# Chapter 1 Results of the Initial Environmental Survey in FY2018

## 1. Purpose of the survey

Initial Environmental Surveys are implemented in compliance with the Law Concerning Reporting, etc. of Releases of Specific Chemical Substances to the Environment and Promoting Improvement in Their Management (Law No. 86, 1999) (hereafter, the PRTR); these surveys provide the basic resources to properly evaluate chemical substances which may present environmental risk by compiling and tracking data notably from areas susceptible to high concentrations in their general environments, as well as for evaluating environmental and exposure risks to chemical substances that are other than as designated by law.

## 2. Target chemicals

In the FY2018 Initial Environmental Survey, 19 chemicals (groups) 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 | Before the revision | Before the revision | After the revision | Surface water | Sedi-ment | Air |
| [1] | *o*-Acetoxybenzoic acid (synonym: Aspirin) | II Monitored | | | | ○ | | |
| [2] | *o*-Anisidine | II Monitored | | I 14 | I 17 | | | ○ |
| [3] | 2-Ethylhexanoic acid | | | | I 51 | ○ | | |
| [4] | 2-Ethoxy-1-{[2'-(5-oxo-2,5-dihydro-1,2,4-oxadiazol-3-yl)biphenyl-4-yl]methyl}-1*H*-benzimidazole-7-carboxylic acid (synonym: Azilsartan) | | | | | ○ | | |
| [5] | 3-(3-Chloro-5-[3'-(dimethylamino)propyl)]-10,11-dihydro-5*H*-dibenzo[*b*,*f*]azepin (synonym: Clomipramine) | | | | | ○ | | |
| [6] | 6-Chloro-7-sulfamoyl-3,4-dihydrobenzo[*e*][1,2,4]-2*H*-thiadiazine 1,1-dioxide (synonym: Hydrochlorothiazide) | | | | | ○ | | |
| [7] | 1-(2-Chlorotrityl)imidazole (synonym: Clotrimazole) | | | | | ○ | | |
| [8] | 2-(4-{2-[(4-Chlorobenzoyl)amino]ethyl}phenoxy)-2-methylpropanoic acid (synonym: Bezafibrate) | | | | | ○ | | |
| [9] | Salicylic acid and its salts (as Sodium salicylate) | | | | | ○ | | |
| [10] | 5*H*-Dibenzo[*b*,*f*]azepine-5-carboxamide (synonym: Carbamazepine) | | | | | ○ | | |
| [11] | Trifluoroacetic acid | | | | | | | ○ |
| [12] | 1,3,7-Trimethyl-1*H*-purine-2,6(3*H*,7*H*)-dione (synonym: Caffeine) | | | | | ○ | | |
| [13] | 2-Naphthylamine | | | | | | | ○ |
| [14] | *p*-*tert*-Butylbenzoic acid | | | | | ○ | | ○ |
| [15] | 5-(Propylthio)-1*H*-benzimidazol-2-yl carbamic acid methyl ester (synonym: Albendazole) and its metabolites | | | | | | | |
| | [15-1] 5-(Propylthio)-1*H*-benzimidazol-2-yl carbamic acid methyl ester (synonym: Albendazole) | | | | | ○ | | |
| | [15-2] 5-(Propylsulfonyl)-1*H*-benzimidazol-2-yl amine (synonym: Albendazole-2-amino sulfone) | | | | | ○ | | |
| | [15-3] 5-(Propylsulfinyl)-1*H*-benzimidazol-2-yl carbamic acid methyl ester (synonym: Albendazole sulfoxide) | | | | | ○ | | |
| | [15-4] 5-(Propylsulfonyl)-1*H*-benzimidazol-2-yl carbamic acid methyl ester (synonym: Albendazole sulfone) | | | | | ○ | | |
| [16] | 2-(*m*-Benzoylphenyl)propionic acid (synonym: Ketoprofen) | | | | | ○ | | |
| [17] | Benzo[*a*]pyrene | | | | | ○ | ○ | |

| No. | Name | The Chemical Substances Control Law | | The PRTR Law | | Surveyed media | | |
|---|---|---|---|---|---|---|---|---|
| | | Before the revision | Before the revision | Before the revision | After the revision | Surface water | Sedi-ment | Air |
| [18] | (*E*)-5-Methoxy-4'-(trifluoromethyl)valerophenone *O*-(2-aminoethyl)oxime (synonym: Fluvoxamine) | | | | | ○ | | |
| [19] | 2-Methoxy-5-methylaniline | II Monitored | | I 344 | I 451 | | | ○ |

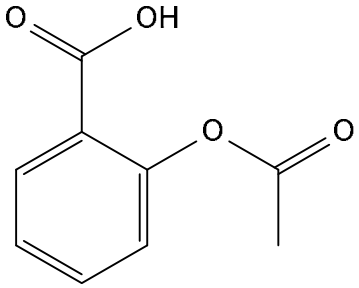
(Note 1) "The Chemical Substances Control Law" hereafter means "Law Concerning the Examination and Regulation of Manufacture, etc. of Chemical Substances (Law No. 117 of 1973)."

(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".

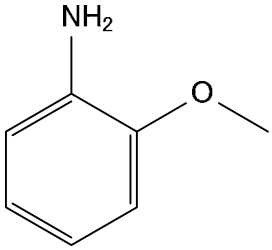
Chemical and physical properties of target chemicals of the Initial Environmental Survey are as follows.

[1] *o*-Acetoxybenzoic acid (synonym: Aspirin)



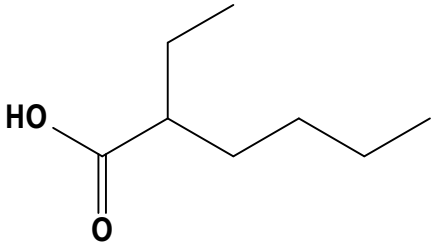
Molecular formula: $C_9H_8O_4$
CAS: 50-78-2
ENCS: 3-1652
MW: 180.16
mp: 135 ° C (rapid heating)[1)]
bp: Uncertain
sw: 1g/300mL(25 ° C)[1)]
Specific gravities: 1.4 [1)]
logPow: 1.19 [2)]

[2] *o*-Anisidine



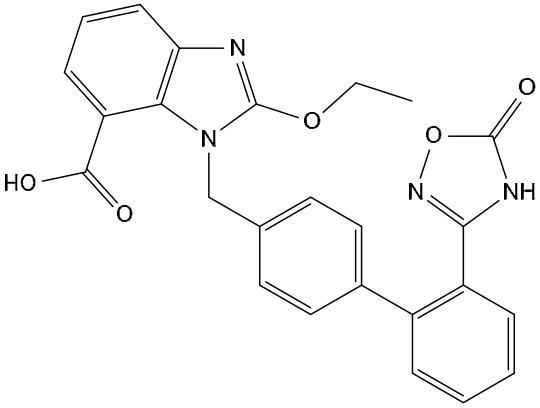
Molecular formula: $C_7H_9NO$
CAS: 90-04-0
ENCS: 3-682
MW: 123.15
mp: 5 ° C [1)]
bp: 225 ° C [1)]
sw: 13g/L(25 ° C)[2)]
Specific gravities: 1.098(15 ° C/15 ° C)[1)]
logPow: 1.18 [2)]

[3] 2-Ethylhexanoic acid



Molecular formula: $C_8H_{16}O_2$
CAS: 149-57-5
ENCS: 2-608
MW: 144.21
mp: -59 ° C [3)]
bp: 227.5 ° C [4)]
sw: 2g/L(20 ° C)[5)]
Specific gravities: 0.9031g/cm$^3$(25 ° C)[4)]
logPow: 2.64 [2)]

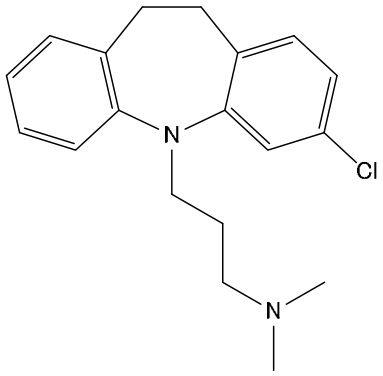
[4] 2-Ethoxy-1-{[2'-(5-oxo-2,5-dihydro-1,2,4-oxadiazol-3-yl)biphenyl-4-yl]methyl}-1*H*-benzimidazole-7-carboxylic acid (synonym: Azilsartan)



Molecular formula: $C_{25}H_{20}N_4O_5$
CAS: 147403-03-0
ENCS: No pertinence
MW: 456.46
mp: 212-214 ° C [1)]
bp: Uncertain
sw: Uncertain
Specific gravities: Uncertain
logPow: 0.90 [1)]

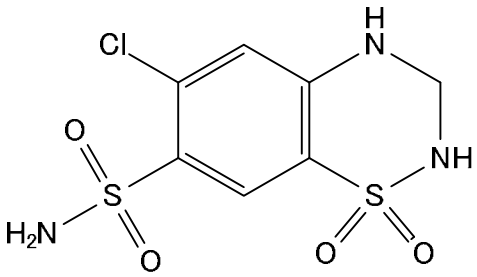
(Abbreviations) CAS CAS registry number, ENCS registry number in the Existing and New Chemical Substances List, MW molecular weight, mp melting point, bp boiling point, SW solubility in water, Specific gravities Specific gravity(no unit) or density, logPow *n*-octanol-water partition coefficient, kPa kilopascal (1 atom approximately equal to 101.3kPa).

[5] 3-(3-Chloro-5-[3'-(dimethylamino)propyl)]-10,11-dihydro-5*H*-dibenzo[*b*,*f*]azepin (synonym: Clomipramine)



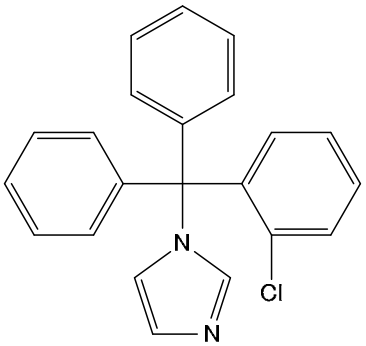
Molecular formula: $C_{19}H_{23}ClN_2$
CAS: 303-49-1
ENCS: 9-372
MW: 314.86
mp: 189.5 ° C [5)]
bp: 160-170 ° C (0.3mm Hg)[1)]
sw: Uncertain
Specific gravities: Uncertain
logPow: 5.19 [2)]

[6] 6-Chloro-7-sulfamoyl-3,4-dihydrobenzo[*e*][1,2,4]-2*H*-thiadiazine 1,1-dioxide (synonym: Hydrochlorothiazide)



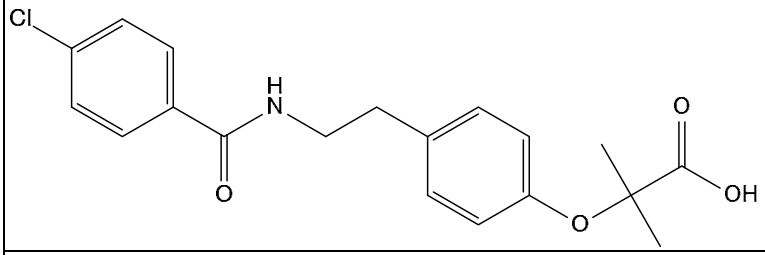
Molecular formula: $C_7H_8ClN_3O_4S_2$
CAS: 58-93-5
ENCS: No pertinence
MW: 297.73
mp: 273-275 ° C [1)]
bp: Uncertain
sw: 0.722g/L(25 ° C)[2)]
Specific gravities: 1.693g/cm$^3$ [2)]
logPow: -0.07 [2)]

[7] 1-(2-Chlorotrityl)imidazole (synonym: Clotrimazole)



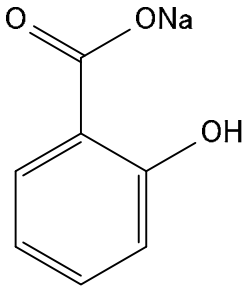
Molecular formula: $C_{22}H_{17}ClN_2$
CAS: 23593-75-1
ENCS: No pertinence
MW: 344.84
mp: 147-149 ° C [1)]
bp: Uncertain
sw: Slightly soluble [1)]
Specific gravities: Uncertain
logPow: Uncertain

[8] 2-(4-{2-[(4-Chlorobenzoyl)amino]ethyl}phenoxy)-2-methylpropanoic acid (synonym: Bezafibrate)



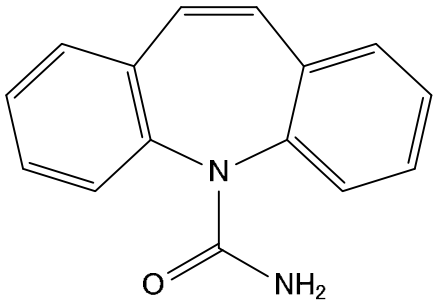
Molecular formula: $C_{19}H_{20}ClNO_4$
CAS: 41859-67-0
ENCS: No pertinence
MW: 361.82
mp: 186 ° C [1)]
bp: Uncertain
sw: Uncertain
Specific gravities: Uncertain
logPow: Uncertain

[9] Salicylic acid and its salts (as Sodium salicylate)



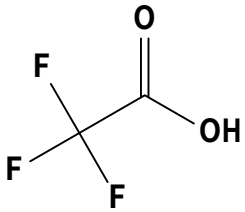
Molecular formula: $C_7H_5NaO_3$
CAS: 54-21-7
ENCS: 3-1639
MW: 160.10
mp: 440 ° C [1)]
bp: Uncertain
sw: 125g/L(25 ° C)[5)]
Specific gravities: 1.443(20 ° C/4 ° C as salicylic acid)[1)]
logPow: -1.43 [5)]

[10] 5*H*-Dibenzo[*b*,*f*]azepine-5-carboxamide (synonym: Carbamazepine)



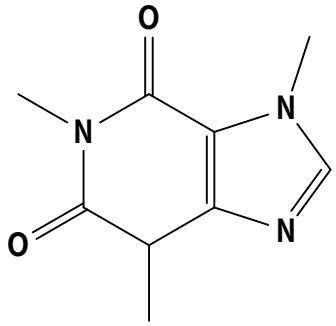
Molecular formula: $C_{15}H_{12}N_2O$
CAS: 298-46-4
ENCS: 9-630
MW: 236.27
mp: 190-193 ° C [1)]
bp: Uncertain
sw: Slightly soluble [1)]
Specific gravities: Uncertain
logPow: 2.45 [2)]

[11] Trifluoroacetic acid



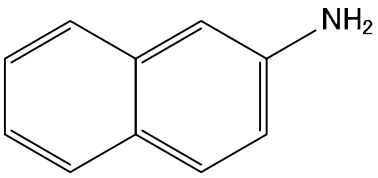
Molecular formula: $C_2HF_3O_2$
CAS: 76-05-1
ENCS: 2-1185
MW: 114.02
mp: -15.4 ° C [1)]
bp: 72.4 ° C [1)]
sw: 1,000g/L(20 ° C)[5)]
Specific gravities: 1.5351(20 ° C)[1)]
logPow: -2.1 [3)]

[12] 1,3,7-Trimethyl-1*H*-purine-2,6(3*H*,7*H*)-dione (synonym: Caffeine)



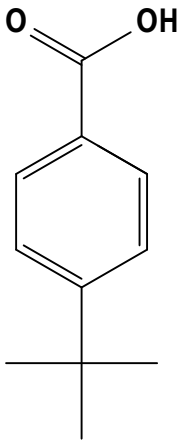
Molecular formula: $C_8H_{10}N_4O_2$
CAS: 58-08-2
ENCS: 9-419
MW: 194.19
mp: 238 ° C [1)]
bp: 178 ° C(sublimation)[1)]
sw: 21.7g/kg(25 ° C)[4)]
Specific gravities: 1.23(18 ° C/4 ° C)[1)]
logPow: -0.091(23 ° C)[6)]

[13] 2-Naphthylamine




Molecular formula: $C_{10}H_9N$
CAS: 91-59-8
ENCS: No pertinence
MW: 143.18
mp: 111-113 ° C [1)]
bp: 306 ° C [1)]
sw: 0.189g/kg(20 ° C)[4)]
Specific gravities: 1.061(98 ° C/4 ° C)[1)]
logPow: 2.28 [2)]

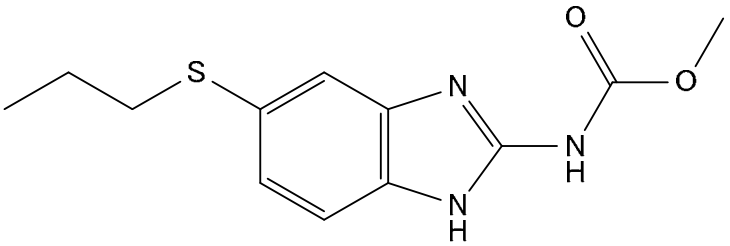
[14] *p-tert*-Butylbenzoic acid




Molecular formula: $C_{11}H_{14}O_2$
CAS: 98-73-7
ENCS: 3-1338
MW: 178.23
mp: 164 ° C [4)]
bp: Uncertain
sw: 0.028g/L(25 ° C)[5)]
Specific gravities: Uncertain
logPow: 3.85 [5)]

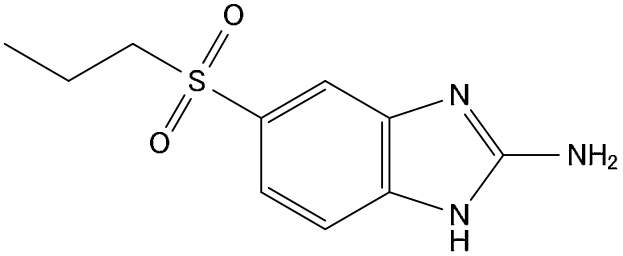
[15] 5-(Propylthio)-1*H*-benzimidazol-2-yl carbamic acid methyl ester (synonym: Albendazole) and its metabolites

[15-1] 5-(Propylthio)-1*H*-benzimidazol-2-yl carbamic acid methyl ester (synonym: Albendazole)



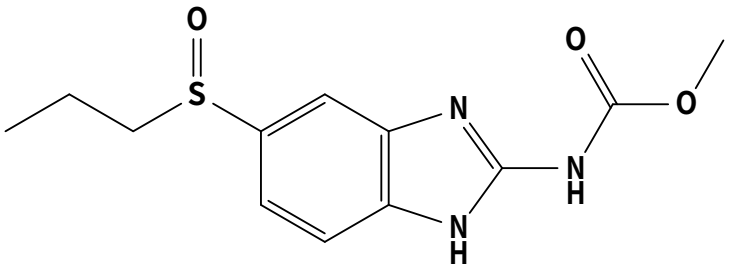

Molecular formula: $C_{12}H_{15}N_3O_2S$
CAS: 54965-21-8
ENCS: No pertinence
MW: 265.33
mp: 208-210 ° C [1)]
bp: Uncertain
sw: Slightly soluble [1)]
Specific gravities: Uncertain
logPow: 3.07 [5)]

[15-2] 5-(Propylsulfonyl)-1*H*-benzimidazol-2-yl amine (synonym: Albendazole-2-amino sulfone)



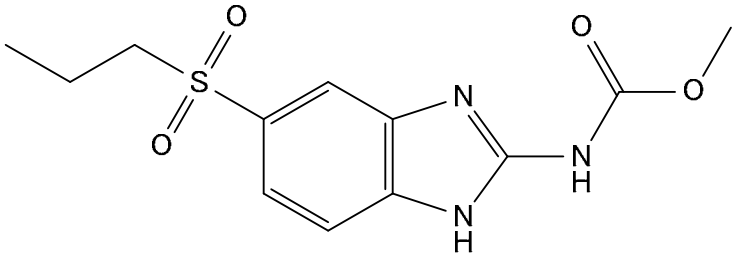

Molecular formula: $C_{10}H_{13}N_3O_2S$
CAS: 80983-34-2
ENCS: No pertinence
MW: 239.29
mp: Uncertain
bp: Uncertain
sw: Uncertain
Specific gravities: Uncertain
logPow: Uncertain

[15-3] 5-(Propylsulfinyl)-1*H*-benzimidazol-2-yl carbamic acid methyl ester (synonym: Albendazole sulfoxide)



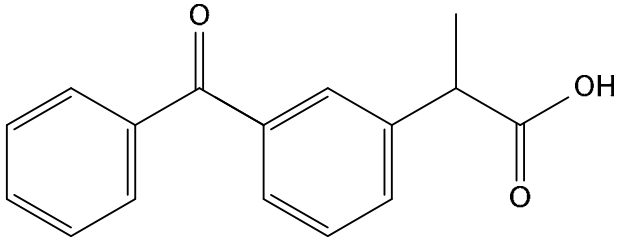
Molecular formula: $C_{12}H_{15}N_3O_3S$
CAS: 54029-12-8
ENCS: No pertinence
MW: 281.33
mp: 226-228 ° C [1)]
bp: Uncertain
sw: Uncertain
Specific gravities: Uncertain
logPow: Uncertain

[15-4] 5-(Propylsulfonyl)-1*H*-benzimidazol-2-yl carbamic acid methyl ester (synonym: Albendazole sulfone)



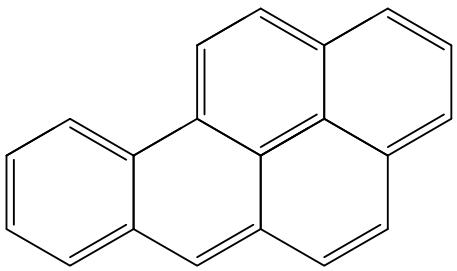
Molecular formula: $C_{12}H_{15}N_3O_4S$
CAS: 75184-71-3
ENCS: No pertinence
MW: 297.33
mp: Uncertain
bp: Uncertain
sw: Uncertain
Specific gravities: Uncertain
logPow: Uncertain

[16] 2-(*m*-Benzoylphenyl)propionic acid (synonym: Ketoprofen)



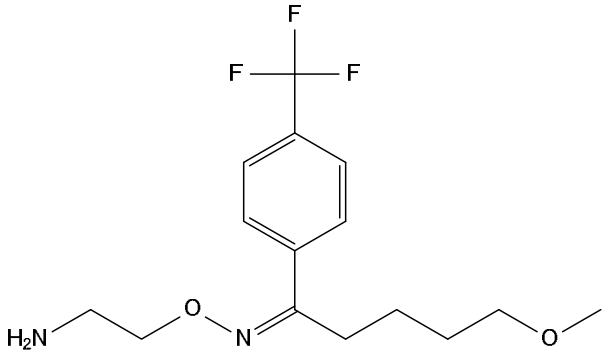
Molecular formula: $C_{16}H_{14}O_3$
CAS: 22071-15-4
ENCS: No pertinence
MW: 254.29
mp: 94 ° C [1)]
bp: Uncertain
sw: 0.051g/L(22 ° C)[5)]
Specific gravities: Uncertain
logPow: 3.12 [5)]

[17] Benzo[*a*]pyrene



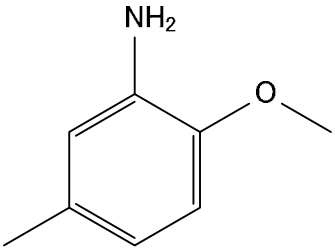
Molecular formula: $C_{20}H_{12}$
CAS: 50-32-8
ENCS: No pertinence
MW: 252.31
mp: 179-179.3 ° C [1)]
bp: 310～312 ° C(10mm Hg)[1)]
sw: 0.0000043g/kg(25 ° C)[4)]
Specific gravities: 1.351 [2)]
logPow: 6.20 [4)]

[18] (*E*)-5-Methoxy-4'-(trifluoromethyl)valerophenone *O*-(2-aminoethyl)oxime (synonym: Fluvoxamine)



Molecular formula: $C_{15}H_{21}F_3N_2O_2$
CAS: 54739-18-3
ENCS: No pertinence
MW: 318.34
mp: Uncertain
bp: Uncertain
sw: Uncertain
Specific gravities: Uncertain
logPow: Uncertain

[19] 2-Methoxy-5-methylaniline




| | |
|---|---|
| Molecular formula: | $C_8H_{11}NO$ |
| CAS: | 120-71-8 |
| ENCS: | 3-614 |
| MW: | 137.18 |
| mp: | 53 ° C [4)] |
| bp: | 235 ° C [4)] |
| sw: | Slightly soluble [4)] |
| Specific gravities: | Uncertain |
| logPow: | 1.74 [2)] |

References

1) O'Neil, M.J. (ed), The Merck Index 15th Edition (2013), CRC Press.
2) U.S. National Library of Medicine, Hazardous Substances Data Bank (HSDB) (https://toxnet.nlm.nih.gov/cgi-bin/sis/htmlgen?HSDB)
3) International Programme on Chemical Safty, International Chemical Safety Cards (ICSC) (http://www.ilo.org/safework/info/publications/WCMS_113134/lang--en/index.htm)
4) Rumble, J.R. (ed), CRC Handbook of Chemistry and Physics 98th Edition (2017), The Royal society of Chemistry.
5) U.S. EPA, Estimation Programs Interface (EPI) Suite v4.1 (http://www.epa.gov/oppt/exposure/pubs/episuitedl.htm)
6) OECD, Screening Information Dataset (SIDS) for High Product inVolume Chemicals (Processed by UNEP Chemicals) (http://www.inchem.org/pages/sids.html)

## 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 analysed by private analytical laboratories.

(1) Organisations responsible for sampling

| Local communities | Organisations responsible for sampling[*1] | Surveyed media | | |
|---|---|---|---|---|
| | | Surface water | Sediment | 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. | Environmental Improvement Division, Bureau of Environment, Tokyo Metropolitan Government and 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 | ○ | | |
| Ishikawa Pref. | Ishikawa 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, Regional Environmental measures Division, Environmental Bureau, Nagoya city | ○ | ○ | ○ |
| 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 | ○ | | ○[*2] |
| Osaka City | Osaka City Institute of Public Health and Environmental Sciences | ○ | ○ | |
| Hyogo Pref. | Water and Air Quality Control Division, Environmental Management Bureau, Agricultural and Environmental Affairs Department, Hyogo Prefectural Government and Hyogo Prefectural Institute of Environmental Sciences, Hyogo Environmental Advancement Association | ○ | ○ | ○ |
| Kobe City | Natural Environmental Symbiotic Division, Environmental Preservation Branch, Environment Bureau, Kobe City and Kobe Institute of Health, Welfare Bureau, Health Division, Health | ○ | | |
| Nara Pref. | Nara Prefecture Landscape and Environment 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 Pablic Health, Pharmaceutical and Environmental Sciences Center | | | ○ |
| Kagawa Pref. | Kagawa Prefectural Research Institute for Environmental Sciences and Public Health | ○ | | ○ |
| Fukuoka Pref. | Fukuoka Institute of Health and Environmental Sciences | ○ | | ○ |
| Kitakyushu City | Kitakyushu City Institute of Health and Environmental Sciences | ○ | ○ | ○ |
| Fukuoka City | Fukuoka City Institute for Hygiene and the Environment | ○ | | |
| Saga Pref. | Saga Prefectural Environmental Research Center | ○ | | ○ |
| Oita Pref. | Environment Preservation Division, Department of Environment, Oita Prefectural Government and Oita Prefectural Institute of Health and Environment | ○ | | |

(Note 1) *1: Organisations responsible for sampling are described by their official names in FY 2018.
(Note 2) *2: That organization cooperated with a private analytical laboratory in sampling specimens

(2) Surveyed sites and target chemicals

The numbers of target chemicals (groups) and the numbers of surveyed sites, etc. by surveyed medium in the initial environmental survey were as shown in the following table.

The target chemicals and the national distribution map of the survey sites for each medium are shown in Table 1-1-1and Fig.1-1-1 for surface water, Table 1-1-2 and Fig.1-1-1 for sediment, Table 1-1-3 and Fig.1-1-2 for air.

In addition, about 20 sites were selected as survey sites per target chemical. To obtain data for areas to be expected to high concentrations in the general environment survey sites are selected based on information regarding releases and emissions. Among the sites considering to rank in the top of PRTR emissions, it was included the surrounding sites where samples can be taken in the survey sites.

| Surveyed media | Numbers of local communities | Numbers of target chemicals (groups) | Numbers of surveyed sites | Numbers of samples at a surveyed site |
|---|---|---|---|---|
| Surface water | 40 | 15 | 59 | 1 |
| Sediment | 14 | 1 | 20 | 3 |
| Air | 22* | 5 | 23 | 3 |
| All media | 42 | 19 | 83 | |

(Note) *: For 1 of the 22 organization, it was cooperated with a private analytical laboratory in sampling specimens.

(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)).

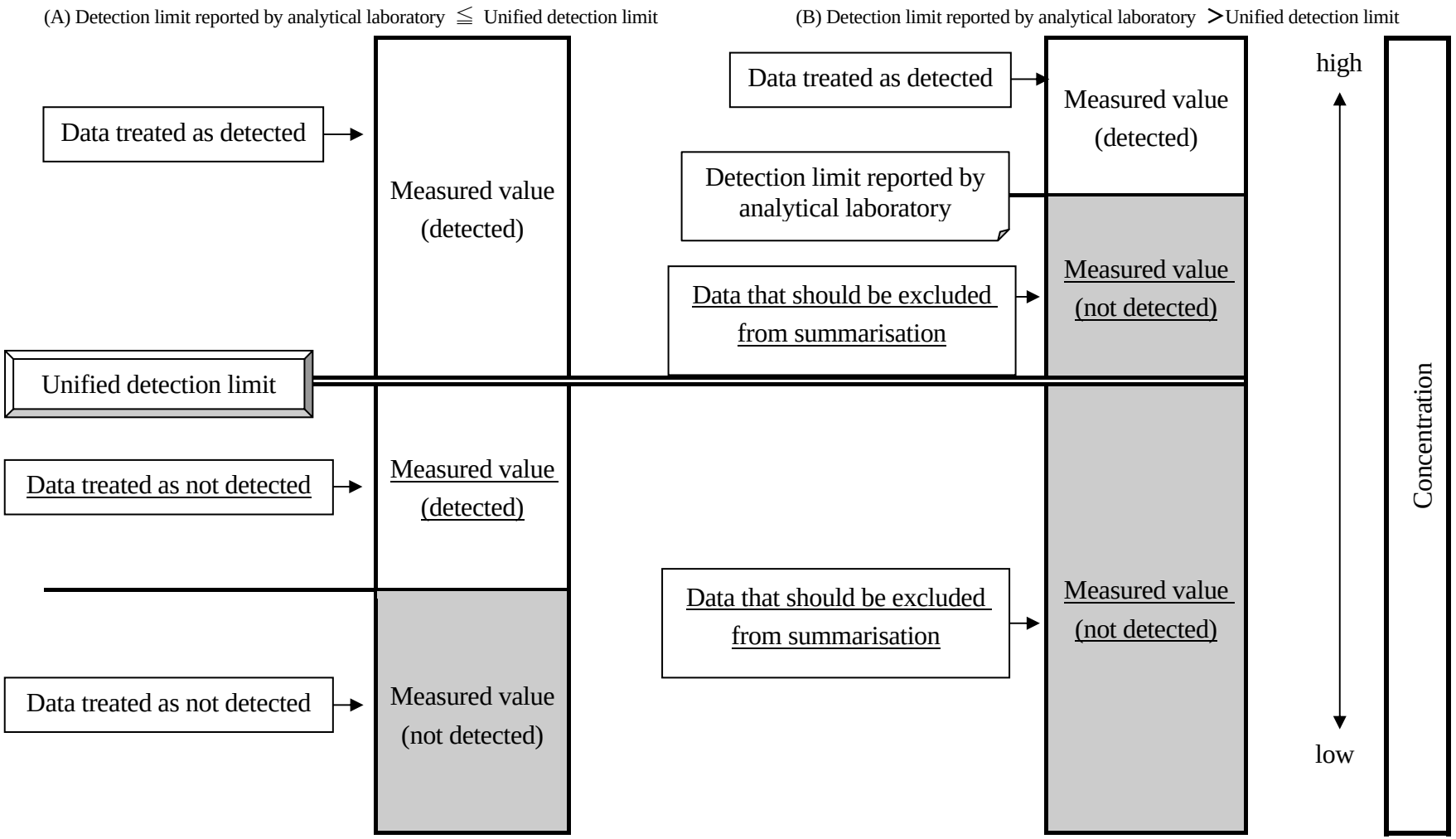
When the instrument detection limit (IDL) and the method detection limit (MDL) are given in the analytical method, which is described in reports on the investigation of the development of analytical methods for chemicals and adopted in the Initial Environmental Survey (hereafter, the Initial Environmental 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

Table 1-1-1 List of surveyed sites (surface water) and target chemicals in the Initial Environmental Survey in FY2018

| Local Communities | Surveyed sites | Target chemicals | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | [1] | [3] | [4] | [5] | [6] | [7] | [8] | [9] | [10] | [12] | [14] | [15] | [16] | [17] | [18] |
| Hokkaido | Ishikarikakokyo Bridge, Mouth of Riv. Ishikari(Ishikari City) | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| | Tomakomai Port | | | | | | | | | | | | | | ○ | |
| Sapporo City | Nakanuma of Riv.Toyohira(Sapporo City) | | | ○ | | | | | | | | | ○ | | | |
| | Daiichishinkawa-bashi Bridge, Riv. Shin(Sapporo City) | | | ○ | ○ | ○ | | | | ○ | | | ○ | | | |
| Iwate Pref. | Riv. Toyosawa(Hanamaki City) | | | | | | | ○ | | | | | ○ | | | |
| Miyagi Pref. | Futatsuya-bashi Bridge, Riv. Hasama(Tome City) | | | | | | | | ○ | | | | | | | |
| Sendai City | Hirose-ohashi Bridge, Riv. Hirose(Sendai City) | ○ | | | | ○ | | | ○ | | ○ | ○ | | | | ○ |
| Akita Pref. | Akita Canal(Akita City) | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| Yamagata Pref. | Mouth of Riv. Mogami(Sakata City) | | | | | | ○ | | | | | | | | | |
| Ibaraki Pref. | Tonekamome-ohasi Bridge, Mouth of Riv. Tone(Kamisu City) | | ○ | ○ | | | ○ | | | | | | ○ | ○ | | |
| | The Sea of Kashima(Recipient water body of Fukashiba Sewate treatment plant) | | ○ | | | | | | | | | | | | | |
| Tochigi Pref. | Tagawa Kyubun Area Head Works(Utsunomiya City) | | | | | ○ | | | | | | | | | | |
| Gunma Pref. | Namiii-hashi Bridge, Riv. Kanzawa(Isesaki City, Maebashi City) | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| Saitama Pref. | Akigaseshusuizeki of Riv. Arakawa(Shiki City) | | ○ | | | | | | | | | | | | | |
| Saitama City | Nakadote-hashi Bridge, Riv. Kamo(Saitama City) | | | | | | | | | | | | ○ | | | |
| Chiba Pref. | Asai-bashi Bridge, Riv.Yourou(Ichihara City) | | | ○ | ○ | | ○ | ○ | | ○ | ○ | | ○ | ○ | | ○ |
| Tokyo Met. | Mouth of Riv. Arakawa(Koto Ward) | ○ | | ○ | ○ | | ○ | ○ | ○ | ○ | ○ | | | ○ | ○ | |
| | Mouth of Riv. Sumida(Minato Ward) | ○ | ○ | ○ | | ○ | ○ | ○ | | ○ | ○ | | ○ | ○ | ○ | ○ |
| Yokohama City | Kamenoko-bashi Bridge, Riv.Tsurumi(Yokohama City) | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | | ○ | ○ | ○ |
| | Yokohama Port | | ○ | | | | | | | | | ○ | | | ○ | |
| Kawasaki City | Mouth of Riv. Tama(Kawasaki City) | ○ | | ○ | ○ | ○ | ○ | | ○ | ○ | ○ | | | ○ | | ○ |
| | Keihin Canal, Port of Kawasaki,The Coast of Ougi Town | | | | | | | | | | | | | | ○ | |
| Niigata Pref. | Lower Riv. Shinano(Niigata City) | | | ○ | | ○ | | | | | | | ○ | | | |
| Ishikawa Pref. | Mouth of Riv. Sai(Kanazawa City) | ○ | | ○ | | | | | ○ | | | ○ | | | ○ | |
| Nagano Pref. | Tategahana-bashi Bridge, Riv. Shinano(Nakano City) | | ○ | | | | | | | | | | | | | ○ |
| | Lake Suwa(center) | ○ | | | ○ | | | | | | | | | | | |
| Shizuoka Pref. | Shimizu Port | ○ | | | | | | | ○ | | | ○ | | | ○ | |
| | Lower Riv. Niino(Omaezaki City) | ○ | | | | | | | ○ | | | ○ | | | | |
| | Riv. Tenryu(Iwata City) | ○ | | | | | | | ○ | | ○ | ○ | | | | |
| Aichi Pref. | Nagoya Port , West of Shiomi Wharf | | | | | | | | | | | | ○ | ○ | | |
| Nagoya City | Minatoshinbashi Bridge, Riv. Hori (Nagoya City) | ○ | | | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| Mie Pref. | Yokkaichi Port | | ○ | | | | | | | | | ○ | | | ○ | |
| | Toba Port | | | | | | | | | | | | ○ | | ○ | |
| Shiga Pref. | Lake Biwa(center, offshore of Minamihira) | | ○ | | | | | | | | | | | | | |
| | Lake Biwa(center, offshore of Karasaki) | | ○ | | | | | | | | | | | | | |
| Kyoto Pref. | Miyazu Port | | ○ | | | | | | | ○ | | | | ○ | | |
| | Gokou-bashi Bridge, Riv. Kizu(Yawata City) | | | ○ | | | | | | | | | | | | |

| Local Communities | Surveyed sites | Target chemicals | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | [1] | [3] | [4] | [5] | [6] | [7] | [8] | [9] | [10] | [12] | [14] | [15] | [16] | [17] | [18] |
| 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. | Offshore of Himeji | | | | | | | | | | | ○ | | | ○ | |
| | Aboshi Port | | | | | | | | | | | | | | | ○ |
| | Offshore of Takasago West Port | | | | | | | | | | | | | | ○ | |
| Kobe City | Kobe Port(center) | | ○ | | | | | ○ | | | ○ | | | | | |
| Nara Pref. | Riv. Yamato(Oji Town) | | | | | | ○ | | | | | | ○ | | | |
| Wakayama Pref. | Kinokawa-ohashi Bridge, Mouth of Riv. Kinokawa(Wakayama City) | | | | ○ | | | | | | | | | ○ | | |
| | Asahi-bashi Bridge, Riv. Waka(Wakayama City) | | | | | ○ | | | ○ | | | | | | | |
| Okayama Pref. | Sasagase-bashi Bridge, Riv. Sasagase(Okayama City) | ○ | | ○ | | ○ | | ○ | ○ | ○ | | ○ | | | | ○ |
| | Offshore of Mizushima | ○ | | | | | | ○ | ○ | | | ○ | | | ○ | |
| Yamaguchi Pref. | Tokuyama Bay | | ○ | | | | | | | | | ○ | | | ○ | |
| | Offshore of Hagi | | | | | | | | | | ○ | | | | ○ | |
| Kagawa Pref. | Takamatsu Port | ○ | | | | | | | ○ | | | ○ | | | | |
| Fukuoka Pref. | Kabura-bashi Bridge, Riv Raizan(Itoshima City) | | ○ | | | | | ○ | | | | | | | ○ | |
| | Offshore of Omuta | | ○ | | | | | ○ | | | | | | | ○ | |
| Kitakyushu City | Dokai Bay | ○ | | | | | | | ○ | | | ○ | | | ○ | |
| Fukuoka City | Hakata Bay | | | ○ | | | | | | ○ | ○ | | | ○ | | ○ |
| Saga Pref. | Imari Bay | | | | | | | | ○ | | | | | | | |
| Oita Pref. | Mouth of Riv. Oita(Oita City) | | | | ○ | | ○ | ○ | | | ○ | | ○ | | | |

[1] *o*-Acetoxybenzoic acid (synonym: Aspirin), [3] 2-Ethylhexanoic acid,
[4] 2-Ethoxy-1-{[2'-(5-oxo-2,5-dihydro-1,2,4-oxadiazol-3-yl)biphenyl-4-yl]methyl}-1*H*-benzimidazole-7-carboxylic acid (synonym: Azilsartan),
[5] 3-(3-Chloro-5-[3'-(dimethylamino) propyl)]-10,11-dihydro-5*H*-dibenzo[*b*,*f*]azepin (synonym: Clomipramine),
[6] 6-Chloro-7-sulfamoyl-3,4-dihydrobenzo[*e*][1,2,4]-2*H*-thiadiazine 1,1-dioxide (synonym: Hydrochlorothiazide),
[7] 1-(2-Chlorotrityl)imidazole (synonym: Clotrimazole),
[8] 2-(4-{2-[(4-Chlorobenzoyl)amino]ethyl}phenoxy)-2-methylpropanoic acid (synonym: Bezafibrate),
[9] Salicylic acid and its salts (as Sodium salicylate), [10] 5*H*-Dibenzo[*b*,*f*]azepine-5-carboxamide (synonym: Carbamazepine) ,
[12] 1,3,7-Trimethyl-1*H*-purine-2,6(3*H*,7*H*)-dione (synonym: Caffeine) , [14] *p-tert*-Butylbenzoic acid,
[15] 5-(Propylthio)-1*H*-benzimidazol-2-yl carbamic acid methyl ester (synonym: Albendazole) and its metabolites,
[16] 2-(*m*-Benzoylphenyl)propionic acid (synonym: Ketoprofen), [17] Benzo[*a*]pyrene,
[18] (*E*)-5-Methoxy-4'-(trifluoromethyl)valerophenone *O*-(2-aminoethyl)oxime (synonym: Fluvoxamine)

Table 1-1-2 List of surveyed sites (sediment) and target chemicals in the Initial Environmental Survey in FY2018

| Local Communities | Surveyed sites | Target chemicals |
|---|---|---|
| | | [17] Benzo[*a*]pyrene |
| Hokkaido | Ishikarikakokyo Bridge, Mouth of Riv. Ishikari(Ishikari City) | ○ |
| | Tomakomai Port | ○ |
| | Muroran Port | ○ |
| Akita Pref. | Akita Canal(Akita City) | ○ |
| Tokyo Met. | Mouth of Riv. Arakawa(Koto Ward) | ○ |
| | Mouth of Riv. Sumida(Minato Ward) | ○ |
| Yokohama City | Yokohama Port | ○ |
| Kawasaki City | Keihin Canal, Port of Kawasaki,The Coast of Ougi Town | ○ |
| Ishikawa Pref. | Mouth of Riv. Sai(Kanazawa City) | ○ |
| Shizuoka Pref. | Shimizu Port | ○ |
| Nagoya City | Minatoshinbashi Bridge, Riv. Hori (Nagoya City) | ○ |
| Mie Pref. | Yokkaichi Port | ○ |
| | Toba Port | ○ |
| Osaka City | Osaka Port | ○ |
| Hyogo Pref. | Offshore of Himeji | ○ |
| | Offshore of Takasago West Port | ○ |
| Okayama Pref. | Offshore of Mizushima | ○ |
| Yamaguchi Pref. | Tokuyama Bay | ○ |
| | Offshore of Hagi | ○ |
| Kitakyushu City | Dokai Bay | ○ |

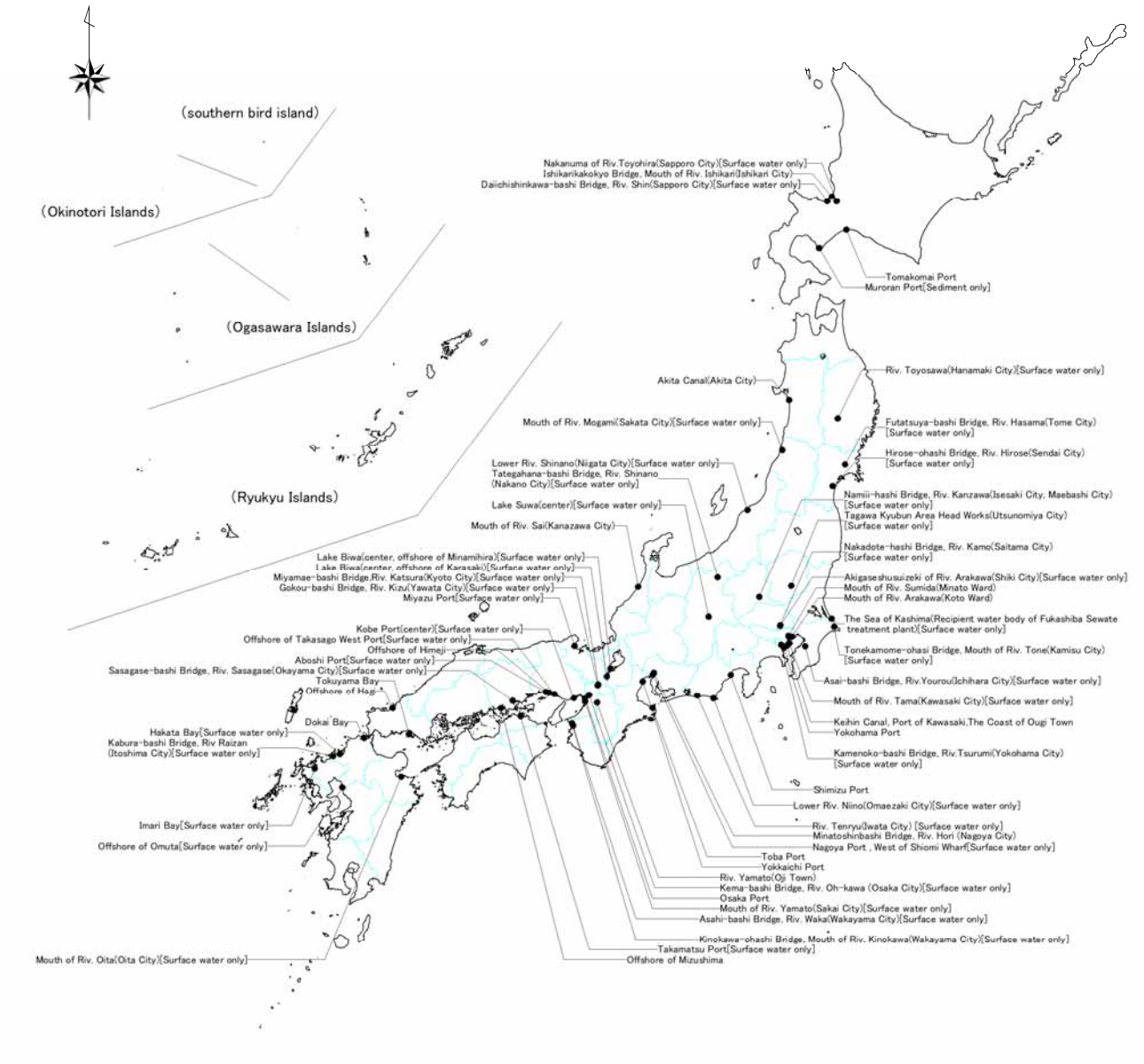



Figure 1-1-1 Surveyed sites (surface water and sediment) in the Initial Environmental Survey in FY 2018

Table 1-1-3 List of surveyed sites (air) and target chemicals in the Initial Environmental Survey in FY 2018

| Local Communities | Surveyed sites | Target chemicals | | | | |
|---|---|---|---|---|---|---|
| | | [2] | [11] | [13] | [14] | [19] |
| Hokkaido | Hokkaido Research Organization Environmental and Geological Research Department Institute of Environmental Sciences | | ○ | | ○ | |
| Sapporo City | Sapporo City Institute of Public Health(Sapporo City) | ○ | | ○ | | ○ |
| Sendai City | Tsutsujigaoka Park(Sendai City) | ○ | | ○ | ○ | ○ |
| Ibaraki Pref. | Ibaraki Kasumigaura Environmental Science Center(Tsuchiura City) | | ○ | | ○ | |
| Saitama City | Saitama City Public Health Center(Saitama City) | | ○ | | ○ | |
| Chiba Pref. | Ichihara-Iwasakinishi Air Quality Monitoring Station(Ichihara City) | ○ | ○ | ○ | ○ | ○ |
| Kanagawa Pref. | Kanagawa Environmental Research Center(Hiratsuka City) | | ○ | | ○ | |
| Yokohama City | Yokohama Environmental Science Research Institute(Yokohama City) | | | | ○ | |
| Ishikawa Pref. | Ishikawa Prefectural Institute of Public Health and Environmental Science(Kanazawa City) | ○ | | ○ | | ○ |
| Nagano Pref. | Nagano Environmental Conservation Research Institute(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) | ○ | ○ | ○ | ○ | ○ |
| Kyoto City | Kyoto City Institute of Health and Environmental Sciences(Kyoto City) | | ○ | | ○ | |
| Osaka Pref. | Osaka Joint Prefectural Government Building, Building 2 Annex(Osaka City) | ○ | | ○ | | ○ |
| Hyogo Pref. | Aioi City Government Building(Aioi City) | ○ | ○ | ○ | | ○ |
| Yamaguchi Pref. | 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. | Kagawa Prefectural Public Swimming Pool(Takamatsu City) | | | | ○ | |
| Fukuoka Pref. | Fukuoka Institute of Health and Environmental Science(Dazaifu City) | ○ | | ○ | | ○ |
| | Omuta City Government Building(Omuta City) | ○ | | ○ | | ○ |
| Kitakyushu City | Kitakyushu City Institute of Health and Environmental Sciences(Kitakyushu City) | ○ | | ○ | | ○ |
| Saga Pref. | Saga Prefectural Environmental Research Center(Saga City) | ○ | ○ | ○ | ○ | ○ |

[2] *o*-Anisidine, [11] Trifluoroacetic acid, [13] 2-Naphthylamine ,[14] *p-tert*-Butylbenzoic acid,
[19] 2-Methoxy-5-methylaniline

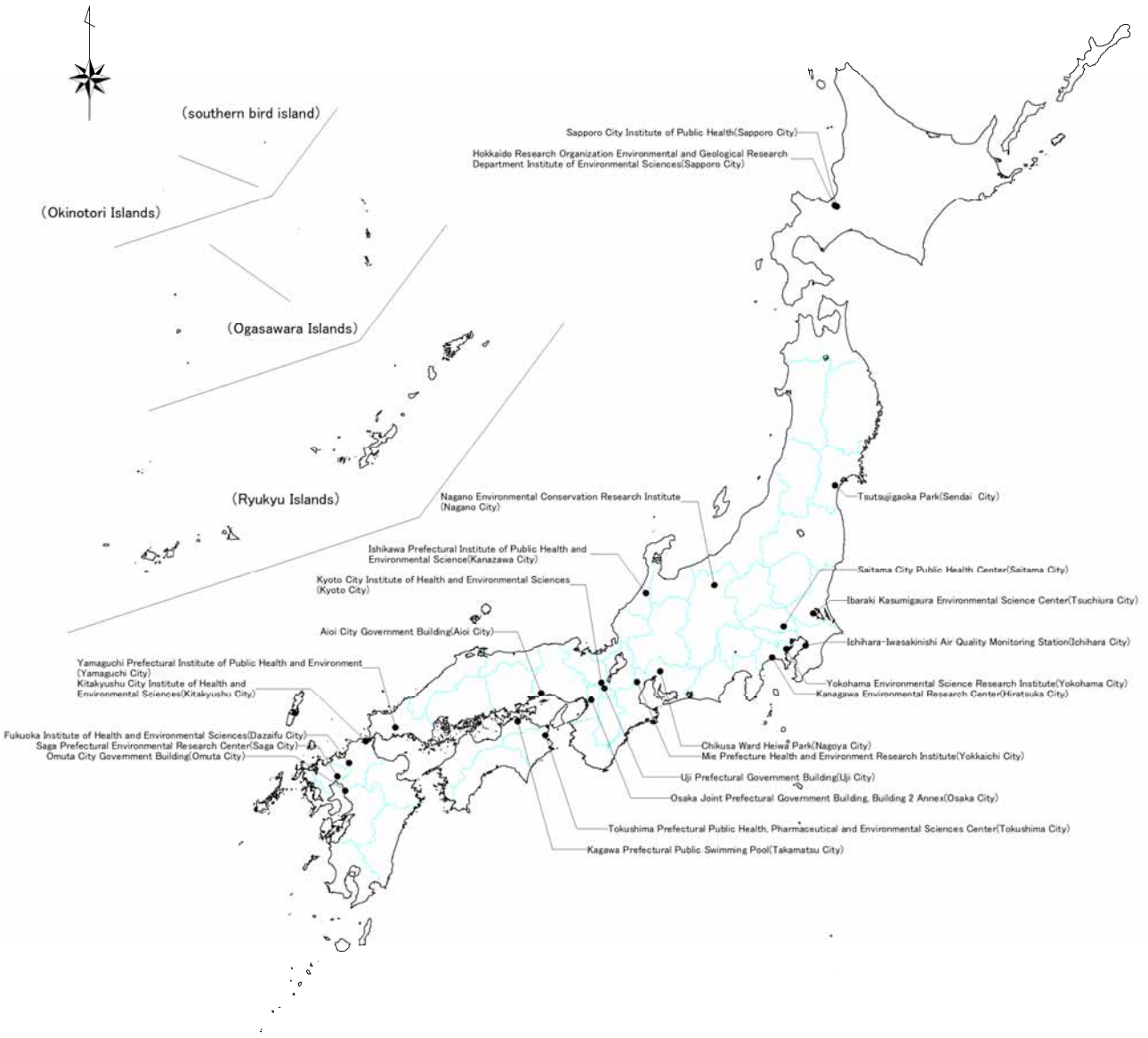



Figure 1-1-2 Surveyed sites (air) in the Initial Environmental Survey in FY 2018

## 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, 12 out of the 15 target chemicals (groups) were detected. Target chemicals were categorized by analytical methods such as structurally similar chemicals capable of simultaneous analyses.

- [3] 2-Ethylhexanoic acid: 1 of the 19 valid site
- [4] 2-Ethoxy-1-{[2'-(5-oxo-2,5-dihydro-1,2,4-oxadiazol-3-yl)biphenyl-4-yl]methyl}-1*H*-benzimidazole-7-carboxylic acid (synonym: Azilsartan): 17 of the 18 valid sites
- [5] 3-(3-Chloro-5-[3'-(dimethylamino)propyl)]-10,11-dihydro-5*H*-dibenzo[*b,f*]azepin (synonym: Clomipramine): 8 of the 16 valid sites
- [6] 6-Chloro-7-sulfamoyl-3,4-dihydrobenzo[*e*][1,2,4]-2*H*-thiadiazine 1,1-dioxide (synonym: Hydrochlorothiazide): All 16 valid sites
- [7] 1-(2-Chlorotrityl)imidazole (synonym: Clotrimazole): 11 of the 16 valid sites
- [8] 2-(4-{2-[(4-Chlorobenzoyl)amino]ethyl}phenoxy)-2-methylpropanoic acid (synonym: Bezafibrate): 11 of the 18 valid sites
- [9] Salicylic acid and its salts (as Sodium salicylate): 14 of the 20 valid sites
- [10] 5*H*-Dibenzo[*b,f*]azepine-5-carboxamide (synonym: Carbamazepine): All 16 valid sites
- [12] 1,3,7-Trimethyl-1*H*-purine-2,6(3*H*,7*H*)-dione (synonym: Caffeine): All 18 valid sites
- [14] *p-tert*-Butylbenzoic acid: 16 of the 18 valid sites
- [16] 2-(*m*-Benzoylphenyl) propionic acid (synonym: Ketoprofen): 12 of the 17 valid sites
- [17] Benzo[*a*]pyrene: 9 of the 23 valid sites

In sediment, 1 target chemical was detected.

- [17] Benzo[*a*]pyrene: All 20 valid sites

In air, 2 out of the 5 target chemicals (groups) were detected.

- [10] Trifluoroacetic acid: 8 of the 13 valid sites
- [16] 2-(*m*-Benzoylphenyl) propionic acid (synonym: Ketoprofen): 14 of the 15 valid sites

Table 1-2 Summary of the detection ranges and the detection limits in the Initial Environmental Survey in FY 2018

| 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] | *o*-Acetoxybenzoic acid (synonym: Aspirin) | nd<br>0/21 | 19 | | | | |
| [2] | *o*-Anisidine | | | | | nd<br>0/14 | 1.6 |
| [3] | 2-Ethylhexanoic acid * | nd～350<br>1/19 | 160 | | | | |
| [4] | 2-Ethoxy-1-{[2'-(5-oxo-2,5-dihydro-1,2,4-oxadiazol-3-yl)biphenyl-4-yl]methyl}-1*H*-benzimidazole-7-carboxylic acid<br>(synonym: Azilsartan) | nd～24<br>17/18 | 0.037 | | | | |
| [5] | 3-(3-Chloro-5-[3'-(dimethylamino)propyl)]-10,11-dihydro-5*H*-dibenzo[*b*,*f*]azepin<br>(synonym: Clomipramine) | nd～1.5<br>8/16 | 0.020 | | | | |
| [6] | 6-Chloro-7-sulfamoyl-3,4-dihydrobenzo[*e*][1,2,4]-2*H*-thiadiazine 1,1-dioxide<br>(synonym: Hydrochlorothiazide) | 0.44～39<br>16/16 | 0.091 | | | | |
| [7] | 1-(2-Chlorotrityl)imidazole<br>(synonym: Clotrimazole) | nd～0.48<br>11/16 | 0.043 | | | | |
| [8] | 2-(4-{2-[(4-Chlorobenzoyl)amino]ethyl}phenoxy)-2-methylpropanoic acid<br>(synonym: Bezafibrate) | nd～96<br>11/18 | 0.99 | | | | |
| [9] | Salicylic acid and its salts<br>(as Sodium salicylate) | nd～1400<br>14/20 | 50 | | | | |
| [10] | 5*H*-Dibenzo[*b*,*f*]azepine-5-carboxamide (synonym: Carbamazepine) | 0.11～54<br>16/16 | 0.021 | | | | |
| [11] | Trifluoroacetic acid | | | | | nd～120<br>8/13 | 24 |
| [12] | 1,3,7-Trimethyl-1*H*-purine-2,6(3*H*,7*H*)-dione<br>(synonym: Caffeine) | 7.4～2,400<br>18/18 | 1.1 | | | | |
| [13] | 2-Naphthylamine | | | | | nd<br>0/14 | 0.85 |
| [14] | *p*-*tert*-Butylbenzoic acid | nd～210<br>16/18 | 18 | | | nd～24<br>14/15 | 0.21 |
| [15] | 5-(Propylthio)-1*H*-benzimidazol-2-yl carbamic acid methyl ester<br>(synonym: Albendazole) and its metabolites | | | | | | |
| | [15-1] 5-(Propylthio)-1*H*-benzimidazol-2-yl carbamic acid methyl ester<br>(synonym: Albendazole) | nd<br>0/18 | 1.1 | | | | |
| | [15-2] 5-(Propylsulfonyl)-1*H*-benzimidazol-2-yl amine<br>(synonym: Albendazole-2-amino sulfone) | nd<br>0/18 | 10 | | | | |
| | [15-3] 5-(Propylsulfinyl)-1*H*-benzimidazol-2-yl carbamic acid methyl ester<br>(synonym: Albendazole sulfoxide) | nd<br>0/18 | 6.8 | | | | |
| | [15-4] 5-(Propylsulfonyl)-1*H*-benzimidazol-2-yl carbamic acid methyl ester<br>(synonym: Albendazole sulfone) | nd<br>0/18 | 11 | | | | |
| [16] | 2-(*m*-Benzoylphenyl)propionic acid<br>(synonym: Ketoprofen) | nd～50<br>12/17 | 0.055 | | | | |
| [17] | Benzo[*a*]pyrene | nd～4.5<br>9/23 | 0.086 | 2.7～5,100<br>20/20 | 0.19 | | |
| [18] | (*E*)-5-Methoxy-4'-(trifluoromethyl)valerophenone *O*-(2-aminoethyl)oxime<br>(synonym: Fluvoxamine) | nd<br>0/17 | 34 | | | | |
| [19] | 2-Methoxy-5-methylaniline | | | | | nd<br>0/14 | 1.4 |

(Note 1) Detection frequency is based on the number of sites, 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. In sediment, wildlife and air, 3 samples were measured for a site, and the detection in more than one out of samples from a site can be defined as one detected site.

(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.

(Note 3) ☐ means the medium was not surveyed.

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