$, $0.55g/kg(45^\circ C)$ ¹⁾
Specific gravity: $1.1058g/cm^3(20^\circ C)$ ¹⁾
logPow: 2.84 ¹⁾

[8] 4-Chloro-2-methylphenol



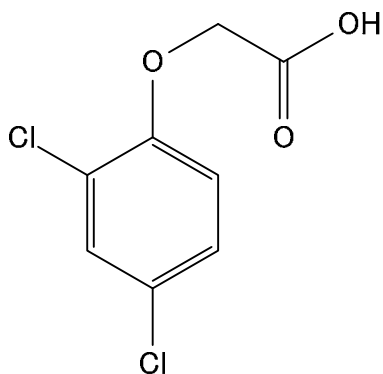
Molecular formula: C_7H_7ClO
CAS: 1570-64-5
ENCS: 3-900
MW: 142.58
mp: $51^\circ C$ ¹⁾
bp: $223^\circ C$ ¹⁾
sw: $6.8g/kg(25^\circ C)$ ¹⁾
Specific gravity: approximately $1.2g/cm^3(50^\circ C)$ ⁹⁾
logPow: 2.63 ¹⁰⁾

[9] Cyclohexane



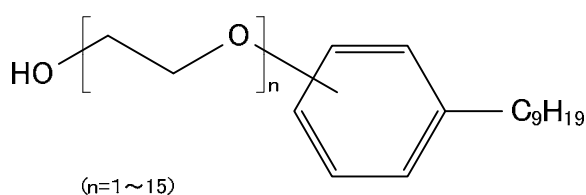
Molecular formula: C_6H_{12}
CAS: 110-82-7
ENCS: 3-2233
MW: 84.16
mp: $6.7^\circ C$ ¹⁾
bp: $80.7^\circ C$ ¹⁾
sw: $0.058-0.092g/kg(25-70^\circ C)$ ¹⁾
Specific gravity: $0.7739g/cm^3(25^\circ C)$ ¹⁾
logPow: 3.44 ¹⁾

[10] 2,4-Dichlorophenoxyacetic acid (synonym: 2,4-D or 2,4-PA)



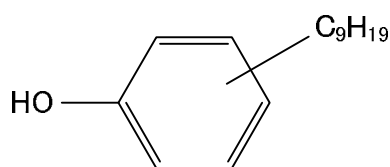
Molecular formula: $C_8H_6Cl_2O_3$
 CAS: 94-75-7
 ENCS: 3-927
 MW: 84.16
 mp: $140^\circ C$ ¹⁾
 bp: $160^\circ C$ ¹⁾
 sw: $0.7g/kg(25^\circ C)$ ¹⁾
 Specific gravity: $1.6(30^\circ C)$ ¹¹⁾
 logPow: 2.81 ⁹⁾

[11] α -(Nonylphenyl)- ω -hydroxypoly(oxyethylene)s (polymerisation degree = 1-15)
 (synonym: Poly(oxyethylene) nonylphenyl ethers (polymerisation degree = 1-15))



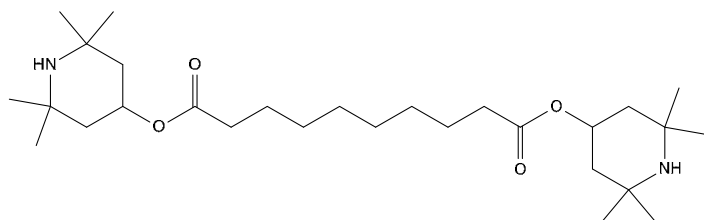
Molecular formula: $C_{(2n+15)}H_{(4n+24)}O_{(n+1)}$ ($n=1\sim 10$)
 CAS: 9016-45-9
 ENCS: 7-172
 MW: 660.88
 mp: $42\sim 43^\circ C$ ¹²⁾
 bp: Uncertain
 sw: $>1g/L$ ¹²⁾
 Specific gravity: 1.06(average degree of polymerisation = 9.5, $20^\circ C$) ¹³⁾
 logPow: Uncertain

[12] Nonylphenols



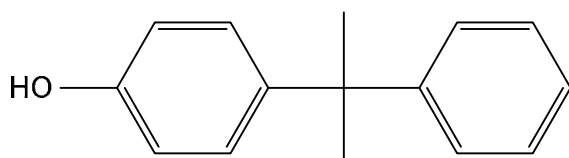
Molecular formula: $C_{15}H_{24}O$
 CAS: 25154-52-3
 ENCS: 3-503
 MW: 220.35
 mp: $42^\circ C$ ¹⁾
 bp: $317^\circ C$ ¹⁾
 sw: $0.00636g/kg(25^\circ C)$ ¹⁾
 Specific gravity: $0.95g/cm^3(20^\circ C)$ ¹⁾
 logPow: 5.76 ¹⁴⁾

[13] Bis(2,2,6,6-tetramethyl-4-piperidyl)sebacate

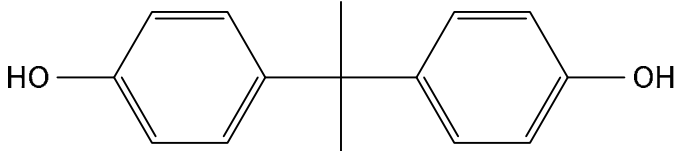
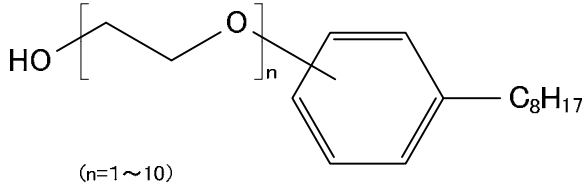
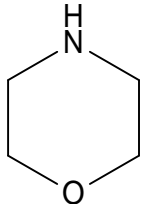


Molecular formula: $C_{28}H_{52}N_2O_4$
 CAS: 52829-07-9
 ENCS: 5-3732
 MW: 480.72
 mp: $83\sim 84^\circ C$ ¹⁵⁾
 bp: Uncertain
 sw: Uncertain
 Specific gravity: Uncertain
 logPow: Uncertain

[14] 4-(2-Phenylpropane-2-yl)phenol



Molecular formula: $C_{15}H_{16}O$
 CAS: 599-64-4
 ENCS: 4-122
 MW: 212.29
 mp: $74.5^\circ C$ ¹⁶⁾
 bp: $335^\circ C$ ¹⁶⁾
 sw: Uncertain
 Specific gravity: 1.0163($20/4^\circ C$, liquid) ¹⁶⁾
 logPow: Uncertain

<p>[15] 4,4'-(Propane-2,2-diyl)diphenol (synonym: 4,4'-Isopropylidenediphenol or Bisphenol A)</p> 	<p>Molecular formula: C₁₅H₁₆O₂ CAS: 80-05-7 ENCS: 4-123 MW: 228.29 mp: 150~155°C ¹⁷⁾ bp: 220°C ¹⁷⁾ sw: 120-300mg/L ¹⁷⁾ Specific gravity: 1.195(25/25°C) ¹⁸⁾ logPow: 3.40 ¹⁷⁾</p>
<p>[16] Poly(oxyethylene)octylphenylethers (polymerisation degree = 1-10)</p>  <p>(n=1 ~ 10)</p>	<p>Molecular formula: C_(2n+14)H_(4n+22)O_(n+1) (n=1 ~ 10) CAS: 9036-19-5 ENCS: 7-172 MW: 646.85 mp: Uncertain bp: Uncertain sw: Uncertain Specific gravity: 1.039(polymerisation degree = 9, 20°C /4°C) ¹⁹⁾ logPow: Uncertain</p>
<p>[17] Morpholine</p> 	<p>Molecular formula: C₄H₉NO CAS: 110-91-8 ENCS: 5-859 MW: 87.12 mp: -4.8°C ¹⁾ bp: 128.2°C ¹⁾ sw: 0.15g/kg(20°C) ¹⁾ Specific gravity: 1.0005(20°C) ¹⁾ logPow: -0.86 ²⁾</p>

References

- 1) Lide, D.R.(ed), CRC Handbook of Chemistry and Physics 95th Edition
- 2) Philip H. Howard, William M. Meylan, Handbook of Physical Properties of Organic Chemicals (1997)
- 3) Hansch,C.,A.Leo and D.Hoekman(1995):Exploring QSAR-Hydrophobic,Electronic and Steric Constants,American Chemical Society
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- 11) International Chemical Safety Cards ICSC0033
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- 15) Zakrzewski, Jerzy; MOCMB7; Monatsh. Chem.; EN; 121; 10; 1990; 803-808.
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3. Surveyed site and procedure

In the Detailed Environmental Survey, the sampling and analysis of specimens was entrusted to prefectural governments and government-designated cities across Japan, and some specimens were sampled and analysed by private analytical laboratories.

(1) Organisations responsible for sampling

Local communities	Organisations responsible for sampling*1	Surveyed media			
		Surface water	Sediment	Wildlife	Air
Hokkaido	Environmental Promotion Section, Environment Division, Department of Environment and Lifestyle, Hokkaido Prefectural Government and Hokkaido Research Organization Environmental and Geological Research Department Institute of Environmental Sciences	○	○		○
Sapporo City	Sapporo City Institute of Public Health				○
Iwate Pref.	Research Institute for Environmental Sciences and Public Health of Iwate Prefecture	○	○	○	
Miyagi Pref.	Miyagi Prefectural Institute of Public Health and Environment	○			
Sendai City	Sendai City Institute of Public Health	○	○		
Akita Pref.	Akita Research Center for Public Health and Environment	○			
Yamagata Pref.	Yamagata Institute of Environmental Sciences	○			
Ibaraki Pref.	Ibaraki Kasumigaura Environmental Science Center	○	○		○
Tochigi Pref.	Tochigi Prefectural Institute of Public Health and Environmental Science	○			
Gunma Pref.	Gunma Prefectural Institute of Public Health and Environmental Sciences	○			
Saitama Pref.	Center for Environmental Science in Saitama	○			○
Saitama City	Saitama City Institute of Health Science and Research	○			○
Chiba Pref.	Chiba Prefectural Environmental Research Center	○			
Tokyo Met.	Tokyo Metropolitan Research Institute for Environmental Protection	○	○	○	○
Kanagawa Pref.	Kanagawa Environmental Research Center				○
Yokohama City	Yokohama Environmental Science Research Institute	○	○	○	
Kawasaki City	Kawasaki Environment Research Institute	○	○	○	
Niigata Pref.	Niigata Prefectural Institute of Public Health and Environmental Sciences	○		○	
Toyama Pref.	Toyama Prefectural Environmental Science Research Center	○			○
Ishikawa Pref.	Ishikawa Prefectural Institute of Public Health and Environmental Science	○	○		○
Fukui Pref.	Fukui Prefectural Institute of Public Health and Environmental Science	○			
Nagano Pref.	Nagano Environmental Conservation Research Institute	○	○		○
Shizuoka Pref.	Shizuoka Institute of Environment and Hygiene	○	○		
Aichi Pref.	Aichi Environmental Research Center	○	○		
Nagoya City	Nagoya City Environmental Science Research Center	○	○	○	○
Mie Pref.	Mie Prefecture Health and Environment Research Institute	○	○		○
Shiga Pref.	Lake Biwa Environmental Research Institute	○	○		
Kyoto Pref.	Kyoto Prefectural Institute of Public Health and Environment				○
Kyoto City	Kyoto City Institute of Health and Environmental Sciences	○			
Osaka Pref.	Environment Preservation Division, Environment Management Office, Department of Environment, Agriculture, Forestry and Fisheries, Osaka Prefectural Government and Research Institute of Environment, Agriculture and Fisheries, Osaka Prefecture	○	○	○	○*2
Osaka City	Osaka City Institute of Public Health and Environmental Sciences	○	○		
Hyogo Pref.	Hyogo Prefectural Agricultural Administration and Environment Division, Environment Bureau	○	○	○	○
Kobe City	Health Division, Health Welfare Bureau, Kobe Institute of Health	○			○
Nara Pref.	Nara Prefectural Scenery and Environmental Center	○			
Wakayama Pref.	Wakayama Prefectural Research Center of Environment and Public Health	○			
Okayama Pref.	Okayama Prefectural Institute for Environmental Science and Public Health	○	○	○	
Yamaguchi Pref.	Yamaguchi Prefectural Institute of Public Health and Environment	○		○	○
Tokushima Pref.	Tokushima Prefectural Public Health, Pharmaceutical and Environmental Sciences Center	○			○
Kagawa Pref.	Kagawa Prefectural Research Institute for Environmental Sciences and Public Health	○	○		○
Ehime Pref.	Ehime Prefectural Institute of Public Health and Environmental Science	○			
Fukuoka Pref.	Fukuoka Institute of Health and Environmental Sciences	○			○
Fukuoka City	Fukuoka City Institute of Health and Environmental	○			

Local communities	Organisations responsible for sampling*1	Surveyed media			
		Surface water	Sediment	Wildlife	Air
Saga Pref.	Saga Prefectural Environmental Research Center	○			
Oita Pref.	Oita Prefectural Institute of Health and Environment, Life and Environment Department	○	○	○	
Miyazaki Pref.	Miyazaki Prefectural Institute for Public Health and Environment				○

(Note 1) *1: Organisations responsible for sampling are described by their official names in FY 2014.

(Note 2) *2: Those organizations cooperated with a private analytical laboratory in sampling specimens.

(2) Surveyed sites (or areas) and target chemicals

Surveyed sites and target chemicals for surface water are shown in Table 2-1-1 and Figure 2-1-1. Surveyed sites and target chemicals for sediment are shown in Table 2-1-2 and Figure 2-1-1. Surveyed sites and target chemicals for wildlife are shown in Table 2-1-3 and Figure 2-1-2. Surveyed sites and target chemicals for Air are shown in Table 2-1-4 and Figure 2-1-3. The breakdown is summarized as follows.

To ensure more accurate data for areas susceptible to high concentrations in the general environment, Survey Points are selected and determined based on information regarding releases and emissions. New survey points utilized for the FY2014 surveys were finalized considering the emissions and releases reports submitted in accord with the PRTR, correlated with identification of geographical points with high particulate release volumes.

Surveyed media	Numbers of local communities	Numbers of target chemicals	Numbers of surveyed sites	Numbers of samples at a surveyed site
Surface water	41	13	72	1
Sediment	20	2	23	3
Wildlife	11	3	13	3
Air	21*	5	28	3
All media	45	17	114	

(Note) *:For 1 of the 21 organizations, it was cooperated with a private analytical laboratory in sampling specimens.

Table 2-1-1 List of surveyed sites (surface water) and target chemicals in the Detailed Environmental Survey in FY2014

Local communities	Surveyed sites	Target chemicals															
		[1]	[3]	[7]	[8]	[9]	[10]	[11]	[12]	[13]	[14]	[15]	[16]	[17]			
Hokkaido	Ishikarikakokyo Bridge, Mouth of Riv. Ishikari(Ishikari City)			○					○		○				○	○	
Iwate Pref.	Riv. Toyosawa(Hanamaki City)								○		○					○	
Miyagi Pref.	Futatsuya-bashi Bridge, Riv. Hasama (Tome City)			○	○			○		○					○		
	Sakura-hodoukyou Bridge, Riv. Shiroishi (Shibata Town)			○	○			○		○					○		
Sendai City	Hirose-ohashi Bridge, Riv. Hirose (Sendai City)	○							○							○	
Akita Pref.	Takanosu-bashi Bridge, Riv. Yoneshiro (Kita-akita City)				○	○					○						
	Akita Canal(Akita City)				○	○					○						
	Takemi-bashi Bridge, Riv. Omono (Daisen City)				○	○					○						
Yamagata Pref.	Mouth of Riv. Mogami (Sakata City)		○							○						○	
	Offshore of Sakata								○								
Ibaraki Pref.	Tonekamome-ohasi Bridge, Mouth of Riv. Tone(Kamisu City)			○						○							
Tochigi Pref.	Riv. Tagawa (Utsunomiya City)			○		○											
	Kinugawa-ohashi Bridge, Riv. Kinugawa (Kaminokawa Town)								○								
Gunma Pref.	Tako-bashi Bridge, Riv. Kabura (Takasaki City)			○				○							○		
Saitama Pref.	Dou-hashish Bridge, Riv. Naka(Kazo City)											○	○				
	Akigaseshusui of Riv. Arakawa(Shiki City)							○				○	○				
Saitama City	Nakadote-hashish Bridge, Riv. Kamo (Saitama City)			○								○	○	○			
Chiba Pref.	Coast of Chiba Port								○								
	Asai-bashish Bridge, Riv. Yourou (Ichihara City)	○			○				○	○		○	○			○	
	Coast of Kisarazu Port								○								
Tokyo Met.	Mouth of Riv. Arakawa(Koto Ward)	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	
	Mouth of Riv. Sumida(Minato Ward)	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	
Yokohama City	Kamenoko-bashish Bridge, Riv. Tsurumi (Yokohama City)	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	
	Yokohama Port	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	
	Offshore of Isogo		○														
Kawasaki City	Mouth of Riv. Tama (Kawasaki City)			○						○		○	○	○			
	Keihin Canal, Port of Kawasaki,The Coast of Chidori Town		○														
	Keihin Canal, Port of Kawasaki,The Coast of Ougi Town			○													
Niigata Pref.	Niigata Higashi Port								○								
	Lower Riv. Shinano (Niigata City)		○												○		
Toyama Pref.	Jintsu-ohashish Bridge, Riv. Jintsu (Toyama City)														○		
	Jyokoji-bashish Bridge, Riv. Koyabu (Takaoka City)			○													
Ishikawa Pref.	Mouth of Riv. Sai (Kanazawa City)	○			○	○											
	Tatsunokuchi-bashish Bridge, Riv. Tedorigawa(Nomi City, Kawakita Town)		○														
	Ishida-bashish Bridge, Riv. Kakehashigawa (Komatsu City)									○							
Fukui Pref.	Mishima-bashish Bridge, Riv. Shono (Tsuruga City)							○									
Nagano Pref.	Lake Suwa (center)	○			○	○					○				○	○	
Shizuoka Pref.	Shimizu Port	○									○						

Local communities	Surveyed sites	Target chemicals														
		[1]	[3]	[7]	[8]	[9]	[10]	[11]	[12]	[13]	[14]	[15]	[16]	[17]		
Aichi Pref.	Shinsakai-bashi Bridge, Riv. Sakai (Kariya City, Toyoake City)	○					○	○	○		○	○				
	Sakai-ohashi Bridge, Riv. Aizuma (Kariya City)							○								
	Nagoya Port , West of Shiomi Wharf *						○	○	○	○	○	○	○	○		
Nagoya City	Minatoshinbashi Bridge, Riv. Hori (Nagoya City)								○		○	○				
	Nagoya Port , South of Shiomi Wharf						○									
Mie Pref.	Ise-ohashi Bridge, Riv. Ibi (Kuwana City)							○								
	Oizumi-bashi Bridge, Riv. Inabe (Inabe City)							○								
	Yokkaichi Port	○			○			○	○	○	○	○	○	○		
Shiga Pref.	Lake Biwa (center, offshore of Minamihira)		○				○				○	○		○		
	Lake Biwa (center, offshore of Karasaki)		○				○				○	○		○		
Kyoto City	Miyamae-bashi Bridge,Riv. Katsura (Kyoto City)					○	○									
Osaka Pref.	Mouth of Riv. Yamato (Sakai City)	○	○	○	○	○	○	○	○	○	○	○	○	○		
Osaka City	Kema-bashi Bridge, Riv. Oh-kawa (Osaka City)					○			○							
	Osaka Port					○			○							
Hyogo Pref.	Coast of Amagasaki	○														
	Offshore of Himeji	○	○	○	○			○	○	○			○	○		
	Shinogawa-bashi Bridge, Riv. Ichikawa (Himeji Town)							○								
Kobe City	Kobe Port(center)	○	○	○	○				○	○			○	○		
Nara Pref.	Riv. Yamato (Oji Town)					○	○		○							
Wakayama Pref.	Kinokawa-ohashi Bridge, Mouth of Riv. Kinokawa (Wakayama City)							○	○		○	○				
	Shimotsu Port, Arita Port Area Berth		○											○		
	Nishikawa-ohashi Bridge, Mouth of Riv. Nishi(Mihama Town)							○								
Okayama Pref.	Offshore of Mizushima	○	○		○			○	○	○			○	○		
Yamaguchi Pref.	Tokuyama Bay	○	○	○	○	○			○	○						
	Offshore of Hagi	○	○	○	○	○			○	○						
	Offshore of Chofu, the Sea of Suo							○								
Tokushima Pref.	Tomioka Port	○														
Kagawa Pref.	Takamatsu Port		○		○		○		○	○	○	○		○		
Ehime Pref.	Offshore of Niihama Port										○	○				
Fukuoka Pref.	Kabura-bashi Bridge, Riv. Raizan (Maebaru City)			○					○							
	Offshore of Omuta			○					○							
Fukuoka City	Hakata Bay	○	○		○	○	○	○	○	○	○	○		○		
Saga Pref.	Imari Bay		○			○										
Oita Pref.	Mouth of Riv. Oita(Oita City)					○	○		○							

[1] Acrylic acid, [3] 2-Aminoethanol, [7] Chlorobenzene, [8] 4-Chloro-2-methylphenol [9] Cyclohexane, [10] 2,4-Dichlorophenoxyacetic acid (synonym: 2,4-D or 2,4-PA), [11] α -(Nonylphenyl)- ω -hydroxypoly(oxyethylene)s (polymerisation degree = 1-15) (synonym: Poly(oxyethylene) nonylphenyl ethers (polymerisation degree = 1-15)), [12] Nonylphenols, [13] Bis(2,2,6,6-tetramethyl-4-piperidyl)sebacate, [14] 4-(2-Phenylpropane-2-yl)phenol, [15] 4,4'-(Propane-2,2-diyl)diphenol (synonym: 4,4'-Isopropylidenediphenol or Bisphenol A), [16] Poly(oxyethylene)octylphenylethers (polymerisation degree = 1-10), [17] Morpholine

(Note) *: “Keihin Canal, Port of Kawasaki,The Coast of Ougi Town” of Detailed Environmental Survey and “Keihin Canal, Port of Kawasaki” of Environmental Monitoring, and “Nagoya Port, West of Shiomi Wharf” of Initial and Detailed Environmental Survey and “Nagoya Port” of Environmental Monitoring are the same point each.

Table 2-1-2 List of surveyed sites (sediment) and target chemicals in the Detailed Environmental Survey in FY2014

Local communities	Surveyed sites	Target chemicals	
		[10]	[15]
Hokkaido	Ishikarikakokyo Bridge, Mouth of Riv. Ishikari(Ishikari City)	○	○
	Tomakomai Port	○	○
Iwate Pref.	Riv. Toyosawa(Hanamaki City)	○	○
Sendai City	Hirose-ohashi Bridge, Riv. Hirose(Sendai City)	○	○
Ibaraki Pref.	Tonekamome-ohasi Bridge, Mouth of Riv. Tone (Kamisu City)	○	○
Tokyo Met.	Mouth of Riv. Arakawa(Koto Ward)	○	○
	Mouth of Riv. Sumida(Minato Ward)	○	○
Yokohama City	Yokohama Port	○	○
Kawasaki City	Mouth of Riv. Tama(Kawasaki City)	○	○
	Keihin Canal, Port of Kawasaki, The Coast of Ougi Town*	○	○
Ishikawa Pref.	Mouth of Riv. Sai(Kanazawa City)	○	○
Nagano Pref.	Lake Suwa(center)	○	○
Shizuoka Pref.	Shimizu Port	○	○
Aichi Pref.	Nagoya Port , West of Shiomi Wharf *	○	○
Nagoya City	Minatoshinbashi Bridge, Riv. Hori (Nagoya City)		○
Mie Pref.	Yokkaichi Port	○	○
Shiga Pref.	Lake Biwa(center, offshore of Karasaki)	○	○
Osaka Pref.	Mouth of Riv. Yamato(Sakai City)	○	○
Osaka City	Osaka Port	○	○
Hyogo Pref.	Offshore of Himeji	○	○
Okayama Pref.	Offshore of Mizushima	○	○
Kagawa Pref.	Takamatsu Port	○	○
Oita Pref.	Mouth of Riv. Oita(Oita City)	○	○

[10] 2,4-Dichlorophenoxyacetic acid (synonym: 2,4-DA or 2,4-PA), [15] 4,4'-(Propane-2,2-diyl)diphenol (synonym: 4,4'-Isopropylidenediphenol or Bisphenol A)

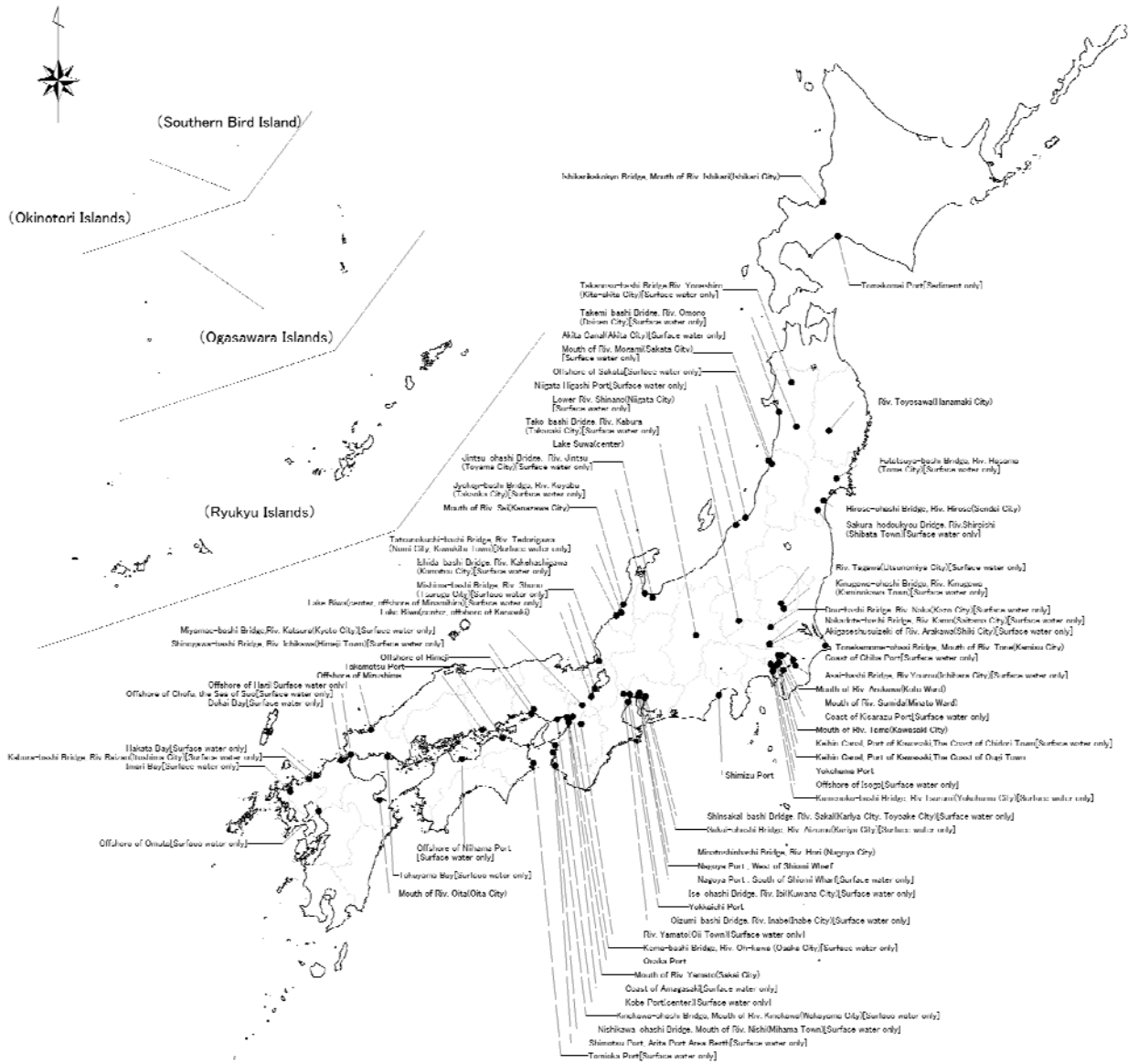


Figure 2-1-1 Surveyed sites (surface water and sediment) in the Detailed Environmental Survey in FY2014

Table 2-1-3 List of surveyed sites (wildlife) and target chemicals in the Detailed Environmental Survey in FY2014

Local communities	Surveyed sites	Wildlife species	Target chemical		
			[2]	[12]	[15]
Iwate Pref.	Yamada Bay	Blue mussel	○	○	○
		Greenling	○	○	○
Tokyo Met.	Tokyo Bay	Sea bass	○	○	○
Yokohama City	Yokohama Port	Blue mussel		○	
Kawasaki City	Offshore of Ogishima Island, Port of Kawasaki	Sea bass	○	○	○
Niigata Pref.	Lower Riv. Shinano(Niigata City)	Carp	○	○	○
Nagoya City	Nagoya Port	Striped mullet	○	○	○
Osaka Pref.	Osaka Bay	Sea bass	○	○	○
Hyogo Pref.	Offshore of Himeji	Sea bass	○	○	○
Okayama Pref.	Offshore of Mizushima	Striped mullet	○	○	○
Yamaguchi Pref.	Tokuyama Bay	Striped mullet	○	○	○
	Offshore of Hagi	Sea bass	○	○	○
Oita Pref.	Mouth of Riv. Oita(Oita City)	Sea bass	○	○	○

[2] *n*-Butyl acrylate, [12] Nonylphenols, [15] 4,4'-(Propane-2,2-diyl)diphenol (synonym: 4,4'-Isopropylidenediphenol or Bisphenol A)

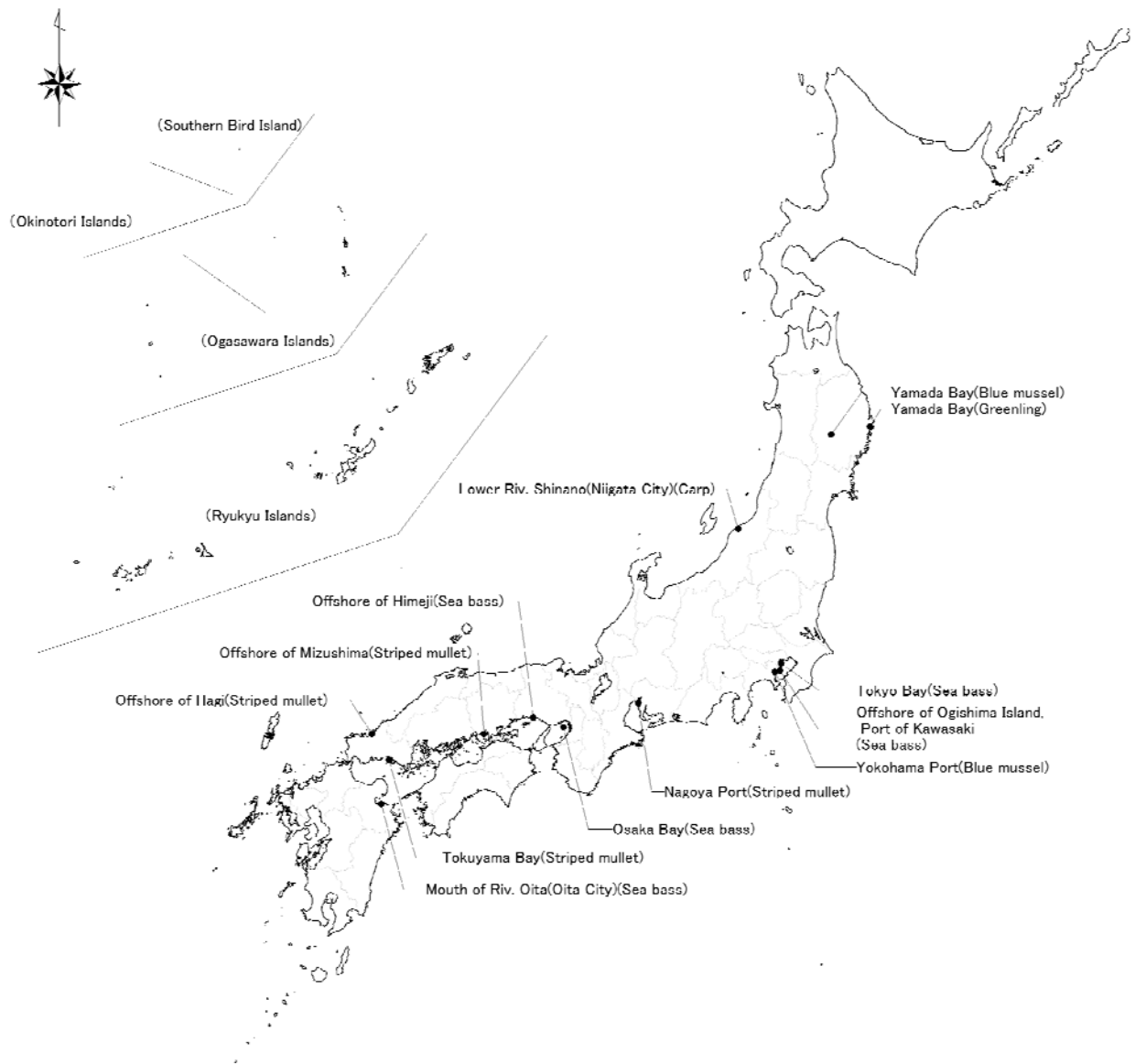


Figure 2-1-2 Surveyed sites (wildlife) in the Detailed Environmental Survey in FY2014

Table 2-1-4 List of surveyed sites (air) and target chemicals in the Detailed Environmental Survey in FY2014

Local communities	Surveyed sites	Target chemical				
		[3]	[4]	[5]	[6]	[7]
Hokkaido	Hokkaido Research Organization Environmental and Geological Research Department Institute of Environmental Sciences(Sapporo City)	○				
Sapporo City	Sapporo City Institute of Public Health(Sapporo City)					○
Ibaraki Pref.	Ibaraki Kasumigaura Environmental Science Center (Tsuchiura City)	○	○	○	○	○
Saitama Pref.	Center for Environmental Science in Saitama (Kazo City)	○	○			○
Saitama City	Saitama City Public Health Center (Saitama City)			○	○	
Tokyo Met.	Tokyo Metropolitan Research Institute for Environmental Protection(Koto Ward)			○	○	
	Chichijima Island(Ogasawara Village)	○		○	○	
Kanagawa Pref.	Kanagawa Environmental Research Center (Hiratsuka City)	○	○	○	○	○
Toyama Pref.	Takaoka-Hushiki Air Quality Monitoring Station(Takaoka City)					○
	Tonami Air Quality Monitoring Station(Tonami City)			○	○	
Ishikawa Pref.	Ishikawa Prefectural Institute of Public Health and Environmental Science (Kanazawa City)	○	○	○	○	
Nagano Pref.	Nagano Environmental Conservation Research Institute (Nagano City)		○	○	○	○
	Nabeyata Air Quality Monitoring Station(Nagano City)	○				
Nagoya City	Chikusa Ward Heiwa Park (Nagoya City)	○	○	○	○	○
Mie Pref.	Mie Prefecture Health and Environment Research Institute (Yokkaichi City)	○	○			○
Kyoto Pref.	Uji Prefectural Government Building(Uji City)	○	○	○	○	○
Osaka Pref.	Research Institute of Environment, Agriculture and Fisheries, Osaka Prefectural Government(Osaka City)	○		○	○	
	Osaka Prefecture Shutoku School(Kashiwara City)		○			
	Izumiotu City Government Building(Izumiotu City)		○			
Hyogo Pref.	Hyogo Prefectural Environmental Research Center(Kobe City)	○	○	○	○	○
Kobe City	Rokko Island Air Quality Monitoring Station(Kobe City)		○			
	Fukiai Air Quality Monitoring Station(Kobe City)			○	○	
Yamaguchi Pref.	Miyanomae Children's Park Air Quality Monitoring Station(Syunan City)					○
	Yamaguchi Prefectural Institute of Public Health and Environment(Yamaguchi City)					○
Tokushima Pref.	Tokushima Prefectural Public Health, Pharmaceutical and Environmental Sciences Center (Tokushima City)	○	○	○	○	○
Kagawa Pref.	Takamatsu Joint Prefectural Government Building (Takamatsu City)	○	○	○	○	○
Fukuoka Pref.	Omuta City Government Building(Omuta City)		○			○
Miyazaki Pref.	Miyazaki Prefectural Institute for Public Health and Environment(Miyazaki City)	○	○			

[3] 2-Aminoethanol, [4] Epichlorohydrin, [5] Glyoxal, [6] Glutaraldehyde, [7] Chlorobenzene

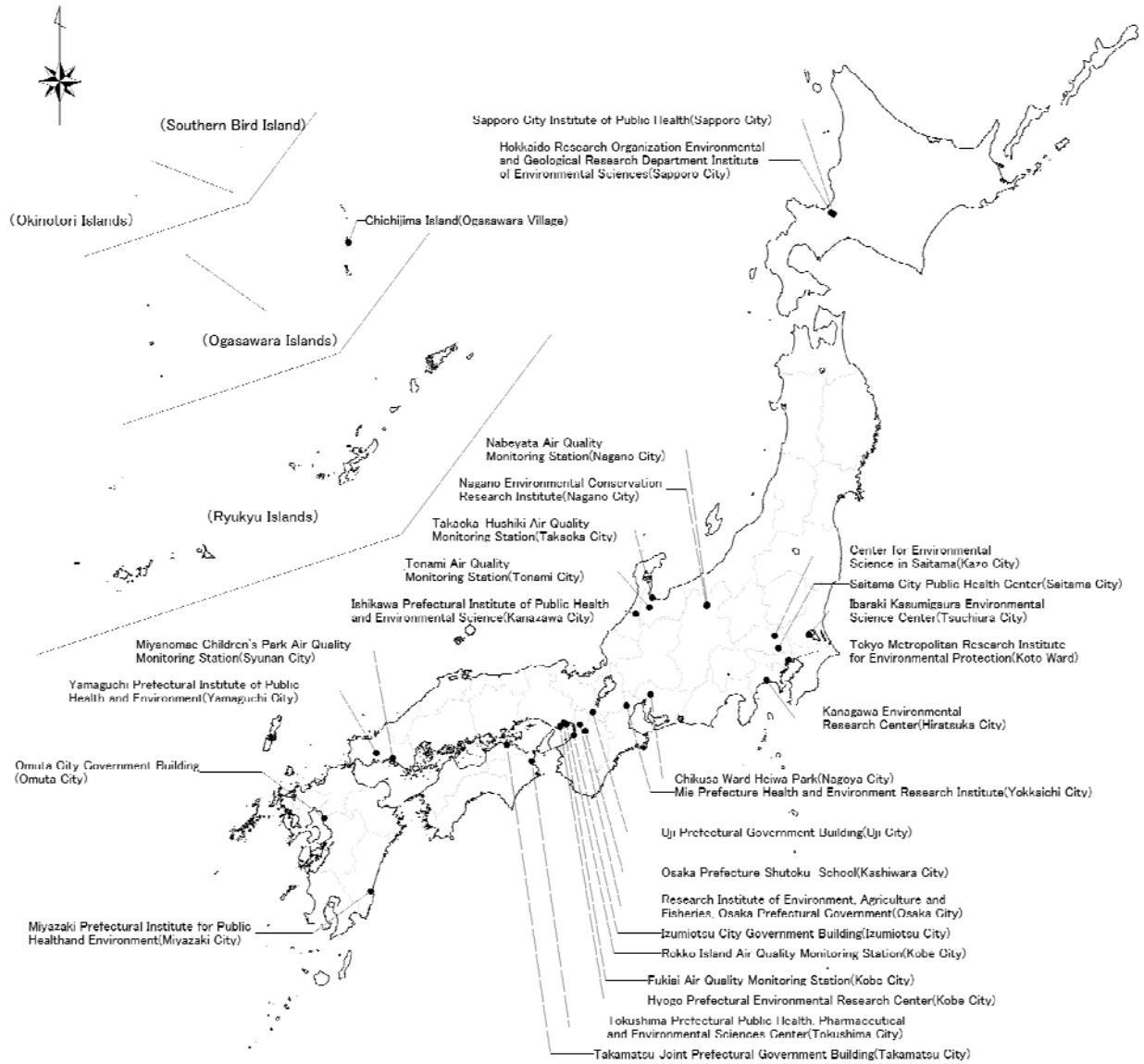


Figure 2-1-3 Surveyed sites (air) in the Detailed Environmental Survey in FY 2014

(3) Detection limit

The detection limits of analysed values reported by the analytical laboratory are not necessarily the same because of differences in the properties of specimens and in the available measurement equipment. To enable summarisation, therefore, a unified detection limit is predetermined and the analytical values reported by the analytical laboratory are summarised by the following procedure.

Treatment of measured value as an undetected value in high-sensitivity analysis

In the case of high-sensitivity analysis, in which the detection limit of the analytical laboratory is lower than the unified detection limit, any measured value lower than the unified detection limit is treated as an undetected value in the nationwide summary (see schematic (A)).

Elimination of undetected values in low-sensitivity analysis from summary subject

When the detection limit of the analytical laboratory is higher than the unified detection limit, any target chemical not detected is eliminated from the subject of the summary (see schematic (B)).

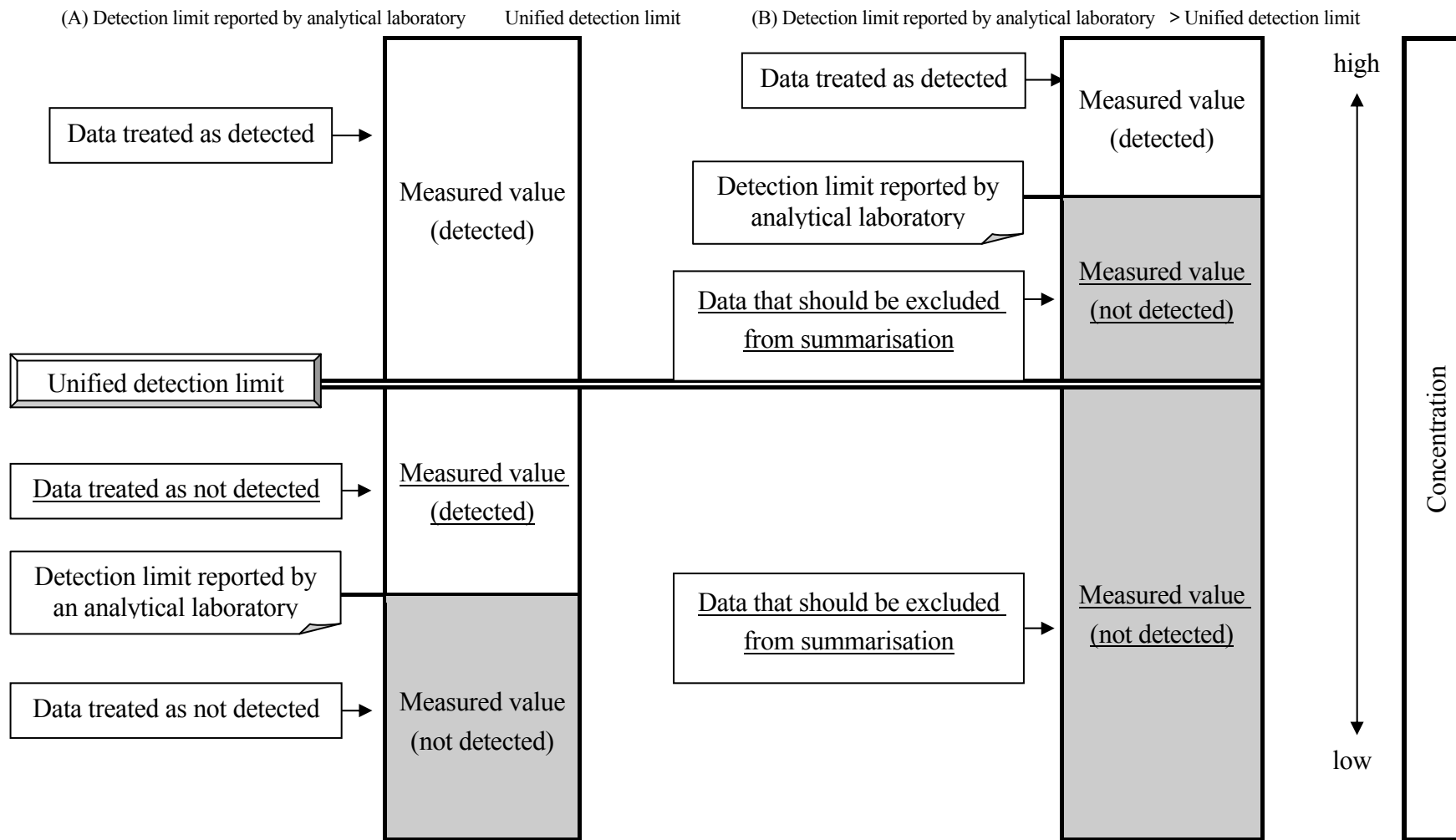
When the instrument detection limit (IDL) and the method detection limit (MDL) are given in the analytical method, which is described in reports on the investigation of the development of analytical methods for chemicals and adopted in the Detailed Environmental Survey (hereafter, the Detailed Environmental Survey Analytical Method), if the IDL measured by the analytical laboratory is lower than the given IDL, the MDL of the Detailed Environmental Survey Analytical Method is used as the detection limit by the analytical laboratory.

When IDL and MDL are not given in the Detailed Environmental Survey Analytical Method, the detection limit is predetermined by the following procedure.

When the analytical laboratory calculates the appropriate IDL and MDL following the calculation method stated in the analytical method development instruction manuals, this calculated MDL is used as the detection limit by the analytical laboratory.

When the appropriate IDL and MDL are not calculated by the analytical laboratory, one of the following procedures was employed to establish the detection limit by the analytical laboratory.

- deduction from the IDL and MDL calculated for the corresponding chemical by Detailed Environmental Survey Analytical Method or other analytical laboratories
- deduction from the lowest calibration curve concentration and the results of recovery tests
- deduction from the results of addition and collection tests, the results of operation blank tests, and the signal/noise ratio (S/N ratio) obtained from the chromatogram of environmental specimens



Schematic of procedure for data summarisation

4. Summary of survey results

The detection ranges and the detection limits are shown in Table 2-2. The survey results are summarized as follows.

In surface water, 12 out of the 13 target chemicals (groups) were detected.

- [1] Acrylic acid :17 of the 17 valid sites
- [3] 2-Aminoethanol:19 of the 21 valid sites
- [7] Chlorobenzene : 12 of the 20 valid sites
- [9] Cyclohexane: 1 of the 20 valid sites
- [10] 2,4-Dichlorophenoxyacetic acid (synonym: 2,4-D or 2,4-PA): 19 of the 20 valid sites
- [11] α -(Nonylphenyl)- ω -hydroxypoly(oxyethylene)s (polymerisation degree = 1-15) (synonym: Poly(oxyethylene) nonylphenyl ethers (polymerisation degree = 1-15)): 16 of the 27 valid sites
- [12] Nonylphenols: 16 of the 30 valid sites
- [13] Bis(2,2,6,6-tetramethyl-4-piperidyl)sebacate: 7 of the 21 valid sites
- [14] 4-(2-Phenylpropane-2-yl)phenol: 10 of the 20 valid sites
- [15] 4,4'-(Propane-2,2-diyl)diphenol (synonym: 4,4'-Isopropylidenediphenol or Bisphenol A): 18 of the 20 valid sites
- [16] Poly(oxyethylene)octylphenylethers (polymerisation degree = 1-10): 17 of the 20 valid sites
- [17] Morpholine: 4 of the 21 valid sites

In sediment, all 2 target chemicals were detected.

- [10] 2,4-Dichlorophenoxyacetic acid (synonym: 2,4-D or 2,4-PA): 1 of the 22 valid sites
- [15] 4,4'-(Propane-2,2-diyl)diphenol (synonym: 4,4'-Isopropylidenediphenol or Bisphenol A): 20 of the 23 valid sites

In wildlife (bivalves or fish), 2 out of the 3 target chemicals (groups) were detected.

- [12] Nonylphenols: 9 of the 13 valid sites
- [15] 4,4'-(Propane-2,2-diyl)diphenol (synonym: 4,4'-Isopropylidenediphenol or Bisphenol A): 9 of the 12 valid sites

In air, all 5 target chemicals were detected.

- [3] 2-Aminoethanol:13 of the 15 valid sites
- [4] Epichlorohydrin:16 of the 16 valid sites
- [5] Glyoxal : 15 of the 15 valid sites
- [6] Glutaraldehyde: 15 of the 15 valid sites
- [7] Chlorobenzene: 6 of the 15 valid sites

Table 2-2 Summary of the detection ranges and the detection limits in the Detailed Environmental Survey in FY 2014

No.	Target chemicals	Surface water [ng/L]		Sediment [ng/g-dry]		Wildlife [ng/g-wet]		Air [ng/m ³]	
		Detection range and frequency	Detection limit	Detection range and frequency	Detection limit	Detection range and frequency	Detection limit	Detection range and frequency	Detection limit
[1]	Acrylic acid *	100~3,200 17/17	30						
[2]	<i>n</i> -Butyl acrylate					nd 0/12	0.38		
[3]	2-Aminoethanol *	nd~19,000 19/21	60					nd~8.3 13/15	0.42
[4]	Epichlorohydrin *							0.65~150 16/16	0.26
[5]	Glyoxal							4.1~140 15/15	0.4
[6]	Glutaraldehyde							1.0~10 15/15	0.89
[7]	Chlorobenzene *	nd~370 12/20	0.17					nd~580 6/15	39
[8]	4-Chloro-2-methylphenol	nd 0/21	3.2						
[9]	Cyclohexane	nd~5.9 1/20	1.2						
[10]	2,4-Dichlorophenoxyacetic acid (synonym: 2,4-D or 2,4-PA)	nd~7.7 19/20	0.08	nd~0.044 1/22	0.014				
[11]	α -(Nonylphenyl)- ω -hydroxypoly(oxyethylene)s (polymerisation degree = 1-15) (synonym: Poly(oxyethylene) nonylphenyl ethers (polymerisation degree = 1-15))*	nd~1,300 16/27	**43						
[12]	Nonylphenols *, ***	nd~320 16/30	**18			nd~25 9/13	5.5		
[13]	Bis(2,2,6,6-tetramethyl-4-piperidyl)sebacate	nd~690 7/21	4.9						
[14]	4-(2-Phenylpropane-2-yl)phenol	nd~94 10/20	2.5						
[15]	4,4'-(Propane-2,2-diyl)diphenol (synonym: 4,4'-Isopropylidenediphenol or Bisphenol A)*	nd~280 18/20	1.7	nd~190 20/23	2.4	nd~3.4 9/12	0.18		
[16]	Poly(oxyethylene)octylphenylethers (polymerisation degree = 1-10)*	nd~110 17/20	**1.7						
[17]	Morpholine *	nd~300 4/21	84						

(Note 1) Detection frequency is based on the number of sites or areas, thus means (the number of detected sites/the number of surveyed sites). A site where data was not available was excluded from the number of surveyed sites. A site where the data became invalid under a unified detection limit was also excluded. 3 samples were measured for a site or area, and the detection in more than one out of samples from a site or area can be defined as one detected site or area.

(Note 2) Detection range is based on the number of samples and therefore can be shown as “nd~” even if a target chemical is detected in all sites (or areas).

(Note 3) means the medium was not surveyed.

(Note 4) “*” connotes target substances or points selected for survey in light of documentation or submittals regarding emissions.

(Note 5) “**” indicates the sum value of the Quantification [Detection] limits of each congener, isotope or target chemicals.

(Note 6) “***”: In surface water of Nonylphenols, it was monitored their typical isomer and it was recorded the sum value of measured value.