Chapter 1 Results of the Initial Environmental Survey in FY 2009

1. Purpose of the survey

The Initial Environmental Survey is aimed at understanding the environmental presence of chemicals requiring examination of the appropriateness of the designation as a Designated Chemical Substance in the Law Concerning Reporting, etc. of Releases of Specific Chemical Substances to the Environment and Promoting Improvement in Their Management (Law No. 86 of 1999) (hereinafter, the PRTR Law) and chemicals requiring survey from social viewpoints.

2. Target chemicals

In the FY 2009 Initial Environmental Survey, 10chemicals that were selected and designated as target chemicals. The combinations of target chemicals and the surveyed media are given below.

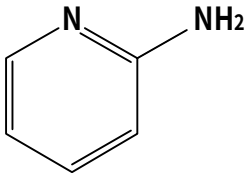
No.	Name	The Chemical Substances Control Law	The PRTR Law		Surveyed media		
			Before the revision	After the revision	Surface water	Sediment	Air
[1]	2-Aminopyridine	II Monitored	II 4		○	○	
[2]	*o*-Aminophenol				○		
[3]	Benzyl acetate			II 20	○		
[4]	*o*-Nitroanisole	II Monitored		I 311	○		
[5]	*m*-Nitroaniline	II Monitored III Monitored	II 55	II 69			○
[6]	Nitromethane	II Monitored		I 317			○
[7]	Methyl 4-hydroxybenzoate			I 334			○
[8]	*tert*-Butyl 2-ethylperoxyhexanoate				○		
[9]	2-*tert*-Butyl-5-methylphenol	II Monitored III Monitored		I 373		○	
[10]	4,4'-Methylenebis(2-methylcyclohexanamine)	II Monitored III Monitored	II 79	II 97	○		

(Note 1) "The Chemical Substances Control Law" hereinafter means "Law Concerning the Examination and Regulation of Manufacture, etc. of Chemical Substances (Law No. 117 of 1973)."

(Note 2) " 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".

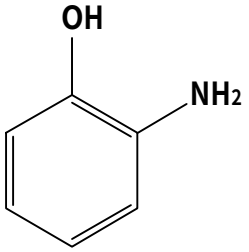
Chemical and physical properties of target chemicals of the Initial Environmental Survey are as follows.

[1] 2-Aminopyridine



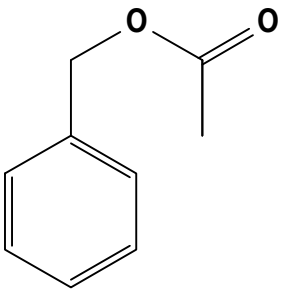
Molecular formula: $C_5H_6N_2$
CAS: 504-29-0
ENCS: 5-724、9-106
MW: 94.11
mp: 58.1°C[1)]
bp: 210.6°C[1)]
sw: 5,400mg/L（25°C）[2)]
Specific gravity: 1.065（20/4°C）[3)]
logPow: 0.48[4)]

[2] *o*-Aminophenol



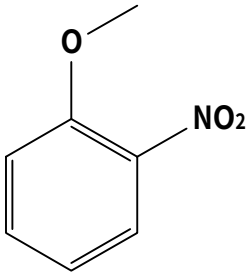
Molecular formula: C_6H_7NO
CAS: 95-55-6
ENCS: 3-675
MW: 109.13
mp: 189.6～190.2°C[1)]
bp: 284°C（degradation）[1)]
sw: 0.65%（24°C）[1)]
Specific gravity: 1.3g/cm^3 [5)]
logPow: 0.04[4)]

[3] Benzyl acetate



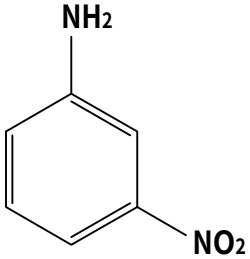
Molecular formula: $C_9H_{10}O_2$
CAS: 140-11-4
ENCS: 3-1020、3-1045
MW: 150.17
mp: -51°C[1)]
bp: 213°C[1)]
sw: 1.50g/kg（25°C）[6)]
Specific gravity: 1.050（25/4°C）[1)]
logPow: 1.96[4)]

[4] *o*-Nitroanisole



Molecular formula: $C_7H_7NO_3$
CAS: 91-23-6
ENCS: 3-787
MW: 153.14
mp: 9.4°C[1)]
bp: 277°C[1)]
sw: 1.69g/kg（30°C）[6)]
Specific gravity: 1.254（20/4°C）[1)]
logPow: 1.73[4)]

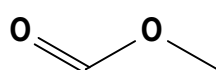
[5] *m*-Nitroaniline



Molecular formula: $C_6H_6N_2O_2$
CAS: 99-09-2
ENCS: 3-392
MW: 138.12
mp: 114°C[1)]
bp: Uncertain
sw: 1g/880mL[1)]
Specific gravity: 0.9011（25/4°C）[1)]
logPow: 1.37[4)]

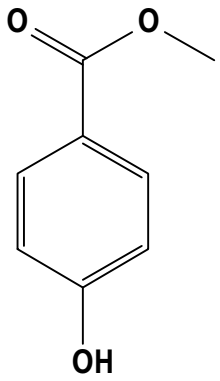
(Abbreviations) CAS: CAS registry number, ENCS: registry number in the Existing and New Chemical Substances List, MW: molecular weight, mp: melting point, bp: boiling point, SW: solubility in water, logPow: *n*-octanol-water partition coefficient, kPa: kilopascal (1 atom 101.3kPa).

[6] Nitromethane



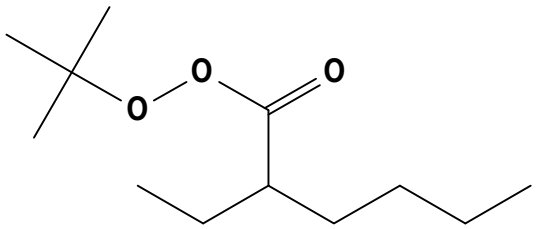
Molecular formula: CH_3NO_2
CAS: 75-52-5
ENCS: 2-191
MW: 61.04
mp: -29°C[1)]
bp: 101.2°C[1)]
sw: 9.5%（25°C）[1)]
Specific gravity: 1.1322（25/4°C）[1)]
logPow: -0.35[4)]

[7] Methyl 4-hydroxybenzoate



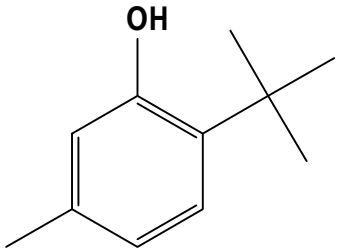
Molecular formula: $C_8H_8O_3$
CAS: 99-76-3
ENCS: 3-1585
MW: 152.15
mp: 131°C[1)]
bp: 270～280°C（degradation）[1)]
sw: 1g/400mL（20°C）[1)]
Specific gravity: Uncertain
logPow: 1.96[4)]

[8] *tert*-Butyl 2-ethylperoxyhexanoate



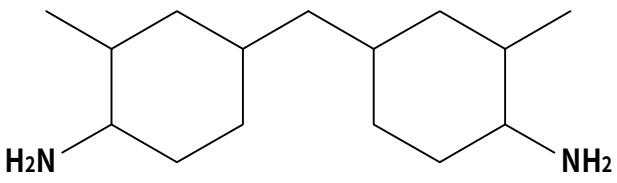
Molecular formula: $C_{12}H_{24}O_3$
CAS: 3006-82-4
ENCS: 2-687
MW: 216.32
mp: <-30°C[3)]
bp: Uncertain
sw: Uncertain
Specific gravity: Uncertain
logPow: Uncertain

[9] 2-*tert*-Butyl-5-methylphenol



Molecular formula: $C_{11}H_{16}O$
CAS: 88-60-8
ENCS: 3-521
MW: 164.24
mp: 46.5°C[1)]
bp: 117°C（11mmHg）[1)]
sw: 0.42g/L（25°C）[7)]
Specific gravity: 0.922g/cm^3（80°C）[1)]
logPow: 4.11（25°C）[7)]

[10] 4,4'-Methylenebis(2-methylcyclohexanamine)



Molecular formula: $C_{15}H_{30}N_2$
CAS: 6864-37-5
ENCS: 4-102
MW: 238.41
mp: -7°C[8)]
bp: 342°C[8)]
sw: 3.6g/L（20°C）[8)]
Specific gravity: 0.944g/cm^3（20°C）[8)]
logPow: 2.51（25°C）[8)]

References

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2) Howard et al., Handbook of Physical Properties of Organic Chemicals, CRC Press Inc. (1996)
3) Kirk-Othmer, Encyclopedia of Chemical Technology 5th Edition, John Wiley & Sons (2004)
4) Hansch et al., Exploring QSAR - Hydrophobic, Electronic and Steric Constants, American Chemical Society (1995)
5) Ermer et al., Molecular recognition among alcohols and amines: super-tetrahedral crystal architectures of linear diphenol-diamine complexes and aminophenols, Journal of the Chemical Society, Perkin Transactions 2, 5, 925-944(1994)
6) Lide, CRC Handbook of Chemistry and Physics, 90th Edition, CRC Press LLC (2009)
7) OECD, 6-*tert*-Butyl-*m*-cresol, SIDS Initial Assessment Report for 15th SIAM (2002)
8) OECD, 2,2'-Dimethyl-4,4'-methylene bis(cyclohexylamine), SIDS Initial Assessment Report for 13th SIAM (2001)

3. Surveyed site and procedure

In the Initial 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 analyzed by private analytical laboratories.

(1) Organisations responsible for sampling

Local communities	Organisations responsible for sampling[*1]	Surveyed media		
		Surface water	Sediment	Air
Hokkaido	Hokkaido Institute of Environmental Sciences	○	○	○[*2]
Sapporo City	Sapporo City Institute of Public Health			○
Iwate Pref.	Research Institute for Environmental Sciences and Public Health of Iwate Prefecture	○	○	
Sendai City	Sendai City Institute of Public Health	○		
Ibaraki Pref.	Ibaraki Kasumigaura Environmental Science Center	○	○	○
Tochigi Pref.	Tochigi Prefectural Institute of Public Health and Environmental Science	○		
Saitama Pref.	Center for Environmental Science in Saitama	○		○
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 Municipal Research Institute for Environmental Protection	○	○	
Niigata Pref.	Niigata Prefectural Institute of Public Health and Environmental Sciences	○	○	
Ishikawa Pref.	Ishikawa Prefectural Institute of Public Health and Environmental Science	○	○	
Nagano Pref.	Nagano Environmental Conservation Research Institute	○		○
Gifu Pref.	Gifu Prefectural Research Institute for Health and Environmental Sciences			○
Aichi Pref.	Aichi Environmental Research Center	○	○	
Nagoya City	Nagoya City Environmental Science Research Institute			○
Mie Pref.	Mie Prefecture Health and Environment Research Institute	○		○
Shiga Pref.	Lake Biwa Environmental Research Institute	○	○	
Kyoto City	Kyoto City Institute of Public Health and Environmental sciences			○
Osaka Pref.	Research Institute of Environment, Agriculture and Fisheries, Osaka Prefectural Government	○	○	○[*2]
Osaka City	Osaka City Institute of Public Health and Environmental Sciences	○	○	
Hyogo Pref.	Water Quality Division, Agricultural Administration and Environment Bureau, Hyogo Prefectural Government			○[*2]
Kobe City	Environmental Conservation and Guidance Division, (Environment Bureau, Kobe city)	○		
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 Public Health and Environment	○	○	○
Tokushima Pref.	Tokushima Prefectural Institute of Public Health and Environmental Sciences			○
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 Science	○	○	○[*2]
Kitakyushu City	Kitakyushu City Institute of Environmental Sciences	○		○
Fukuoka City	Fukuoka City Institute for Hygiene and the Environment	○		
Saga Pref.	Saga Prefectural Environmental Research Center	○		○

(Note 1) *1: Organisations responsible for sampling are described by their official names in FY 2009.
(Note 2) *2: Those organizations sampled some specimens, and cooperated with a private analytical laboratory in sampling other specimens.

(2) Surveyed sites and target chemicals

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

Surveyed media	Numbers of local communities	Numbers of target chemicals	Numbers of surveyed sites	Numbers of samples at a surveyed site
Surface water	27	6	37	3
Sediment	15	2	19	3
Air	20※	3	20	3
All media	35	10	57	

(Note) 4 of the 20 organizations cooperated with private analytical laboratories in sampling all specimens.

Table 1-1-1 List of surveyed sites (surface water) and target chemicals in the Initial Environmental Survey in FY 2009

Local communities	Surveyed sites	Target chemicals					
		[1]	[2]	[3]	[4]	[8]	[10]
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.	Katta-bashi Bridge, Riv. Naka(Hitachinaka City)	○			○		○
	Tonekamome-ohasi Bridge, Mouth of Riv. Tone(Kamisu City)	○			○		○
Tochigi Pref.	Riv. Tagawa(Utsunomiya City)				○		
Saitama Pref.	Shiki-ohasi Bridge, Riv. Yanase(Shiki City)			○			○
Chiba Pref.	Coast of Ichihara and Anegasaki						○
	Asai-bashi Bridge, Riv.Yourou(Ichihara City)	○					
Tokyo Met.	Mouth of Riv. Arakawa(Koto Ward)	○		○	○		
	Mouth of Riv. Sumida(Minato Ward)	○		○	○		
Yokohama City	Kamenoko Bridge over Riv.Tsurumi(Yokohama City)				○	○	
	Yokohama Port				○		○
Kawasaki City	Mouth of Riv. Tama(Kawasaki City)		○	○			
	Keihin Canal, Port of Kawasaki			○			
Niigata Pref.	Lower Riv. Shinano(Niigata City)				○		
Ishikawa Pref.	Mouth of Riv. Sai(Kanazawa City)	○		○	○		○
Nagano Pref.	Lake Suwa(center)				○		
Aichi Pref.	Nagoya Port	○	○	○	○	○	○
Mie Pref.	Yokkaichi Port		○		○	○	
Shiga Pref.	Lake Biwa(center, offshore of Minamihira)	○			○		
Osaka Pref.	Mouth of Riv. Yamato(Sakai City)		○		○		○
Osaka City	Kema Bridge, Riv. Oh-kawa (Osaka City)			○	○	○	
	Osaka Port	○		○	○	○	
Kobe City	Kobe Port(center)				○	○	
Okayama Pref.	Otoidezeki of Riv. Asahi(Okayama City)					○	
	Offshore of Mizushima		○		○	○	
Yamaguchi Pref.	Tokuyama Bay				○		
	Offshore of Hagi				○		
Kagawa Pref.	Takamatsu Port				○		
Ehime Pref.	Mishima area, Riv. Iwamatsu(Uwajima City)	○	○				○
Fukuoka Pref.	Kabura-bashi Bridge, River Raizan(Maebaru City)		○			○	
	Offshore of Omuta		○	○	○	○	
Kitakyushu City	Dokai Bay		○		○	○	
Fukuoka City	Hakata Bay		○		○		
Saga Pref.	Imari Bay						○

[1] 2-Aminopyridine, [2] *o*-Aminophenol, [3] Benzyl acetate, [4] *o*-Nitroanisole,
[8] *tert*-Butyl 2-ethylperoxyhexanoate, [10] 4,4'-Methylenebis(2-methylcyclohexanamine)

Table 1-1-2 List of surveyed sites (sediment) and target chemicals in the Initial Environmental Survey in FY 2009

Local communities	Surveyed sites	Target chemicals	
		[4]	[18]
Hokkaido	Tomakomai Port	○	
Iwate Pref.	Riv. Toyosawa(Hanamaki 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)	○	
Kawasaki City	Mouth of Riv. Tama(Kawasaki City)		○
	Keihin Canal, Port of Kawasaki		○
Niigata Pref.	Lower Riv. Shinano(Niigata City)	○	
Ishikawa Pref.	Mouth of Riv. Sai(Kanazawa City)		○
Aichi Pref.	Nagoya Port	○	○
Shiga Pref.	Lake Biwa(center, offshore of Minamihira)	○	
Osaka Pref.	Mouth of Riv. Yamato(Sakai City)	○	○
Osaka City	Kema Bridge, Riv. Oh-kawa (Osaka City)		○
	Osaka Port	○	○
Okayama Pref.	Otoidezeki of Riv. Asahi(Okayama City)		○
	Offshore of Mizushima		○
Yamaguchi Pref.	Offshore of Hagi	○	
Kagawa Pref.	Takamatsu Port	○	
Fukuoka Pref.	Kabura-bashi Bridge, River Raizan(Maebaru City)		○

[1] 2-Aminopyridine, [9] 2-*tert*-Butyl-5-methylphenol

Figure 1-1-1 Surveyed sites (surface water and sediment) in the Initial Environmental Survey in FY 2009

Table 1-1-3 List of surveyed sites (air) and target chemicals in the Initial Environmental Survey in FY 2009

Local communities	Surveyed sites	Target chemicals		
		[5]	[6]	[7]
Hokkaido	Hokkaido Institute of Environmental Sciences		○	
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(Kasu City)	○	○	
Chiba Pref.	Ichihara-Matsuzaki Air Quality Monitoring Station (Ichihara City)		○	
Kanagawa Pref.	Kanagawa Environmental Research Center(Hiratsuka City)			○
Nagano Pref.	Nagano Environmental Conservation Research Institute(Nagano City)		○	
Gifu Pref.	Gifu Prefectural Research Institute for Health and Environmental Sciences(Kakamigahara City)	○		
Nagoya City	Chikusa Ward Heiwa Park(Nagoya City)			○
Mie Pref.	Mie Prefecture Health and Environment Research Institute(Yokkaichi City)	○		
Kyoto City	Kyoto City Hall(Kyoto City)		○	
Osaka Pref.	Research Institute of Environment, Agriculture and Fisheries, Osaka Prefectural Government(Osaka City)			○
Hyogo Pref.	Hyogo Prefectural Environmental Research Center (Kobe City)		○	
Wakayama Pref.	Wakayama Prefectural Research Center of Environment and Public Health(Wakayama City)	○		
Yamaguchi Pref.	Yamaguchi Prefectural Public Health and Environment(Yamaguchi City)	○		
Tokushima Pref.	Tokushima Prefectural Institute of Public Health and Environmental Sciences(Tokushima City)			○
Kagawa Pref.	Takamatsu Joint Prefectural Government Building (Takamatsu City)	○		
Fukuoka Pref.	Omuta City Government Building(Omuta City)		○	○
Kitakyushu City	Kitakyushu Monitoring Station (Kitakyushu City)	○		
Saga Pref.	Saga Prefectural Environmental Research Center(Saga City)	○		

[5] *m*-Nitroaniline, [6] Nitromethane, [7] Methyl 4-hydroxybenzoate

Figure 1-1-2 Surveyed sites (air) in the Initial Environmental Survey in FY 2009

(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)).

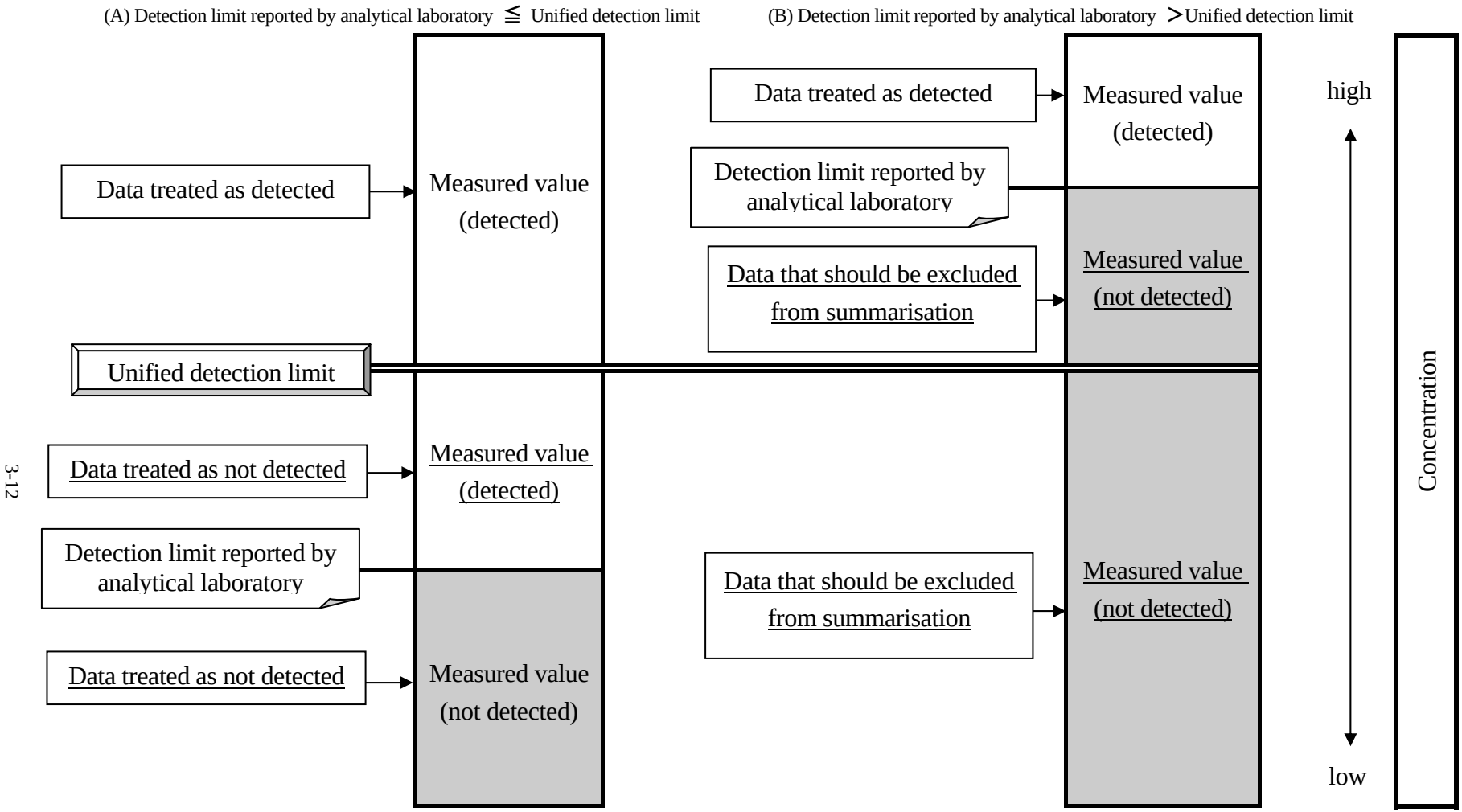
When the instrument detection limit (IDL) and the method detection limit (MDL) are given in the analytical method, which is described in reports on the investigation of the development of analytical methods for chemicals and adopted in the Initial Environmental Survey (hereinafter, the Initial Environmental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

When IDL and MDL are not given in the Initial 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 Initial 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 1-2. The survey results are summarized as follows.

In surface water, 2 out of the 6 target chemicals were detected.

・[1] 2-Aminopyridine: 7 of the 11 valid sites

・[2] *o*-Aminophenol: 8 of the 11 valid sites

In sediment, 1 out of the 2 target chemicals was detected.

・[1] 2-Aminopyridine: 11 of the 11 valid sites

In air, 1 out of the 3 target chemicals was detected.

・[6] Nitromethane: 7 of the 7 valid sites

Table 1-2 Summary of the detection ranges and the detection limits in the Initial Environmental Survey in FY 2009

No.	Target chemicals	Surface water [ng/L]		Sediment [ng/g-dry]		Air [ng/m^3]	
		Detection range and frequency	Detection limit	Detection range and frequency	Detection limit	Detection range and frequency	Detection limit
[1]	2-Aminopyridine	nd～14 7/11	2.3	0.021～1.2 11/11	0.013		
[2]	*o*-Aminophenol	nd～22 8/11	2.3				
[3]	Benzyl acetate	nd 0/11	16				
[4]	*o*-Nitroanisole	nd 0/27	10				
[5]	*m*-Nitroaniline					nd 0/8	0.27
[6]	Nitromethane					22～120 7/7	0.31
[7]	Methyl 4-hydroxybenzoate					nd 0/6	2.7
[8]	*tert*-Butyl 2-ethylperoxyhexanoate	nd 0/12	6.9				
[9]	2-*tert*-Butyl-5-methylphenol			nd 0/12	0.59		
[10]	4,4'-Methylenebis(2-methylcyclohexanamine)	nd 0/10	2.4				