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Compilation of marine data for AE, AES, AS, DTDMAC, LAS

Sponsor ERASM

Contract

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Executive Summary

This report is a compilation and summary of marine (water and sediment) data on exposure and effects for five surfactant classes of compounds, AE, AES, AS, DTDMAC and LAS, commissioned by ERASM.

Data from the literature and industry sources for 47 biodegradation and 307 eco- toxicological studies are reported and summarised. A complete list of sources searched is given in Appendix 1. The data provided in the publications were assessed*, those that were found to be reliable and robust were included in this report. Supporting information was also provided to enable clear evalution of the end points.

Marine biodegradation studies for AE and LAS reported half lives in the range of 2-30 days and 5-45 days respectively. Data suggest that these half lives may be longer than quoted for freshwater. The freshwater half lives were in the range 0.2-1.0 days for AE and 0.04-10 days for LAS. No marine biodegradation studies were found for DTDMAC. Only four and three biodegradation studies for AES and AS was found respectively.

A wide variation in the number of published marine eco-toxicological studies was found for each of the surfactant classes. AS and LAS have been studied most, and AES and DTDMAC the least. Marine invertebrates are the most studied class of organism in acute toxicological assessments. Plants and fish are the least studied groups, particularly chronic studies. The typical marine L/EC50's ranged# from 0.2-50 mg/l for AE, 0.5-40 mg/l for AES, 0.4 -160 mg/l for AS, 0.2-36 mg/l for DTDMAC and 0.5-100 mg/l for LAS. Where it was possible to compare eco-toxicology values, marine data ranges generally fell within typical freshwater data ranges.

Significant gaps in data were found in the marine eco-toxicology assessments for all surfactant classes. To enable a robust and reliable risk assessment of effects of the surfactants on the marine environment based upon marine data, the gaps in the data identified in this report will need to be filled. The following types of studies are considered necessary to address the gap in knowledge: AE; Bio-concentration, acute plant, algae & fish and all types of chronic toxicity testing, AES & DTDMAC; All types of marine studies and tests, AS; Biodegradation, bio-concentration, environmental monitoring, acute plant & algae toxicity, and all chronic toxicity studies and tests: LAS; Bio-concentration, acute plant & algae toxicity, and chronic plant & fish toxicity testing.

* The data was reviewed for quality and reliability by assessing the methodology, reproducibility, overall completeness and publication crediblity.

The ranges are for each class of surfactant and include various chain lengths and ethoxylation.

Introduction

The ERASM (Environmental Risk Assessment and Management) organisation (AISE (Association Internationale de la Savonnerie, de la Détergence et des Produits d'Entretien) and CESIO (Comité Européen des Agents de Surface et de leurs Intermédiaires Organiques) commissioned a compilation and summary of marine (water and sediment) data on exposure and effects data for a number of surfactant compounds.

The classes of surfactants identified for study are:

AE	Alcohol Ethoxylates
AES	Alcohol Ethoxysulphates
AS	Alkyl Sulphates
DTDMAC	Ditalow Dimethyl Ammonium Chloride
LAS	Linear Alkylbenzene Sulphonate

DTDMAC is no longer used commercially. In addition the esterquats, triethanolamine ester quat**.** (TEAQ), Diethyl Ester Dimethyl Ammonium Chloride (DEEDMAC) and Hydroxyethyl quat. (HEQ) were screened for marine data, but nothing was found.

Data has been collected from the literature and from industry sources (internal, CEFIC LRI and ECETOC reports, ERASM MonitoringBase Surfactants). The search strategy and list of the databases searched is given in Appendix 1.

Background

The compilation of exposure and effects data for many surfactants by the HERA Initiative was restricted to freshwater studies. To investigate the extent and quality of available data from marine studies ERASM has commissioned this report.

The EU REACH Regulation requires the inclusion of a risk assessment for the marine environment (for chemicals that require a Chemical Safety Assessment (CSA)). This risk assessment can be based either on an extrapolation of freshwater data, or on data specific for marine species, where available. Marine data could also be used in a weight-of-evidence approach. Also, marine ecotoxicity data are considered a suitable substituent for missing freshwater data for chemicals in the EU CLP Regulation dealing with Classification & Labelling of chemicals and mixtures (ref. CLP regulation, draft July 2008), or in REACH PBT assessments. This report provides information on:

- Exposure characterisation
    i. Degradation in the marine environment
    ii. Bioconcentration
    iii. Monitoring data
- Effects characterisation
    i. Aquatic toxicity, acute and chronic, to marine organisms
    ii. Toxicity, acute and chronic, to marine sediment dwelling organisms

- Assessment of existing data, data gaps and requirements to carry out a marine risk assessment.
- Preliminary assessment of any observed differences between the marine data and freshwater data,

For the surfactant classes AE, AES, AS, DTDMAC and LAS, CAS numbers for these substances are given in Appendix 1.

Environmental exposure assessment in the marine environment

Degradation

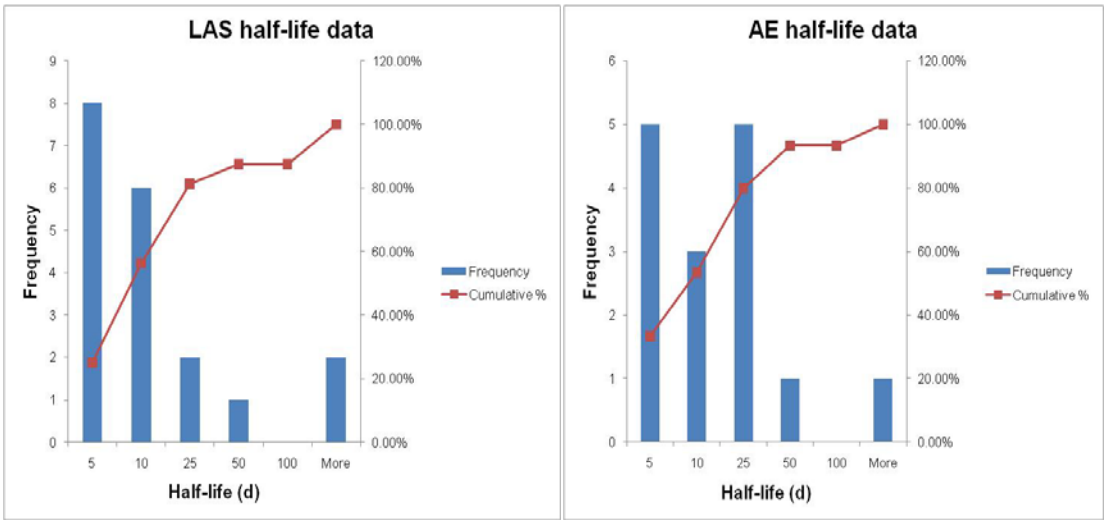
Evidence for the loss of material by abiotic or biotic degradation is important for the assessment of persistence in the environment. Data for the degradation of surfactants in the freshwater environment were collated during the HERA Project, but data for the marine environment have not been collated and summarised. ECETOC collated marine degradation data for general chemicals in 2009, providing a report (ECETOC, 2009) and a database in the form of a spreadsheet. Information on the degradation of surfactants has been summarised in this section of the report and recorded in more detail in Appendix 2.

Table 1 provides a summary of the degradation data in the marine environment obtained for the five study compounds; data has only been found for AE and LAS. Reported half-lives for the degradation of AE and LAS are plotted in Figure 1, and for both substances 80% of the data indicate a half-life of ≤25 days; The longest half-lives (>150 d) were for DOC die-away tests (OECD 301A) using coastal and open sea waters from the Netherlands. These three values were considerably higher than the range of values published from the other studies conducted under similar test conditions. Considering the ECETOC recomendations (20) of the reliability of half lives above 60 d and those that are close to the test duration, the published half lives of longer than 150 days for AE and LAS do not seem reliable and therefore have been excluded from the summary table. The full list of data is given in Appendix 2.

TABLE 1 Summary of marine degradation data.

Compound	Number of studies	Degradation: rate (d^{-1})	Degradation: half-life (d)
AE	15	0.02 - 0.34	2 - 30
AES	4	0.031 - 0.039	17.7 - 30
AS	3	-	0.26 - 18.8
DTDMAC	-	-	-
LAS	24	0.02 - 0.15	4.6 - 45 Outlier 0.001

FIGURE 1 Range of marine degradation half-life data for AE and LAS



Bioconcentration

Bio-concentration or bioaccumulation (BCF) is a measure of the build-up of a chemical in an aquatic organism that is exposed to the material either from the water or the sediment. There is a significant amount of freshwater BCF data, however marine data is virtually non-existent. The one study on bioaccumulation obtained from the database searches was:

AS[6] bioaccumulation in *Squalus acanthias,* spiny dogfish (Ref 27):
1 mg kg^{-1}, N injections, 2-144 hr – result accumulated

This work seems to be non-standard and does not give any "normal" endpoint that can be assessed.

Monitoring data

Marine monitoring data for these surfactants held in the "MonitoringBase Surfactants" database are summarised in Table 2.

TABLE 2 Summary of Monitoring Data.

Compound	Number of marine studies	Marine Data Sediment Concentration Range mg/kg
AE	20	0.0074 - 9.19
AES	0	-
AS	0	-
DTDMAC	10	0.0048 - >25.00
LAS	16	<0.0003 - 15.63

The database searches undertaken for this current work have not found any new monitoring data.

Environmental effects assessment

Many studies have tested the effects of AE, AES, AS, DTDMAC and LAS to a wide range of marine organisms. A total of 250 marine data sets are reported here. The data for AES and DTDMAC were limited to a few studies for each compound, but AE (26), LAS (67) and AS (45) had progressively more information, many with more than one end-point reported.
A wide range of tests are reported, but the majority report standard end-points like the LC50 or EC50 for acute studies and the NOEC for chronic studies. More unusual end-points are either not quantified (e.g. "mortality decreased") or difficult to assess in a summary document compared to the standard end-points; some of these data may, however, be relevant when assessing the effects of individual compounds in specific conditions.

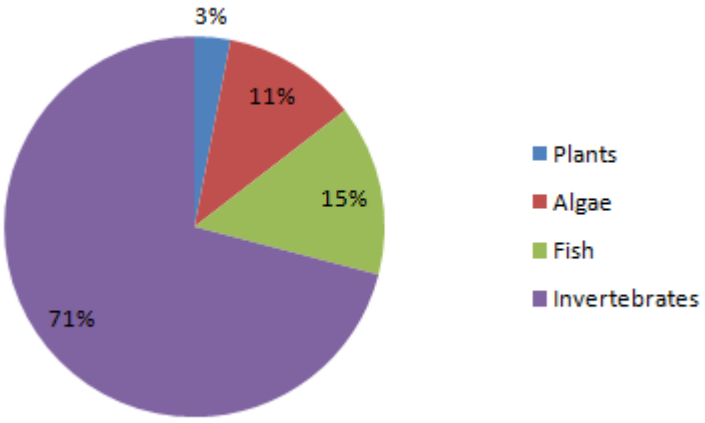
Acute and chronic toxicity to marine plants and organisms

To summarise the results the data have been split into acute and chronic toxicity tests and into four general classes of organism – plants, algae, invertebrates and fish. From the literature identified on toxicity of these five surfactants to marine species the range of species and tests can be summarised as follows:

Many of the studies reported multiple endpoints. 4 different plant species were tested, 29 algae, 88 invertebrates and 22 fish species.

Figure 2 shows the proportional of the published studies for each class of organism. Marine invertebrate surfactant studies are the most reported and plants the least.

FIGURE 2 Class of organism studied in toxicity tests for all surfactants



A summary of the acute and chronic data against substance and organism is given in Table 3; in compiling this table results showing extremely low toxicity compared to the bulk of the data have been discounted, but results showing unusually high toxicity compared to the main body of the data are highlighted. The full list of data is given in Appendix 3.

Acute and chronic toxicity to marine sediment dwelling organisms

Studies that assessed the impact of LAS on marine sediment dwelling organisms are listed in Appendix 3. Four studies were found and are included in the summary Table 3 (29), (57), (59) and (83). Acute and chronic toxicity studies that used sediment as dosing medium were not found for AE, AES, AS, or DTDMAC.

TABLE 3 Summary of toxicity data for all chainlength and ethoxylation numbers– all concentrations expressed as mg L^{-1} nominal, unless otherwise stated.

Compound		Acute toxicity	Number of Studies	Chronic toxicity#	Number of Studies
AE*	Algae		0	1 - 10 NOEC	1
	Invertebrates	48 hr LC50 0.71 – 50 96 hr LC50 0.22 – 50	36	0.5 - 1.5 NOEC	2
AES*	Algae	96 hr 4.1 - 27.7	4	-	0
	Invertebrates	48 hr 34.2 - 42.4	2	-	0
	Fish	0.48- 25	5	-	0
AS	Plant	96 hr EC50 1.75 - 10	4	5 d NOEC 1.5	4
	Algae	2 hr EC50 2.3 - 2.4 (photosynthesis)	4	-	0
	Invertebrates	24 hr L/EC50 0.8 - 154 48 hr L/EC50 0.36 - 165 96 hr LC50 0.72 - 30	87	7 d NOEC 1.6 - 4 10 d NOEC 6.3 - 10	6
	Fish	24 hr L/EC50 1.4 - 5.8 48 hr L/EC50 2.8 - 9 96 hr LC50 0.46 - 15.1	21	-	0
DTDMAC	Invertebrates	EC50 0.2 - 36	5	NOEC 0.075	2
	Fish	EC50 4.8	1	-	0
LAS	Algae	72 hr ErC50 46.2 +/- 20.9 72 hr EbC50 13.9 +/- 7.3	9	-	0
	Invertebrates	48 hr LC50 7.3 - >100 96 hr LC50 1.3 - 350 150 hr LC50 2.5	56	-	0
	Fish	48 hr LC50 3 - 5 96 hr LC50 0.39 - 22.5	15	-	0

* Data for AE and AES belong to different chainlengths details given in the Appendix 3.
# NOEC chronic studies only.

ASSESSMENT OF EXISTING DATA AND DATA GAPS

To summarise the gaps in the marine data the number of studies for each surfactant class and type of assessment is given in Table 4. Grey shading has been used in the Table 4 to show where no studies have been found.

TABLE 4 Summary of data gaps for each surfactant type–Number of studies or values published. Shaded texts indicate no data found.

	AE	AES	AS	DTDMAC	LAS	Total
Degradation	15	4	3	0	24	46
Bioconcentration	0	0	1	0	0	1
Monitoring	20	0	0	20	16	56
Acute Plant toxicity	0	1	4	0	2	7
Acute Algae toxicity	0	4	4	0	9	18
Acute Invertebrate toxicity	36	2	87	5	56	186
Acute fish toxicity	2	5	21	1	15	44
Chronic Plant toxicity	0	1	4	0	3	8
Chronic Algae toxicity	1	0	4	0	12	16
Chronic Invertebrate toxicity	2	0	6	2	11	21
Chronic fish toxicity	0	0	2	0	0	2
Total	76	18	137	28	148	

Figure 3 clearly shows a wide variation in the number of marine studies between the surfactant classes, where AS and LAS have been studied most, and AES and DTDMAC the least.

FIGURE 3 Number of published marine studies for each surfactant class

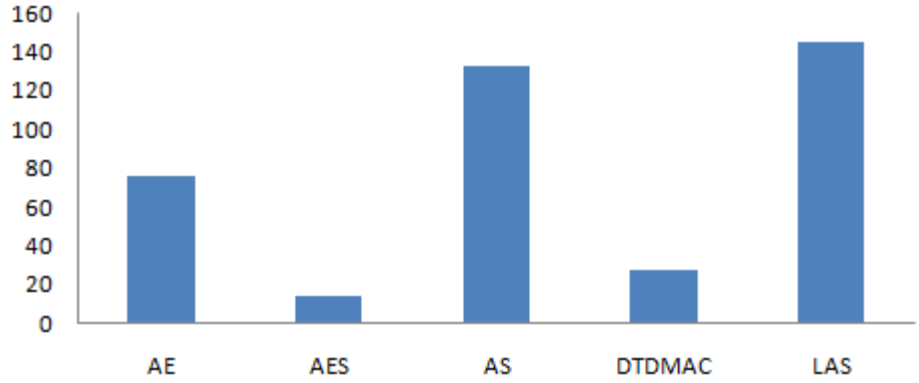
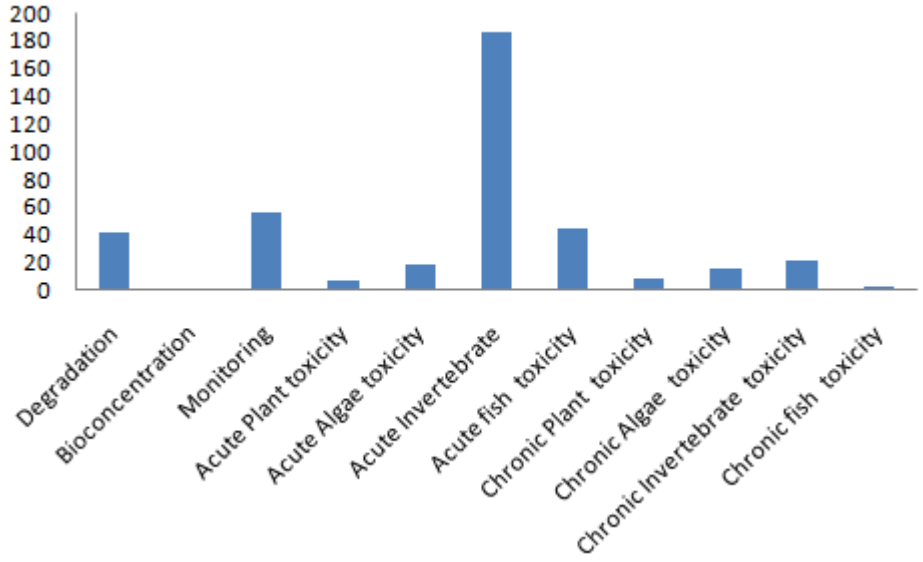


Figure 4 shows a wide variation in the number of marine studies between the different assessments and end points, where acute invertebrate studies account for the majority of the studies, and bioconcentration and chronic fish toxicity the least.

FIGURE 4 Number of published marine studies for each type of study



Overall there are substantial gaps in marine data for the following endpoints:

AE: Bio-concentration, acute plant, algae & fish and all types of chronic toxicity testing:

AES & DTDMAC: All types of marine studies and tests:

AS: Biodegradation, bio-concentration, environmental monitoring, acute plant & algae toxicity, and all chronic toxicity studies and tests:

LAS: Bio-concentration, acute plant & algae toxicity, and chronic plant & fish toxicity testing.

Based on these findings further research studies are needed to enable a robust and reliable risk assessment of effects the surfactants on the marine environment based upon marine data.

DIFFERENCES BETWEEN MARINE AND FRESHWATER DATA

To compare and evaluate the ranges of the marine studies produced in this report comparison is made to freshwater data in the HERA Risk Assessments, ERASM MonitoringBase, Brixham Laboratory Fate and Effects database, and published data reviews (110).

Degradation

Table 5 shows the comparison between the typical ranges of biodegradation half lives summarised from marine and freshwater studies. Broadly the half lives of AE and LAS are in the order of five to ten times higher in marine environments than freshwater. AS and AES have not been included in this comparison because of the limited marine data.

TABLE 5 Comparison of marine and freshwater bio degradation data

Compound	Marine Degradation: Half-life (d)	Typical Freshwater Degradation Half life (d)
AE	2 - 30	0.16 - 1.0
LAS	4.6 - 45	0.042 - 10

Occurrence in the environment

Table 6 shows the comparison between the typical ranges of LAS measured in sediments summarised from marine and freshwater studies. Broadly, LAS concentrations in marine sediments are found with in the lower end of the freshwater range of values. No comparative data could be found for AE or DTDMAC.

TABLE 6 Comparison of marine and freshwater sediment monitoring data

Compound	Number of marine studies	Marine Data Concentration Range	Typical Freshwater Data Concentration Range
LAS	16	<0.03 - 15.6 mg/kg sediment	0.7 - 174 mg/kg sediment

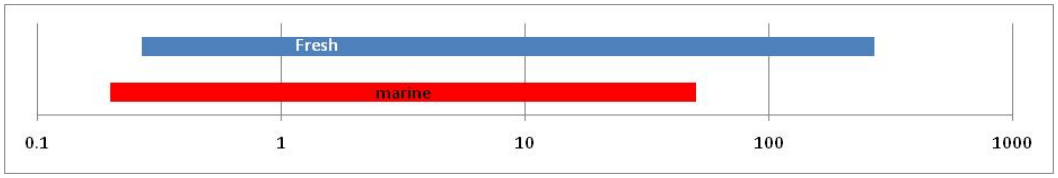
Acute and chronic toxicity to marine plants and organisms

Table 7 shows a comparison between the marine data identified in this report with typical ranges from freshwater studies. Comparison of the ranges are graphically represented below on logarithmic scaled bar graphs for each surfactant class where the red bar is the marine

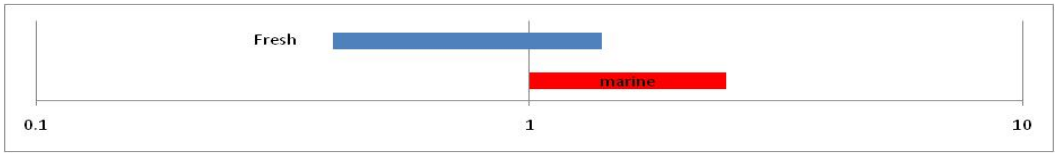
range and blue bar freshwater range. Overall the marine values fall within the range of freshwater values. After excluding the out lying values, the broad conclusions of the ranges of published freshwater and marine toxicity data are:

AE: Acute studies had a similar or overlapping Ecotox values:

AE Acute Invertebrates Data Range (mg/l)



AE Acute Fish Data Range (mg/l)

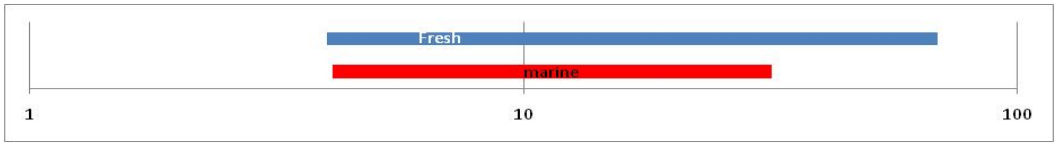


AE: The two Marine chronic invertebrate studies were lower than freshwater Ecotox values:

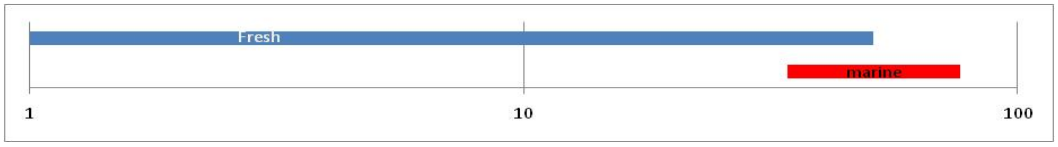
AE Chronic Invertebrates Data Range (mg/l)

AES: Marine algal and fish Ecotox values at the lower end and invertebrate ecotox values at the higher end of the freshwater range of values:

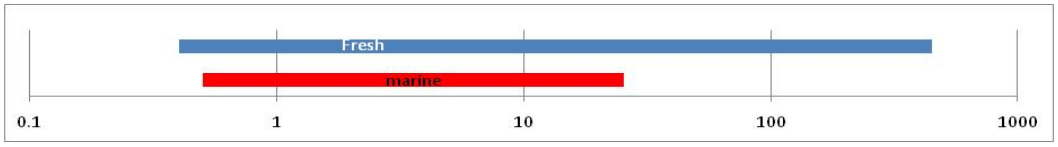
AES Acute Algae Data Range (mg/l)



AES Acute Invertebrate Data Range (mg/l)

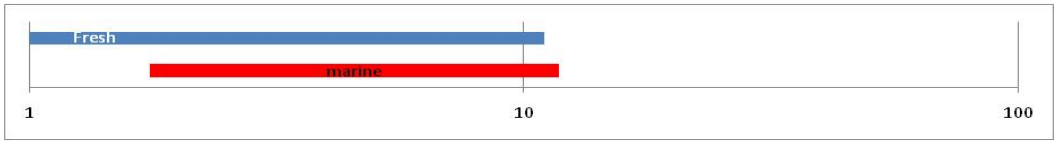


AES Acute Fish Data Range (mg/l)

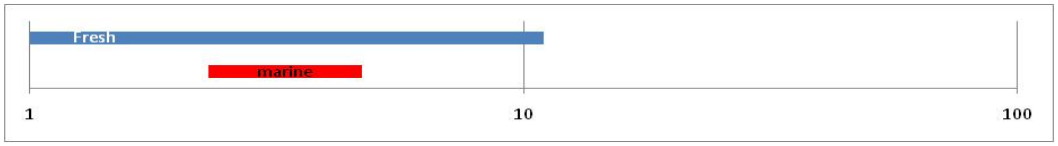


AS: Marine plant and algal Ecotox values similar ranges, invertebrates and fish ecotox values at lower end of freshwater range of values:

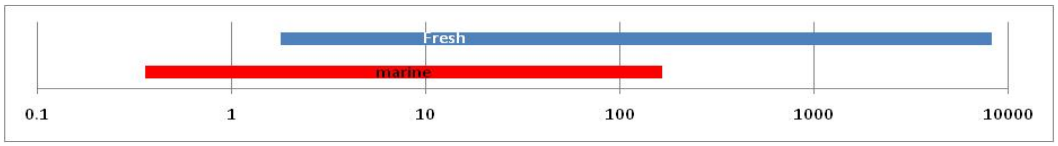
AS Acute Plant Data Range (mg/l)



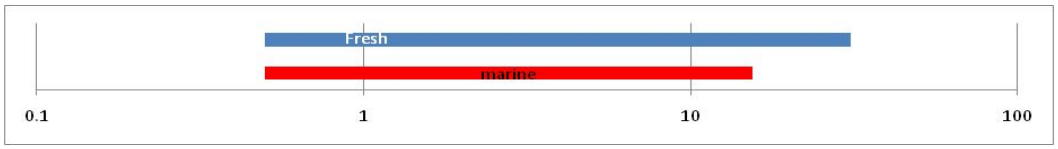
AS Acute Algae Data Range (mg/l)



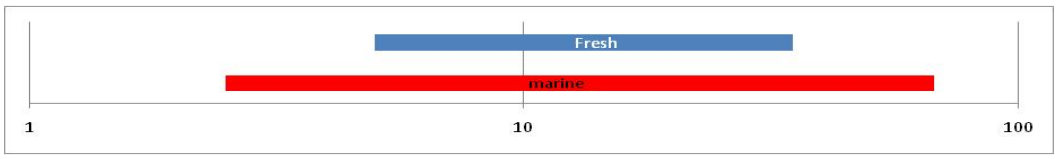
AS Acute Invertebrate Data Range (mg/l)



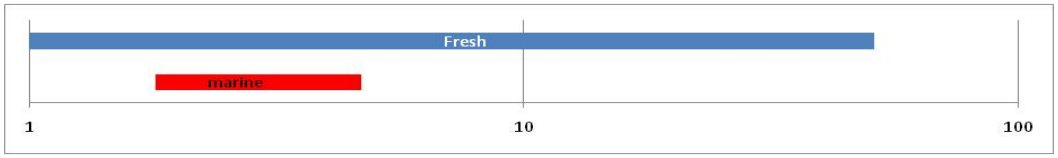
AS Acute Fish Data Range (mg/l)



AS Chronic Invertebrate Data Range (mg/)

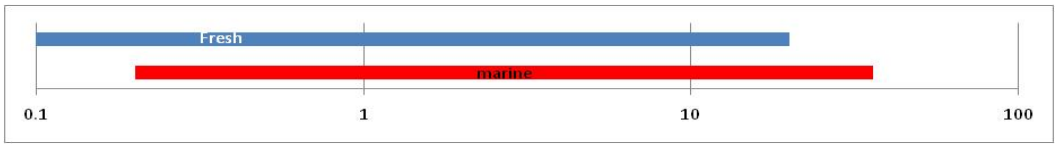


AS Chronic Fish Data Range (mg/l)



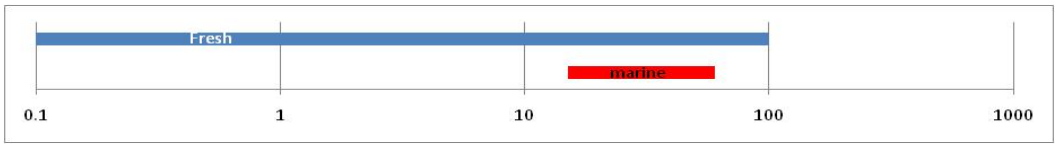
DTDMAC: the marine invertebrate data similar to freshwater range of values:

DTDMAC Acute Invertebrate Data Range (mg/l)



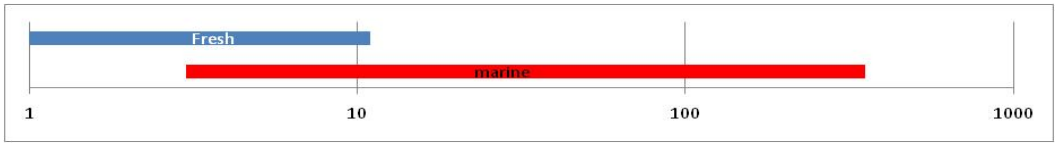
LAS: Marine algal Ecotox falls into freshwater data range of values:

LAS Acute Algae Data Range (mg/l)



LAS: Marine invertebrates Ecotox data at the higher end of freshwater acute range of values and below the chronic freshwater range:

LAS Acute Invertebrate Data Range (mg/l)



LAS Chronic Invertebrate Data Range (mg/l)

LAS: Marine fish Ecotox data similar and overlapping freshwater data range of values.

LAS Acute Fish Data Range (mg/l)

TABLE 7 Comparison of marine and freshwater acute and chronic toxicity data (L/EC50 and NOEC ranges are mg/l)

	Marine Acute Toxicity	Marine Chronic Toxicity	Typical Freshwater Acute Toxicity	Typical Freshwater Chronic Toxicity	Comparison Marine and freshwater
AE Invertebrates	0.2 - 50	0.5 - 1.5	0.29 - 270	5-50	lower end of the freshwater range
AE Fish	NOEC 1.0 - 1.5		NOEC 0.4 - 1.0		Similar range
AES Algae	4.1 - 27.7		4 - 65		Lower end of freshwater range
AES Invertebrates	34.2 - 42.4		1 - 50		Marine data at higher freshwater range
AES Fish	0.5 - 25		0.4 - 450		Marine data at lower end of Freshwater range
AS Plant	1.75 - 10	5 d NOEC 1.5	1 - 10	NOEC <1	Marine data similar range to freshwater
AS Algae	2.3 - 2.4		1 - 10	NOEC <1	Similar range
AS Invertebrates	0.36 - 165	2.5 - 6.5 7 d NOEC 1.6 - 4 10 d NOEC 6.3 - 10	1.8 - 8200	EC50 5-30	Marine data at lower end of freshwater range
AS Fish	0.5 - 15.0	1.8 - 2.9	0.5 - 30.5	1-50	Marine data at lower end of freshwater range
DTDMAC Invertebrates	0.2 - 36	NOEC 0.075	0.1 - 20	NOEC 0.2	Similar data range
LAS Algae	ErC50 46.2 EbC50 13.9 (Sediment)		0.1 - 100	0.1 - 100	Marine data falls within freshwater mid range

LAS Invertebrates	3 - 350	0.21 - 10	1 - 10	1 - 10	Marine data range extends to higher than freshwater range
LAS Fish	0.4 - 22.5		0.3 - 30		Similar data range

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APPENDIX 1 DATA SEARCHES & CAS NUMBERS

Data for this report was searched for by the CAS and chemical names from credible and trustworthy sources of literature. These keywords are provided below.

Since relatively few published marine studies were found, additional qualifying and supporting information was captured and summarised to enable the assessment of the quality and relevance of the data. A screening assessment was used that considered the methodology, reproductibility and completeness to give an overall credibility of the study. Only reliable publications were used. Unrelabile data was not reproduced for this report. The summary data was created from the complete listing of data in Appendix 2 and 3.

Data searches include the following sources and journals:

- Data from the surfactant industry, ERASM, HERA project
- Brixham Laboratory Fate and Effects database
- Information from on-line databases and projects (e.g. USEPA AQUIRE, BIOLOG, DATALOG, DIMAS, ECB, RISICO, ED-North, UGent ECOTOX etc.).
- STN Databases: HCAPLUS CHEMLIST CASREACT TOXCENTER IFICDB IFIPAT IFIUDB USPATOLD USPAT2 USPATFULL
- Dialog Databases: File Name 5: Biosis Previews(R)_1926-2009 6: NTIS_1964-2009/Oct W2 72: EMBASE_1993-2009 73: EMBASE_1974-2009 74: Int.Pharm.Abs_1970-2009 154: MEDLINE(R)_1990-2009 155: MEDLINE(R)_1950-2009 156: ToxFile_1965-2009 159: Cancerlit_1975-2002 162: Global Health_1983-2009 229: Drug Info. Fulltext_2002 304: THE MERCK INDEX ONLINE(SM) 2009 305: Analytical Abstracts_1980-2009/Aug W2 306: Pesticide Fact File_2003 336: RTECS_2009 377: Derwent Drug File_1983-2009 445: IMS R&D Focus_1991-2009 447: IMS Patent Focus_2009 52: TSCA Chemical Substances Inventory_2003 303: Chapman & Hall Chemical Database_1997 307: DOSE 317: Chemical Safety NewsBase_1981-2009 319: Chem Bus NewsBase_1984-2009 332: Material Safety Data Sheets__2009 333: Material Safety Summary Sheets_2009 334: Material Safety Label Data_2009 337: CHEMTOX (R) Online_1998 340: CLAIMS(R)/US Patent_1950-09 353: Ei EnCompassPat(TM)_1964-2009 354: Ei EnCompassLit(TM)_1965-2009 390: Beilstein Database - Facts_2008 398: Chemsearch_1957-2009 399: CA SEARCH(R)_1967-2009 50: CAB Abstracts_1972-2009 107: Adis R&D Insight_1986-2009 128: PHARMAPROJECTS_1980-2009 452: Drug Data Report_1992-2008_1992-2009 453: Drugs of the Future_1990-2009 464: USP Dictionary (USAN)_2005
- Information from CEFIC LRI projects
- Information from ECETOC Task Force and workshop reports
- The following journals: Quat. Toxicol. , Arch. Environ. Contam. Toxicol., Estuar. Cstl. Mar. Sci., Aquat. Toxicol, Arch. Environ. Contam. Toxicol., Archo. Oceanogr. Limnol. , Australas. J. Ecotoxicol., Bull. Environ. Contam. Toxicol., Bull. Environ.

Toxicol. Chemical, Bull. Mt. Desert Isl. Biol. Laboratory, C.H.R.I.S. - Chemical Hazard Response Information System. Calif. State Qual. Control Board, Sacramento Can. Tech. Rep. Fish. Aquat. Sci., Chemosphere., Chesapeake Science, Cienc. Mar DHI Water & Environment., ECETOC, Ecotoxicol. Environ. Saf, Environ. Int. Environ. Pollut., Environ. Sci. Technol, Environ. Toxicol. Chemical, Environ. Toxicol. Water Qual., Environ. Toxicol. Water Qual. Arch. Environ. Contam. Toxicol Environmental Biology Proc. Symp. Environ. Biol.., ERASM, Eur. J. Histochem., Free Radical Biol. & Med., Gidrobiol., Int. Explor. Sci.Mer Mediterr., Int. J. Sediment Res., International Biodeterioration and Biodegradation, J. Environ. Sci. Health J. Fish. Res. Board Can. , J. Jpn. Oil Chem. Soc., J. Phycol., J. Water Pollut. Control Fed.., Limnobios, Maff. Shellfish Inform. Leaflet n22, Mar. Biol (Berlin), Mar. Biol. Mar. Biol. Ctr. Res. Bulletin, Mar. Environ. Res., Mar. Environ. Toxicol. Environ. Chem. , Mar. Pollut. Bull, Marine Biology, Marine Environ, MonitoringBase. Database, Oceanogr. Med. , Proc. Natl. Shellfish Assoc., Regulatory Toxicology and Pharmacology, Rev. Int. Oceanog. Med., Rev. Trav. Inst. Peches Marit., Sci. Total Environ. , Spill Technol. Newsletter, Tech. Rep. No.45, State of Washington, Dep. of Fish, Tenside Surfactants Detergents, Tethys, Water Research.

A1.1 CAS NUMBERS for AE

Description of Substance and/or Synonims	CAS Number
Poly(oxy-1,2-ethanediyl), .alpha.-dodecyl-.omega.-hydroxy-	9002-92-0
Poly(oxy-1,2-ethanediyl), .alpha.-hexadecyl-.omega.-hydroxy-	9004-95-9
Poly(oxy-1,2-ethanediyl), .alpha.-9-octadecenyl-.omega.-hydroxy-, (Z)-	9004-98-2
Polyethyleneglycol monooctadecyl ethe, (EO=2) octadecylether, Poly(oxy-1,2-ethanediyl), .alpha.-octadecyl-.omega.-hydroxy-	9005-00-9
Polyethyleneglycol Isotridecyl Ether	9043-30-5
Alcohols, C10-13, ethoxylated	9057-32-3
Poly(oxy-1,2-ethanediyl), .alpha.-tridecyl-.omega.-hydroxy-	24938-91-8
Poly(oxy-1,2-ethanediyl), .alpha.-tridecyl-.omega.-hydroxy-	24938-91-8
Poly(oxy-1,2-ethanediyl), .alpha.-decyl-.omega.-hydroxy-	26183-52-8
Poly(oxy-1,2-ethanediyl), .alpha.-(2-ethylhexyl)-.omega.-hydroxy-	26468-86-0
Poly(oxy-1,2-ethanediyl), .alpha.-docosyl-.omega.-hydroxy-	26636-40-8
Poly(oxy-1,2-ethanediyl), .alpha.-eicosyl-.omega.-hydroxy-	26636-39-5
Poly(oxy-1,2-ethanediyl), .alpha.-(3,5,5-trimethylhexyl)-.omega.-hydroxy-	26912-60-7
Poly(oxy-1,2-ethanediyl), .alpha.-(1,1,3,3-tetramethylbutyl)-.omega.-hydroxy-	26912-49-2
Poly(oxy-1,2-ethanediyl), .alpha.-octyl-.omega.-hydroxy-	27252-75-1
Poly(oxy-1,2-ethanediyl), .alpha.-tetradecyl-.omega.-hydroxy-	27306-79-2
Glycols, polyethylene, mono(1-propylpentyl) ether	31514-36-0
Glycols, polyethylene, mono(1-ethylhexyl) ether	31497-05-9
Poly(oxy-1,2-ethanediyl), .alpha.-(1-methylheptyl)-.omega.-hydroxy-	31497-04-8
Poly(oxy-1,2-ethanediyl), .alpha.-(2-octyldodecyl)-.omega.-hydroxy-	32128-65-7
Poly(oxy-1,2-ethanediyl), .alpha.-undecyl-.omega.-hydroxy- C11EO10, C12-15EO5.5	34398-01-1
Poly(oxy-1,2-ethanediyl), .alpha.-nonyl-.omega.-hydroxy-	39587-22-9
Poly(oxy-1,2-ethanediyl), .alpha.-hydro-.omega.-hydroxy-, ether with 1,14-tetradecanediol	52228-33-8
Poly(oxy-1,2-ethanediyl), .alpha.-(2-hexyldecyl)-.omega.-hydroxy-	52609-19-5
Poly(oxy-1,2-ethanediyl), .alpha.-isononyl-.omega.-hydroxy-	56619-62-6
Poly(oxy-1,2-ethanediyl), .alpha.-isooctyl-.omega.-hydroxy-	61723-78-2

Description of Substance and/or Synonims	CAS Number
Polyethyleneglycol ether of tallow fatty alcohol	61791-28-4
Alcohols, sperm-oil, ethoxylated	61791-21-7
Alcohols, coco, ethoxylated, C12-14EO20	61791-13-7
Poly(oxy-1,2-ethanediyl), .alpha.-isodecyl-.omega.-hydroxy-, C9-11EO8	61827-42-7
Alcohols, C13-15, ethoxylated, C12-14EO7, C13-15EO11, C13-15EO3, C13-15EO7, C13-15EO7	64425-86-1
Alcohols, C12-13, ethoxylated, C12-13EO6.5	66455-14-9
Alcohols, C10-14, ethoxylated	66455-15-0
Alcohols, C10-12, ethoxylated	67254-71-1
Alcohols, C10-16, ethoxylated, C10-16EO7, C12-14EO3, 6, C12-14EO7	68002-97-1
Poly(oxy-1,2-ethanediyl), .alpha.-tert-nonyl-.omega.-hydroxy-	68035-42-7
Alcohols, C14-18, ethoxylated, C14-16EO5, C14-16EO7, C14-C18EO4	68154-96-1
Alcohols, C12-15, ethoxylated, C12-15EO11, C12-15EO7, C12-15EO7, C12-15EO7, C9-11EO5	68131-39-5
Alcohols, C16 and C18-unsatd., ethoxylated	68155-01-1
Polyethyleneglycol ethers of C12-C18 alcohols, C12-18EO7	68213-23-0
Polyethyleneglycol ethers of C12-C14 alcohols, C12-14EO7	68439-50-9
Alcohols, C11-13-branched, ethoxylated, C11-13EO3	68439-54-3
Polyethyleneglycol Monoalkyl(C16-C18) Ether, C16-18EO25	68439-49-6
Alcohols, C9-11, ethoxylated, C9-11EO4, C9-11EO6, C9-11EO8	68439-46-3
C13-15EO3	68439-45-2
Alcohols, C12-20, ethoxylated	68526-94-3
Alcohols, C12-16, ethoxylated	68551-12-2
Alcohols, C12-19, ethoxylated	68603-20-3
Alcohols, C8-20, ethoxylated	68954-94-9
Alcohols, C16-18 and C18-unsatd., ethoxylated	68920-66-1
Alcohols, C14-15, ethoxylated, C14-15EO5, C14-15EO8	68951-67-7
Poly(oxy-1,2-ethanediyl), .alpha.-tridecyl-.omega.-hydroxy-, branched, C10E05-20, C10EO2-5	69011-36-5
Alcohols, C8-22, ethoxylated	69013-19-0
Alcohols, C16-22, ethoxylated	69227-20-9

Description of Substance and/or Synonims	CAS Number
Alcohols, C8-10, ethoxylated	71060-57-6
Alcohols, C8-16, ethoxylated	71243-46-4
Alcohols, C13-18, ethoxylated	72905-87-4
Alcohols, ethoxylated	74432-13-6
Poly(oxy-1,2-ethanediyl), .alpha.-(1-propylhexyl)-.omega.-hydroxy-	77492-52-5
Poly(oxy-1,2-ethanediyl), .alpha.-(1-methyloctyl)-.omega.-hydroxy-	77492-49-0
Alcohols, C11-14-iso-, C13-rich, ethoxylated, C11-14EO7	78330-21-9
Alcohols, C9-11-iso-, C10-rich, ethoxylated	78330-20-8
Alcohols, C10-18, ethoxylated	85422-93-1
Poly(oxy-1,2-ethanediyl), .alpha.-(2,5,5-trimethylhexyl)-.omega.-hydroxy-	86871-90-1
Alcohols, C9-16, ethoxylated	97043-91-9
Alcohols, C14-22 and C14-22-unsatd., ethoxylated	100843-23-0
Alcohols, C12-20 and C12-20-unsatd., ethoxylated	106232-81-9
Alcohols, C12-15-branched and linear, ethoxylated	106232-83-1
Alcohols, C16-20, ethoxylated	106232-82-0
Alcohols, C18-22, ethoxylated	116810-32-3
Alcohols, C16-18-unsatd., ethoxylated	119415-06-4
Alcohols, C14-15-branched and linear, ethoxylated	120944-68-5
C14-15EO5	120944-68-5
Alcohols, C14-18 and C16-18-unsatd., ethoxylated	126646-02-4
Poly(oxy-1,2-ethanediyl), .alpha.-(11-methylnonadecyl)-.omega.-hydroxy-	146598-25-6
Alcohols, C9-15, ethoxylated	157627-88-8
Alcohols, C13-15-branched and linear, ethoxylated	157627-86-6
Alcohols, C8-18, ethoxylated	157707-43-2
Alcohols, C14-16, C14-15-rich, ethoxylated	157707-41-0
Alcohols, C12-22, ethoxylated	160305-84-0
Alcohols, C12-13-branched and linear, ethoxylated	160901-19-9
Alcohols, C11-14-branched and linear, ethoxylated	160901-20-2
Alcohols, C9-11-branched and linear, ethoxylated	160901-09-7
Alcohols, C10-16, C12-13-rich, ethoxylated	161025-22-5
Alcohols, C12-16, C12-15-rich, ethoxylated	161025-21-4

Description of Substance and/or Synonims	CAS Number
Alcohols, C16-20-branched, ethoxylated	161133-70-6
Alcohols, C12-16-branched, ethoxylated	161133-69-3
Alcohols, C9-11-branched, ethoxylated	169107-21-5
Alcohols, C11-15, ethoxylated	173244-48-0
Poly(oxy-1,2-ethanediyl), .alpha.-(dimethylhexyl)-.omega.-hydroxy-	183259-65-6

A1.2 CAS NUMBERS for AES

CAS Number	CAS Description
27028-82-6	Ethanol, 2,2',2"-nitrilotris-, compd. with a-sulfo-w-(dodecyloxy)poly(oxy-1,2-ethanediyl) (1:1)
54116-08-4	Poly(oxy-1,2-ethanediyl), a-sulfo-w-tridecyloxy)-, sodium salt
67762-19-0	Poly(oxy-1,2-ethanediyl), a-sulfo-w-hydroxy-, C10-16-alkyl ethers, ammonium salts
68037-05-8	Poly(oxy-1,2-ethanediyl), a-sulfo-w-hydroxy-, C6-10-alkyl ethers, ammonium salts
68037-06-9	Poly(oxy-1,2-ethanediyl), a-sulfo-w-hydroxy-, C6-10-alkyl ethers
68540-47-6	Ethanol, 2,2',2"-nitrilotris-, compd. with a-sulfo-w-(tetradecyloxy)poly(oxy-1,2-ethanediyl) (1:1)
68585-34-2	Poly(oxy-1,2-ethanediyl), a-sulfo-w-hydroxy-, C10-16-alkyl ethers, sodium salts
68585-40-0	Poly(oxy-1,2-ethanediyl), a-sulfo-w-hydroxy-, C16-18-alkyl ethers, sodium salts
68891-38-3	Poly(oxy-1,2-ethanediyl), a-sulfo-w-hydroxy-, C12-14-alkyl ethers, sodium salts
96130-61-9	Poly(oxy-1,2-ethanediyl), a-sulfo-w-hydroxy-, C9-11-alkyl ethers, sodium salts
105859-96-9	Ethanol, 2,2',2"-nitrilotris-, compds. with polyethylene glycol hydrogen sulfate C11-15-sec-alkyl ether ammonium salts
125301-92-0	Poly(oxy-1,2-ethanediyl), a-sulfo-w-hydroxy-, C12-15-alkyl ethers, sodium salts
125304-06-5	Ethanol, 2,2',2"-nitrilotris-, compds. with polyethylene glycol hydrogen sulfate C16-18-alkyl ether
129783-23-9	Ethanol, 2,2'-iminobis-, compds. with polyethylene glycol hydrogen sulfate C12-15-alkyl ethers
157627-92-4	Alcohols, C10-16, ethoxylated, sulfates, mono(hydroxyethyl)ammonium salts (>1 <2.5 mol EO)
157707-82-9	Alcohols, C14-16, ethoxylated, sulfates, sodium salts (>1 <2.5 mol EO)
162201-45-8	Ethanol, 2-amino-, compds. with polyethylene glycol hydrogen sulfate C12-15-alkyl ethers
174450-50-1	Alcohol, C12-14, ethoxylated, sulfates, triisopropanolamine salts

102783-14-2	Poly(oxy-1,2-ethanediyl), a-sulfo-w-hydroxy-, C10-18-alkyl ethers, sodium salts
9004-82-4	Sodium lauryl ether sulfate
25231-22-5	Poly(oxy-1,2-ethanediyl), .alpha.-[(tridecyloxy)sulfonyl]-.omega.-hydroxy-, sodium salt
34431-25-9	Polyethylene glycol octyl ether sulfate, sodium salt
52286-19-8	Polyethylene glycol decyl ether sulfate, ammonium salt
67762-21-4	Poly(oxy-1,2-ethanediyl), .alpha.-sulfo-.omega.-hydroxy-, C10-16-alkyl ethers, magnesium salts
68081-91-4	Poly(oxy-1,2-ethanediyl), .alpha.-sulfo-.omega.-hydroxy-, C12-18-alkyl ethers, sodium salts
68184-04-3	2-Aminoethanol compd. with .alpha.-sulfo-.omega.-(dodecyloxy)poly(oxy-1,2-ethanediyl) (1:1)
68610-22-0	Poly(oxy-1,2-ethanediyl), .alpha.-sulfo-.omega.-hydroxy-, C12-18-alkyl ethers, ammonium salts
68891-29-2	Poly(oxy-1,2-ethanediyl), .alpha.-sulfo-.omega.-hydroxy-, C8-10-alkyl ethers, ammonium salts
68891-30-5	Poly(oxy-1,2-ethanediyl), .alpha.-sulfo-.omega.-hydroxy-, C11-15-branched alkyl ethers, ammonium salts
73665-22-2	Poly(oxy-1,2-ethanediyl), .alpha.-sulfo-.omega.-hydroxy-, C6-10-alkyl ethers, sodium salts
157627-95-7	Poly(1,2-ethanediyl), .alpha.-sulfo-.omega.-hydroxy-C16-18 and C18 unsaturated alkyl ethers, sodium salts
160104-51-8	Poly(1,2-ethanediyl), .alpha.-sulfo-.omega.-hydroxy-C12-14 alkyl ethers, magnesium salts
160104-52-9	Poly(1,2-ethanediyl), .alpha.-sulfo-.omega.-hydroxy-C16-18 and C18 unsaturated alkyl ethers, magnesium salts
67762-19-0	Poly(oxy-1,2-ethanediyl), .alpha.-sulfo-.omega.-hydroxy-, C10-16-alkyl ethers, ammonium salts
13150-00-0	Ethanol, 2-[2-[2-(dodecyloxy)ethoxy]ethoxy]-, hydrogen sulfate, sodium salt
32612-48-9	Poly(oxy-1,2-ethanediyl), .alpha.-sulfo-.omega.-(dodecyloxy)-, ammonium salt

A1.3 CAS NUMBERS for AS

CAS Number	CAS Description
139-96-8	Sulfuric acid, monododecyl ester, compd. w/ 2,2',2"-nitrilotriethanol (1:1)
142-31-4	sodium octyl sulphate
142-87-0	sodium decyl sulphate
151-21-3	Sulfuric acid, monododecyl ester sodium salt
1120-01-0	1-Hexadecanol, hydrogen sulfate, sodium salt
1120-04-3	Sulfuric acid, monooctadecyl ester, sodium salt
1191-50-0	1-Tetradecanol, hydrogen sulfate, sodium salt
2235-54-3	Sulfuric acid, monododecyl ester, ammonium salts
68081-96-9	Sulfuric acid, mono-C10-16-alkyl esters, ammonium salts
68081-98-1	Sulfuric acid, mono-C14-18-alkyl esters, sodium salts
68130-43-8	C8-18 alkyl sulfate, sodium salt
68140-10-3	Sulfuric acid, monotallow alkyl esters, sodium salts
68412-83-9	Sulfuric acid, mono-C8-30-alkyl esters, compds. with triethanolamine
68585-47-7	Sulfuric acid, mono-C10-16-alkyl esters, sodium salts
68611-55-2	Sulfuric acid, mono-C10-16-alkyl esters
68890-70-0	C12-15 alkyl sulfate, sodium salt
68955-19-1	Sulfuric acid, mono-C12-18-alkyl esters, sodium salts
68955-20-4	C16-18 alkyl sulfate, sodium salt
73296-89-6	C12-16 alkyl sulfate, sodium salt
85338-42-7	Sulfuric acid, mono-C8-10-alkyl esters, sodium salts
85586-07-8	C12-14 alkyl sulfate, sodium salt
85586-38-5	Sulfuric acid, mono-C8-18-alkyl esters, magnesium salts, compds. with triethanolamine
85665-45-8	Sulfuric acid, mono-C8-14-alkyl esters, compds. with triethanolamine
85681-68-1	Sulfuric acid, mono(C14-18 and C16-18-unsatd. alkyl) esters, sodium salts
86014-79-1	Sulfuric acid, mono-C13-15-alkyl esters, sodium salts
90583-10-1	Sulfuric acid, mono-C8-14-alkyl esters, ammonium salts
90583-12-3	Sulfuric acid, mono-C12-16-alkyl esters, ammonium salts
90583-13-4	Sulfuric acid, mono-C12-18-alkyl esters, ammonium salts
90583-16-7	Sulfuric acid, mono-C12-14-alkyl esters, compds. with ethanolamine
90583-18-9	Sulfuric acid, mono-C12-14-alkyl esters, compds. with triethanolamine
90583-19-0	Sulfuric acid, mono-C8-14-alkyl esters, lithium salts
90583-23-6	Sulfuric acid, mono-C12-14-alkyl esters, magnesium salts
90583-27-0	Sulfuric acid, mono-C8-16-alkyl esters, sodium salts
90583-31-6	Sulfuric acid, mono(C14-18 and C18-unsatd. alkyl) esters, sodium salts
91648-54-3	Sulfuric acid, mono-C14-C16-alkyl esters, sodium salts
91783-23-2	Sulfuric acid, mono-C12-C13-alkyl esters, sodium salts
92797-61-0	Sulfuric acid, mono(C13-15-branched and linear alkyl) esters, sodium salts
96690-75-4	Sulfuric acid, mono-C12-14-alkyl esters, ammonium salts, compds. with triethanolamine
117875-77-1	Sulfuric acid, mono-C10-16-alkyl esters, compds. with triethanolamine

A1.4 CAS NUMBERS FOR DTDMAC

68783-78-8
74967-89-8

A1.5 CAS NUMBERS for ESTERQUATS

CAS No.	Substance name
TEAQ	
91995-81-2	Fatty acids, C_{10-20} and C_{16-18}-unsatd., reaction products with triethanolamine, di-Me sulfate-quaternized
93334-15-7	Fatty acids, tallow, reaction product with triethanolamine, diMe sulfate-quaternized
91032-11-0	Fatty acids, C_{12-20}, reaction products with triethanolamine, di-Me sulphate-quaternized
94095-35-9	9-octadecenoic acid (Z), reaction products with triethanolamine, di-Me sulphate-quaternized
85408-12-4	Octadecenoic acid, reaction products with triethanolamine, di-Me sulphate-quaternized
DEEDMAC	
67846-68-8	Dimethylbis[2-[(1-oxooctadecyl)oxy]ethyl]ammonium chloride
97158-31-1	Dimethylbis[2-[(1-oxohexadecyl)oxy]ethyl]ammonium chloride
HEQ	
19467-38-0	(Z)-2-hydroxy-3-[(1-oxo-9-octadecenyl)oxy]propyltrimethylammonium chloride

A1.6 CAS NUMBERS for LAS

CAS No.	EINECS No.	NAME
68411-30-3	270-115-0	Benzenesulphonic acid, C_{10-13} alkyl derivs., sodium salts
1322-98-1	215-347-5	Sodium decylbenzenesulphonate
25155-30-0	246-680-4	Benzenedodecylsulfonic acid, sodium salt
90194-45-9	290-656-6	Benzenesulphonic acid, mono-C_{10-13} alkyl derivs., sodium salt
85117-50-6	285-600-2	Benzenesulphonic acid, mono-C_{10-14} alkyl derivs., sodium salt

APPENDIX 2 MARINE DEGRADATION DATA - DETAIL

All concentrations expressed as mg L^{-1} nominal, unless otherwise stated.

Compound (Ref)	Inoculum source	Test duration & guideline	Endpoint	Substrate concentration (mg L^{-1})	Degradation: Rate (d^{-1}) Half-life (d) Lag (d) Mineralisation (%)
AE (101)	Estuarine, Escamba Bay	30 d	$^{14}CO_2$	0.0012	0.10 6.9 - 74.5

AE (101)	Estuarine, Escamba Bay	30 d	$^{14}CO_2$	0.00042	0.12 5.8 - 84.4
AE (101)	Estuarine, Escamba Bay, salinity 28 ppt	30 d	$^{14}CO_2$	0.068	0.22 3.1 - 86.3
AE (101)	Estuarine, Escamba Bay	30 d	$^{14}CO_2$	0.006	0.34 2 - 87.2
AE (101)	Estuarine, Escamba Bay	30 d	$^{14}CO_2$	0.00085	0.33 2.1 - 79.3
AE (47)	Estuarine, Escamba Bay	28 d	$^{14}CO_2$	0.0004-0.03	0.29 +/- 0.08 2.4 - -
AE (47)	Estuarine, Escamba Bay	28 d	$^{14}CO_2$	0.00003-0.00013	0.13 +/- 0.05 5.3 - -
AE (33)	Noordwijk 70 (NL), natural open sea water, salinity 35.2 ppt, aged 1 week	Closed bottle test (OECD 301D)	Oxygen uptake	3.76 COD	0.06 13 0 52
AE (33)	Noordwijk 70 (NL), natural open sea water, salinity 35.2 ppt, aged 1 week	DOC die-away test (OECD 301A)	TOC removal	9.1 TOC	0.03 24.2 0 23

AE (33)	Jacobahaven, Wissekerke (NL), natural coastal sea water salinity: 33.6 ppt, aged 1 week	Closed bottle test (OECD 301D)	Oxygen uptake	3.8 COD	0.06 12 0 42% miner.
AE (33)	Jacobahaven, Wissekerke (NL), natural coastal sea water salinity: 33.6 ppt, aged 1 week	DOC die-away test (OECD 301A)	TOC removal	9.5 TOC	0.2 4.5 3 28
AE (33)	Noordwijk 70 (NL), natural open sea water, salinity 35.2 ppt, aged 1 week	Closed bottle test (OECD 301D)	Oxygen uptake	4 COD	0.03 27 0 29
AE (33)	Noordwijk 70 (NL), natural open sea water, salinity 35.2 ppt, aged 1 week	DOC die-away test (OECD 301A)	TOC removal	10.6 TOC	- >150 - 0
AE (33)	Jacobahaven, Wissekerke (NL), natural coastal sea water salinity: 33.6 ppt, aged 1 week	Closed bottle test (OECD 301D)	Oxygen uptake	4 COD	0.02 28 0 22
AE (33)	Jacobahaven, Wissekerke (NL), natural coastal sea water salinity: 33.6 ppt, aged 1 week	DOC die-away test (OECD 301A)	TOC removal	13 TOC	0.03 23 3 8
AES (104)	Coastal water from Ukishima mouth of R. Tama	Die away test	TOC removal	10.2 TOC	- 30 - 0

AS (104)	Ukishima mouth of R. Tama Coastal sea water	Die away test	TOC removal	11.0 TOC	- 13 - 0

Compound (Ref)	**Inoculum source**	**Test duration & guideline**	**Endpoint**	**Substrate concentration (mg L^{-1})**	**Degradation: Rate (d^{-1}) Half-life (d) Lag (d) Mineralisation (%)**
LAS (34)	Coastal	21 d Surface of test vessel was saturated with 100µl of LABs (33mg L^{-1}) before adding seawater			680 0.001 - -
LAS (90)	Estuarine – Krka River saline		Parent - %LAS disappearance at 23C (freshwater 85%, saline 100%, marine 40%)	1	0.136 5.1 0 -
LAS (90)	Estuarine – Krka River freshwater		Parent - %LAS disappearance at 14C (freshwater 98%, saline 30%, marine 30%)	1	0.15 4.62 2 -
LAS (102)	Coastal - Barcelona Beach	10 d	Parent	20	- 6-9 - -
LAS (89)	Calico Creek, Salinity 34 ppt	42 d	$^{14}CO_2$	0.02	<10% CO_2 evolution -

LAS (89)	Calico Creek	58 d	$^{14}CO_2$ 42.3% mineralisation	0.02	0.1 6.9 - -
LAS (89)	Calico Creek Estuarine water plus 1000 mg L^{-1} Calico Creek Sediment	42 d	$^{14}CO_2$ 60.4% mineralisation	0.02	0.1 6.9 - -
LAS (49)	Atlantic Ocean Seawater – inoculums Cadiz Bay SW	99%primary degradation after 500 hr at 10C	Disappearance of parent and formation of SPC intermediates	1	- 6.7 0 -
LAS (49)	Atlantic Ocean Seawater – inoculums Cadiz Bay SW	25C	Disappearance of parent and formation of SPC intermediates	1	- 0.3 - -
LAS (49)	Atlantic Ocean Seawater – inoculums Cadiz Bay SW	99%primary degradation after 500 hr at 10C	Disappearance of parent and formation of SPC intermediates	1	- 3.2 0 -
LAS (71)	Seawater from Bay of Cadiz	OPPTS 835.3160/USEPA, 1998 98% biodegradation after 38 d at 20C	Loss of LAS concenetrations and formation of SPC by HPLC	20	- 6.3 - -
LAS (33)	Noordwijk 70 (NL), natural open sea water, salinity 35.2 ppt, aged 1 week	Closed bottle test (OECD 301D)	Oxygen uptake	4.4 COD	0.03 21 0 36

LAS (33)	Noordwijk 70 (NL), natural open sea water, salinity 35.2 ppt, aged 1 week	DOC die-away test (OECD 301A)	TOC removal	8 TOC	- >150 - 0
LAS (33)	Jacobahaven, Wissekerke (NL), natural coastal sea water salinity: 33.6 ppt, aged 1 week	Closed bottle test (OECD 301D)	Oxygen uptake	4.4 COD	0.02 28 0 26
LAS (33)	Jacobahaven, Wissekerke (NL), natural coastal sea water salinity: 33.6 ppt, aged 1 week	DOC die-away test (OECD 301A)	TOC removal	7.9 TOC	- >150 - 0
LAS (78)	Coastal water from Ukishima mouth of Tama	Die away test	TOC removal	12.6 TOC	- 45 - 26
LAS (78)	Bay of Cadiz Estuarine water	Die away test	Parent disappearance	20	- 6-20 - 20-45
LAS (77)	Coastal	Die away test	Parent disappearance	20	5-8.5 - 10
LAS (77)	Coastal 16% salinity	Die away test	Parent disappearance	20	5 - 10

LAS (77)	Coastal 32 % salinity	Die away test	Parent disappearance	20	4 - 10
LAS (77)	Coastal 50 % salinity	Die away test	Parent disappearance	20	6 - 10
LAS (77)	Coastal 50 % salinity	Die away test	Parent disappearance	20	8 - 20
LAS (15)	Chesapeake Bay Coastal	4 d	Parent disappearance	10	6 -
LAS (58)	Cadiz Bay Sea water	70 d Colonized beads	$^{14}CO_2$	0.005-0.1	<5 <13%
6-C12 - linear alkylbenzene (28)	Coastal	21 d Surface of test vessel was saturated with 100µl of LABs (33mg L^{-1}) before adding seawater			150 0.0046 7 -
Linear alcohol ethoxy sulphate C16 E9 (101)	Estuarine, Escamba Bay	30 d	CO_2	0.140	0.039 17.7 - 82.4

Linear alcohol ethoxy sulphate C16 E9 (101)	Estuarine, Escamba Bay	30 d	CO_2	0.0136	0.031 22.3 - 96.7
Linear alcohol ethoxy sulphate C16 E9 (101)	Estuarine, Escamba Bay	30 d	CO_2	0.0014	0.032 21.6 - 92.4
Dodecyl sulphate (102)	Coastal - Barcelona Beach	10 d	Parent	20	- 0.26-0.34 - -
Sodium dodecyl sulphate (24)	Coastal	13-35 d	Parent diappearance by MBAS	25	- 6.7-18.8 7-14 -

APPENDIX 3 MARINE TOXICITY DATA - detail

In this appendix all concentrations expressed as mg L^{-1} nominal, unless otherwise stated.

M = Measured concentration
SW = Salt Water

A2.1 AE

Compound (Ref)	Species	Common name	Effect concentration	Endpoint	Notes
AE[1] (93)	*Capitella capitata*	Polychaete Worm	1.5 – 3.19 1.25 – 2.55	11 x 48 hr LC50 10 x 96 hr LC50	SW various temperatures 17-18 and 22-23 C
AE[1] (94)	*Scolelepis fulginosa*	Spionid Polchaete	3.19 2.53	48 hr LC50 96 hr LC50	SW temperature 17-18 C
AE[1] (38)	*Idotea balthica*	Aquatic Sowbug	1 – 2.5 1 – 2.5	48 hr LC50 96 hr LC50	SW 17 C
AE[1] (38)	*Sphaeroma serratum*	Aquatic Sowbug	10 - 25 10 - 25	48 hr LC50 96 hr LC50	SW 17 C
AE[2] (63)	*Crangon crangon*	Brown Shrimp	330 – 1000 100 - 330	48 hr LC50 96 hr LC50	SW 15 C
AE[3] (70)	*Americamysis bahia*	Mysid Shrimp	0.71	48 hr LC50	SW
AE[4] (93)	*Capitella capitata*	Polychaete Worm	9 – 14 8 – 12	12 x 48 hr LC50 12 x 96 hr LC50	SW various temperatures 17-18 and 22-23 C range of 12 determinations

Compound (Ref)	Species	Common name	Effect concentration	Endpoint	Notes
AE[4] (95)	*Capitella capitata*	Polychaete Worm	8.64 11.43	2 x 96 hr LC50 3 x 96 hr LC50	22 C 17 C SW range of 2 & 3 determinations
AE[4] (107)	*Elminius modestus*	Australian Barnacle (Nauplii)	113.3	2 x 0.5 hr EC50	Intoxication SW, 15 C
AE[4] (38)	*Idotea balthica*	Aquatic Sowbug	10 – 25 10 – 25	48 hr LC50 96 hr LC50	SW 17 C
AE[4] (40)	*Idotea balthica basteri*	Aquatic Sowbug	10	96 hr LC50	SW, 17 C
AE[4] (93)	*Scolelepis fulginosa*	Spionid Polchaete	12 - 18 10 - 14	12 x 48 hr LC50 12 x 96 hr LC50	SW various temperatures 17-18 and 22-23 C, range of 12 determinations
AE[4] (94)	*Scolelepis fulginosa*	Spionid Polchaete	16.08 12.68	2 x 48 hr LC50 2 x 96 hr LC50	SW temperature 17-18 C range of 2 determinations
AE[4] (95)	*Scolelepis fulginosa*	Spionid Polchaete	10.65 12.68	2 x 96 hr LC50 2 x 96 hr LC50	22 C 17 C SW range of 2 determinations
AE[4] (40)	*Sphaeroma serratum*	Aquatic Sowbug	25 - 50 25 - 50	48 hr LC50 96 hr LC50	SW 17 C
AE[4] (93)	*Capitella capitata*	Polychaete	9 – 14 8 – 12	6 x 48 hr LC50 6 x 96 hr LC50	SW various temperatures 17-18 and 22-23 C range of 6 determinations

Compound (Ref)	Species	Common name	Effect concentration	Endpoint	Notes
AE[4] (95)	*Capitella capitata*	Polychaete	8.64	96 hr LC50	SW, 22 C
AE[4] (107)	*Elminius modestus*	Australian Barnacle (stage Ii Nauplius)	0.00056 Mol	2 x 0.5 hr EC50	Immobilisation SW, 15 C range of 2 determinations
AE[4] (38)	*Idotea balthica*	Aquatic Sowbug	10 – 25 10 – 25	48 hr LC50 96 hr LC50	SW17 C
AE[4] (93)	*Scolelepis fulginosa*	Spionid Polchaete	12 - 18 10 - 14	6 x 48 hr LC50 6 x 96 hr LC50	SW various temperatures 17-18 and 22-23 C range of 6 determinations
AE[5] (26)	*Mytilus edulus*	Blue mussel	0.1-1 0.1-0.5 1 0.5-1.5	22-72 hr 46-72 hr 46 hr 152.2 d	Development Mortality Mortality Reproduction
AE[4] (19)	*Corophium volutator*	Mud shrimp	3.6	2 d LC50	Seawater only Test solutions renewed every 2 days
AE[4] (19)	*Corophium volutator*	Mud shrimp	1.8	4 d LC50	Seawater only Test solutions renewed every 2 days
AE[4] (19)	*Corophium volutator*	Mud shrimp	1.4	6 d LC50	Seawater only Test solutions renewed every 2 days
AE (26)	*Mylitus edulis*	Common mussel	0.1– 1.5 2.0	5 months NOEC 72 hr EC100	Spawning Fertilization

Compound (Ref)	Species	Common name	Effect concentration	Endpoint	Notes
AE (107)	*Mysidopsis bahia*	Mysid Shrimp	0.243	E(L)C50 (mg/l)	
AE (107)	*Mysidopsis bahia*	Mysid Shrimp	0.29	E(L)C50 (mg/l)	
AE (107)	*Crassostrea virgnica*	Oyster	0.47	E(L)C50 (mg/l)	
AE (107)	*Crassostrea virgnica*	Oyster	0.07	NOEC	
AE (107)	*Penaeus duorarum*	Pink Shrimp	1.1	E(L)C50 (mg/l)	
AE (107)	*Penaeus duorarum*	Pink Shrimp	1.2	E(L)C50 (mg/l)	
AE (107)	*Fundulus heterocyclus*	Saltwater Minnows	1	NOEC	
AE (107)	*Fundulus heterocyclus*	Saltwater Minnows	1.45	NOEC	
AE (107)	*Palaemonetes vulgaris*	Shrimp	13.11	E(L)C50 (mg/l)	
AE (107)	*Palaemonetes vulgaris*	Shrimp	0.5	NOEC	
AE (107)	*Callinoctes sapidus*	Bluecrab	31	E(L)C50 (mg/l)	
AE (107)	*Callinoctes sapidus*	Bluecrab	10	NOEC	
AE (107)	*Dunaliella*	Algae	MAC-5 = 1-10	NOEC	
AE (107)	*Crassostrea virgnica*	Oyster	0.22	E(L)C50 (mg/l)	

[1] CAS 0009002-92-0, alpha-dodecyl-psi-hydroxy-poly(oxy-1,2-ethanediyl)
[2] CAS 0009004-95-9, alpha-hexadecyl-psi-hydroxy-poly(oxy-1,2-ethanediyl)
[3] CAS 0024938-91-8, renex 36
[4] CAS 0026183-52-8, poly(oxy-1,2-ethanediyl),.alpha.-decyl-.omega.-hydroxy-
[5] CAS 0061791-28-4, alcohols, tallow, ethoxylated

A2.2 AES

Compound (Ref)	Species	Common name	Effect concentration	Endpoint	Notes
AES[1] (36)	*Laminaria hyperborea*	Cuvie tangleweed	100	24 hr, effect on cells	Decreased respiration rate
AES[1] (36)	*Laminaria hyperborea*	Cuvie tangleweed	10	28 d, effect on population	Decreased growth rate
AES[1] (90)	*Nannochloropsis gaditana*	Marine micro-algae	21.10 - 28.66	96 hr EC50	Growth inhibition
AES[1] (90)	*Isochrysis galbana*	Marine micro-algae	21.39 - 27.73	96 hr EC50	Growth inhibition
AES[1] (90)	*Chaetoceros gracilis*	Marine micro-algae	20.56 – 21.07	96 hr EC50	Growth inhibition
AES[1] (90)	*Dunaliella salina*	Marine micro-algae	4.09 – 4.93	96 hr EC50	Growth inhibition
AES[1] (90)	*Tetrasel chuii*	Marine micro-algae	20.46 – 24.55	96 hr EC50	Growth inhibition
AES[1] (90)	*Artemia franciscana*	Brine shrimp	34.15 – 42.45	48 hr LC50	STD USEPA mortality test
AES (109)	*Cyprinodon variegatus*	Sheepshead minnow	0.48	E(L)C50 (mg/l)	
AES (109)	*Penaeus duorarum*	Pink Shrimp	1000	E(L)C50 (mg/l)	
AES (109)	*Cyprinodon variegatus*	Sheepshead minnow	19	NOEC	
AES (109)	*Cyprinodon variegatus*	Sheepshead minnow	25	E(L)C50 (mg/l)	
AES (109)	*Cyprinodon variegatus*	Sheepshead minnow	2.3	E(L)C50 (mg/l)	
AES (109)	*Cyprinodon variegatus*	Sheepshead minnow	0.48	E(L)C50 (mg/l)	
AES (109)	*Crassostrea virgnica*	Oyster	9	E(L)C50 (mg/l)	

A2.3 AS

Compound (Ref)	Species	Common name	Effect concentration	Endpoint	Notes
AS[2] (107)	*Eliminius modestus*	Australian barnacle (stage II nauplius)	3970	0.5 hour EC50	Immobilisation
AS[3] (30)	*Ulva pertusa*	Green macroalga	5.35, M	5 day EC50	Spore production - Thalli
AS[3] (30)	*Ulva pertusa*	Green macroalga	1.5, M	5 day NOEC	Spore production - Thalli
AS[4] (107)	*Eliminius modestus*	Australian barnacle (stage II nauplius)	470	0.5 hour EC50	Immobilisation
AS[3] (107)	*Eliminius modestus*	Australian barnacle (stage II nauplius)	470	0.5 hour EC50	Immobilisation
AS[5] (93)	*Scolelepis fuliginosa*	Spionid polychaeta	30.4 30.58 30 27.39 27.19 25-30	48 hr LC50 48 hr LC50 48 hr LC50 96 hr LC50 96 hr LC50 96 hr LC50	Static tests
AS[5] (94)	*Scolelepis fuliginosa*	Spionid polychaeta	30.58 27.19	48 hr LC50 96 hr LC50	Static tests
AS[6] (51)	*Champia parvula*	Red algae	0.3	2 day IC50 static	Fertilisation
AS[6] (73)	*Dunaliella tertiolecta*	Green algae	50 15	2 hr EC50 72 hr EC50	β_galactosidase inhibition Population
AS[6] (84)	*Prorocentrum minimum*	Dinoflagellate	1.32	2 hr EC50	Photosynthesis (SW 20 ppt)
AS[6] (84)	*Pseudoisochrysis paradoxa*	Microflagellate	1.27	2 hr EC50	Photosynthesis (SW 20 ppt)
AS[6] (84)	*Skeletonema costatum*	Diatom	2.33	2 hr EC50	Photosynthesis (SW 20 ppt)

Compound (Ref)	Species	Common name	Effect concentration	Endpoint	Notes
AS[6] (34)	*Skeletonema costatum*	Diatom	2.4	96 hr EC50	Immobilisation (SW 30 ppt)
AS[6] (55)	*Skeletonema costatum*	Diatom	1.2, M 1.9, M	96 hr EC50 96 hr EC50	Population Population
AS[6] (69)	*Tetraselmis chuii*	Prasinophyte	30.2	96 hr IC50	Population growth rate
AS[6] (35)	*Ulva fasciata*	Sea Lettuce	1.75-4.29 1.25-2.5 1.25 1.25 1.25	3 x 96 hr EC50 3 x 96 hr LOEC 3 x 96 hr LOEC 3 x 96 hr LOEC 96 hr NOEC	Germination Germination Growth – length Population abundance Germination
AS[6] (63)	*Eichhornia crassipes*	Common water hyacinth	16 day renewal test at 25	Decreased	Mortality
AS[6] (12)	*Macrocystis pyrifera*	Giant kelp (young fronds)	5-10	4 day EC50	Photosynthesis
AS[6] (68)	*Macrocystis pyrifera*	Giant kelp (young blades)	1-10	Changes	Effect on photosynthesis
AS[6] (72)	*Artemia salina*	Brine shrimp, mixed instar 2-3	34.5 53.1 88.5 120	24 hr LC50, 30°C 24 hr LC50, 25°C 24 hr LC50, 20°C 24 hr LC50, 15°C	Lethality (SW 5 ppt)
AS[6] (72)	*Brachionus plicatilis*	Rotifer, non-ovigerous females	29.4 17.7 23.3 27.9	24 hr LC50, 10°C 24 hr LC50, 31°C 24 hr LC50, 24°C 24 hr LC50, 17°C	Lethality (SW 5 ppt)
AS[6] (72)	*Artemia salina*	Brine shrimp, mixed instar 2-3	7.2-154	11 x 24 hr LC50, 10-30°C	Lethality (50% SW and SW 20 ppt)
AS[6] (84)	*Brachionus plicatilis*	Neonate	5.42	24 hr LC50	SW 15 ppt

Compound (Ref)	Species	Common name	Effect concentration	Endpoint	Notes
AS[6] (1)	*Mysidopsis almyra*	Opossum shrimp	2	24 hr LC50	SW 20 ppt
AS[6] (1)	*Palaemonetes pugio*	Daggerblade Grass Shrimp	135 108 108	24 hr LC50 48 hr LC50 96 hr LC50	SW 15 ppt
AS[6] (98)	*Palaemonetes pugio*	Daggerblade Grass Shrimp. Non-gravid adults	66-162 52-162	17 x 48 hr LC50 17 x 96 hr LC50	SW 15 ppt
AS[6] (76)	*Artemia salina*	Brine shrimp	3.6	24 hr LC50	
AS[6] (31)	*Acanthomysis costata*	Mysid (3D)	2.6 2.51 >6.3 1.99 1.58	7 day LC50 7 day LOEC 7 day MATC 7 day MATC 7 day NOEC	SW 35 ppt Mortality Growth Mortality Mortality
AS[6] (67)	*Acartia lillgeborgi*	Calanoid copepod, adult	1.4 1.8 2.6	48 hr LC50	SW 33.5 ppt
AS[6] (34)	*Acartia tonsa*	Calanoid copepod, nauplii	0.12	96 hr EC50	Immobilisation SW 20 ppt
AS[6] (84)	*Acartia tonsa*	Calanoid copepod, nauplii	0.55, M	96 hr LC50	SW 10 ppt
AS[6] (17)	*Americamysis bahia*	Opossum shrimp (24-48 hr)	Survival affected	0.1-10 , 48 hr	Effect on mortality SW 20%
AS[6] (84)	*Americamysis bahia*	Opossum shrimp, adult	7.1, M 6.1, M	96 hr LC50 96 hr LC50	Oxygen 3.3 SW 20 ppt
AS[6] (62)	*Americamysis bahia*	Opossum shrimp, 7 d juvenile	9.3	7 d LC50	

Compound (Ref)	Species	Common name	Effect concentration	Endpoint	Notes
AS[6] (75)	*Americamysis bahia*	Opossum shrimp	9.88 8 >4 4 100% 100% decreased	96 hr LC50 7 d LOEC 7 d NOEC 7 d NOEC 96 hr %mort 96 hr %mort 7 d	Mortality Growth, weight Mortality 16 ppm 16 ppm 1-16 ppm, Repro fecundity
AS[6] (87)	*Anonyx nugax*	Amphipod, (23-42 mm, 3 size classes)	26	96 hr EC50	Immobilisation
AS[6] (10)	*Arbacia lixula*	Sea urchin	1.1 1.56	38 hr IC25 38 hr IC50	Developmental changes, whole organism SW 38 ppt
AS[6] (65)	*Arbacia punctulata*	Purple-spined sea urchin (sperm embryo)	0.4-3.53 <0.4-3.6	13xEC50, 1.33 hr 17xNOEC, 1.33 hr	Developmental changes SW 30 ppt
AS[6] (64)	*Arbacia punctulata*	Purple-spined sea urchin (sperm)	1.4-3.0	4xEC50 ~ 60 min	Reproduction SW 30 ppt
AS[6] (62)	*Arbacia punctulata*	Purple-spined sea urchin (sperm)	3.2	1.5 hr IC50	Fertilisation
AS[6] (53)	*Arenicola marina*	Lugworm polychaete worm	Gill epidermis damage 15.2	20 48 hr LC50	Histological changes
AS[6] (64)	*Artemia parthenogenetica*	Brine shrimp	12.2	48 hr LC50	SW 30 g L^{-1}
AS[6] (55)	*Artemia salina*	Brine Shrimp, nauplii	0.14 mM	24 hr IC50	Mortality
AS[6] (76)	*Artemia salina*	Brine Shrimp, nauplii	3.6 3.6	24 hr LC50 24 hr LC50	

Compound (Ref)	Species	Common name	Effect concentration	Endpoint	Notes
AS[6] (84)	*Artemia salina*	Brine Shrimp, mixed instar 2-3	7.2-154	25 x 24 hr LC50	SW 50, 35, 20, 5 ppt
AS[6] (50)	*Artemia salina*	Brine Shrimp	41.04	24 hr LC50	
AS[6] (16)	*Artemia salina*	Brine Shrimp, larvae	29.7	24 hr LC50	SW 35 ppt
AS[6] (22)	*Artemia sp.*	Brine shrimp, (II-III instar nauplii larvae)	43.6 73.4 93.8	1 hr EC50 1 hr EC50 1 hr EC50	SW 35 ppt SW 25 ppt SW 15 ppt Enzyme inhebition
AS[6] (14)	*Artemia sp.*	Brine shrimp	13 1.5	24 hr LC50 48 hr LC50	
AS[6] (104)	*Artemia sp.*	Brine shrimp, early 2nd instar larvae	>42 35->42	1 d LC50 2 d LC50	SW 29.2-30.7 ppt
AS[6] (22)	*Artemia sp.*	Brine shrimp, (II-III instar nauplii larvae)	30.5-71.8 19.1-41.8	6 x 24 hr LC50 6 x 48 hr LC50	SW 35, 25, 15 ppt
AS[6] (51)	*Artemia sp.*	Brine shrimp	33	48 hr LC50	
AS[6] (18)	*Artemia sp.*	Brine shrimp, (various age instar larvae)	44.2-77.4 13-33.9	4 x 6 hr LC50 120 x 24 hr LC50	SW 35 ppt
AS[6] (9)	*Artemia sp.*	Brine shrimp, larvae	3.72	48 hr LD50	SW 30 ppt
AS[6] (87)	*Boeckosimus edwardsi*	Amphipod, 1 yr, 6-15 mm	>40	96 hr EC50	Immobilisation SW 29.1-34.6 ppt
AS[6] (72)	*Brachionus plicatilis*	Rotifer, Non - Ovigerous Females	10.9-29.4	27x 24 hr LC50	SW 65, 45, 25, 5 ppt
AS[6] (84)	*Brachionus plicatilis*	Rotifer, neonate, 0.2 ug	4.42 5.42 2.58 4.47	24 hr LC50 24 hr LC50 24 hr NOEC 24 hr NOEC	SW 30 ppt SW 15 ppt SW 30 ppt SW 15 ppt

Compound (Ref)	Species	Common name	Effect concentration	Endpoint	Notes
AS[6] (91)	*Brachionus plicatilis*	Rotifer, neonate, 0.2 ug Non - Ovigerous Females	5.6 16.8	24 hr LC50 24 hr LC50	SW 15 ppt SW 65 ppt
AS[6] (8)	*Cancer magister*	Dungeness or edible crab, newly hatched larvae	8.6	48-168 hr EC50	Developmental changes SW 29 ppt
AS[6] (6)	*Cancer magister*	Dungeness or edible crab, larvae	8	48 hr LC50	
AS[6] (43)	*Chlamys asperrima*	Doughboy Scallop	1 0. 7 0.5	48 hr EC50 48 hr LOEC 48 hr NOEC	Developmental abnormalities SW 33 ppt
AS[6] (104)	*Copepoda*	Copepod subclass, adult	4.3-5.3 3.1-3.2	2 d LC50 4 d LC50	SW 29.2-30.7
AS[6] (7)	*Crassostrea gigas*	Pacific Oyster, Veliger Stage Larva	0.67-1.04 0.67-1.04 0.74-1.16	19 x 48 hr EC50 20 x 48 hr EC50 36 x 48 hr LC50	Abnormal growth Development SW 29 ppt
AS[6] (8)	*Crassostrea gigas*	Pacific Oyster, newly fertilised embryos	0.67-1.16	23 x 48 hr EC50	Developmental changes
AS[6] (11)	*Crassostrea gigas*	Pacific Oyster, larvae	2.6 1.8	48 hr EC50 48 hr EC50	Growth abnormalities
AS[6] (6)	*Crassostrea gigas*	Pacific Oyster, larvae	0.58-0.89	48 hr LC50	
AS[6] (8)	*Crassostrea gigas*	Pacific Oyster, newly hatched larvae	0.58-1.2 0.74-0.93 <0.6, 0.74-0.93	21 x 48 hr LC50 2 x 48 hr NOEC 2 x 48 hr NOEC	 Development Mortality
AS[6] (86)	*Echinometra lucunter*	Rock boring urchin, embryo <=1.5 hr post fertilisation	1.3 1.7	24 hr EC50 24 hr LOEC	Developmental changes SW 36 ppt

Compound (Ref)	Species	Common name	Effect concentration	Endpoint	Notes
AS[6] (84)	*Eurytemora affinis*	Calanoid copepod, nauplii	2.6, M	96 hr LC50	
AS[6] (10)	*Gammarus aequicauda*	Scud	5.46	48 hr EC50	Mortality
AS[6] (48)	*Gammarus palustris*	Gammarid amphipod	41.2	24 hr LC50	SW 15 ml L^{-1}
AS[6] (108)	*Geodia cydonium*	Sponge (sections)	Change in CTA precipitation of DNA & RNA Uptake of uridine < phenylalanine into acis-insolubel fractions unaffected	17 hr at 10 17 hr at 0.01 and 0.001	Effect on biochemistry
AS[6] (105)	*Homarus americanus*	American lobster, stage I larvae	3.5 0.72	48 hr LC50 96 hr LC50	
AS[6] (18)	*Homarus americanus*	American lobster, 4th stage larvae	13.5-25.5	96 hr LC50	SW 29.98-31.28 ppt
AS[6] (86)	*Lytechinus variegatus*	Sea urchin, embryo <=1.5 Hr post fertilisatoon	2.3 1.7	24 hr EC50 24 hr LOEC	Developmental changes
AS[6] (66)	*Lytechinus variegatus*	Sea urchin, embryo & sperm	3.52 1.96 1.94-3.61	24 hr EC50 24 hr EC50 7 x 1 hr EC50	Developmental changes Fertilisation SW 33.5 ppt
AS[6] (10)	*Microdeutopus gryllotalpa*	Amphipod	2.98	48 hr EC50	Mortality SW 38 ppt

Compound (Ref)	Species	Common name	Effect concentration	Endpoint	Notes
AS[6] (86)	*Montastraea faveolata*	Coral, embryo <= 1 hr post fertilisation	0.8 >4	24 hr EC50 24 hr EC50	<= 1 hr post fert. <= 20 hr post fert. Developmental changes SW 36 ppt
AS[6] (62)	*Mulinia lateralis*	Clam, embryo <2hr	5.8 8.2	48 hr EC50 48 hr EC50	SW 30 ppt SW 10 ppt Shell deposition
AS[6] (1)	*Mysidopsis almyra*	Opossum shrimp	2	24 hr LC50	

Compound (Ref)	Species	Common name	Effect concentration	Endpoint	Notes
AS[6] (45)	*Mysidopsis intii*	Pacific mysid	4.59	7 d LC50	2 d
			4.14	7 d LC50	0 d
			5.11	7 d LC50	6 d
			4.69	7 d LC50	<= 12 hr
			7.8	10 d LC50	15 d
				Growth	
			6.3	7 d LOEC	2 d
			2.51	7 d LOEC	0 d
			2.51	7 d LOEC	<=12 hr
			6.3	7 d LOEC	6 d
			3.97	7 d LOEC	6 d
			10	10 d LOEC	15 d
				Mortality	
			6.3	7 d LOEC	2 d
			3.97	7 d LOEC	0 d
			3.97	7 d LOEC	<=12 hr
			3.97	7 d LOEC	6 d
			6.3	7 d LOEC	2 d
			10	10 d LOEC	15 d
				Growth	
			4.99	7 d MATC	2 d
			1.99	7 d MATC	0 d
			4.99	7 d MATC	<=12 hr
			1.99	7 d MATC	6 d
			7.93	10 d MATC	15 d
				Mortality	
			4.99	7 d MATC	2 d
			3.16	7 d MATC	0 d
			3.16	7 d MATC	<=12 hr
			3.16	7 d MATC	6 d
			7.93	10 d MATC	15 d
				Repro.	
			4.99	7 d MATC	6 d
			>10	10 d MATC	15 d
				Growth	

Compound (Ref)	Species	Common name	Effect concentration	Endpoint	Notes
AS[6] (31)	*Mysidopsis intii*	Pacific mysid, 2 d	3.15-6.5 6.3 2.51->6.3 <1.58-4.99 3.97 3.97	7 x 7 d LC50 7 d LOEC 7 x 7 d MATC 7 x 7 d MATC 7 d NOEC 7 d NOEC	SW 34 ppt Growth Growth Mortality Growth Mortality
AS[6] (66)	*Mysidopsis juniae*	Shrimp	2.3 2.3 2.2	96 hr LC50 96 hr LC50 96 hr LC50	Adult 10 d 4 d SW 33.5 ppt
AS[6] (106)	*Mytilus galloprovincialis*	Mediterranean mussel	1.9-2.6	28 x 48 hr EC50	Developmental abnormalities – shell SW 34 ppt
AS[6] (41)	*Mytilus galloprovincialis*	Mediterranean mussel, commercial size	Cholesterol level dropped at 24 hr, rose again by 72 hr	72 hr, 100	Physiological effects
AS[6] (84)	*Neomysis americana*	Opossum shrimp, adult	8.8, M 5.7, M	96 hr LC50	SW 20 ppt
AS[6] (46)	*Nereis virens*	Polychaete worm	13.5	96 hr LC50	
AS[6] (87)	*Onisimus litoralis*	Amphipod, 1 yr, 7-13 mm	4-40	96 hr EC50	Immobilisation SW 29.1-34.6 ppt
AS[6] (81)	*Pagrus auratus*	Gilthead, juvenile, 6 mo, 12-14 cm, 30-40 g	Change Change in gill 6.1	96 hr, 5-15 96 hr, 5-15 96 hr LC50	Effect on biochemistry – gill Effect on histology SW 30%

Compound (Ref)	Species	Common name	Effect concentration	Endpoint	Notes
AS[6] (82)	*Pagrus auratus*	Gilthead, juvenile, 6 mo, 12-14 cm, 30-40 g	Change Change 6.1	0.5-250 hr, 5-15 0.5-250 hr, 5-15 96 hr LC50	Effect on biochemistry – intestinal tract Histological changes, intestinal tract SW 30 ppt
AS[6] (97&98)	*Palaemonetes pugio*	Daggerblade grass shrimp, non-gravid adults	66-165 52-162	17x 48 hr LC50 17x 96 hr LC50	SW 15 ppt
AS[6] (1)	*Palaemonetes pugio*	Daggerblade grass shrimp	135 108 108	24 hr LC50 48 hr LC50 96 hr LC50	SW 15 ppt
AS[6] (8)	*Pandalus platyceros*	Spot shrimp	8.9	48-168 hr EC50	Developmental changes SW 29 ppt
AS[6] (6)	*Pandalus platyceros*	Spot shrimp	5.8	48 hr LC50	
AS[6] (10)	*Pandalus platyceros*	Sea urchin, Echinoderm	1.01 1.49	28 hr IC25 28 hr IC50	Developmental changes, whole organism SW 38 ppt
AS[6] (4)	*Penaeus monodon*	Jumbo tiger prawn, post-larval, 28-30 d, 160-205 mg	Increased moulting 23.4 21.2 19 19.2 11.6 16.4	96 hr, 10-84 24 hr LC50 24 hr LC50 48 hr LC50 48 hr LC50 96 hr LC50 96 hr LC50	Effect on development
AS[6] (103)	*Penaeus semisulcatus*	Shrimp, juvenile 0.35-2.4 g	60-70	96 hr LC50	SW 40.5 ppt

Compound (Ref)	Species	Common name	Effect concentration	Endpoint	Notes
AS[6] (8)	*Protothaca staminea*	Littleneck clam, newly hatched larave	0.45 0.87	48 hr EC50 48 hr LC50	Developmental changes SW 29 ppt
AS[6] (6)	*Protothaca staminea*	Littleneck clam, laraval	0.58-0.89	48 hr LC50	
AS[6] (86)	*Pteria colymbus*	Winged pearl oyster, embryo, <=1 hr post fertilisation	0.5	24 hr LOEC	Developmental changes SW 36.6 ppt
AS[6] (10)	*Sphaerechinus granularis*	Echinoderm	1.06 1.65	38 hr IC25 38 hr IC50	Developmental changes, whole organism SW 36.8 ppt
AS[6] (86)	*Strombus gigas*	Pink or Queen Conch, embryo <=12 hr post emergee	>4 >4 2	24 hr EC50 24 hr LOEC 24 hr LOEC	Developmental changes Developmental changes Growth SW 36.8 ppt
AS[6] (67)	*Temora stylifera*	Calanoid copepod, adult	2.31-3	4 x 24 hr LC50	SW 33.5 ppt
AS[6] (8)	*Tresus capax*	Horse clam, newly fertilised embryos	0.39, 0.4 0.36, 0.89 0.52-0.73	2 x 48 hr EC50 2 x 48 hr LC50 48 hr NOEC	Developmental changes Mortality SW 30 ppt
AS[6] (8)	*Tresus nuttalli*	Horse clam, Pacific gaper, newly hatched larvae	0.71 0.63	48 hr EC50 48 hr LC50	Developmental changes SW 29 ppt
AS[6] (6)	*Tresus sp.*	Horse clam, larval	0.58-0.897	48 hr LC50	
AS[6] (5)		Plaice	5.8	24 hr LC50	

Compound (Ref)	Species	Common name	Effect concentration	Endpoint	Notes
AS[6] (32)	*Atherinops affinis*	Topsmelt, larva 22d, 19.1 mg, 13.2 mm	1.88	96 hr LC50	SW 20 ppt
AS[6] (86)	*Cephalopholis cruentata*	Grouper, embryo <2 hr, L128 cell stage	1.4	24 hr EC50	Hatchability SW 36.2 ppt
AS[6] (8)	*Clupea harengus*	Atlantic herring	0.38	48-168 hr EC50	Developmental changes SW 29 ppt
AS[6] (8)	*Cynoscion nebulosus*	Spotted seatrout, embryo <128 cell stage	1.9 2 2 >2 2	24 hr EC50 24 hr EC50 24 hr LOEC 24 hr LOEC 24 hr LOEC	Developmental changes Mortality Developmental changes Growth Mortality SW 35.9 ppt
AS[6] (1)	*Cyprinodon variegatus*	Sheepshead Minnow	10 9 9	24 hr LC50 48 hr LC50 96 hr LC50	SW 15 ppt
AS[6] (84)	*Cyprinodon variegatus*	Sheepshead Minnow, 25.8 mm, 0.7 g	4.1	96 hr LC50	SW 10 ppt
AS[6] (62)	*Cyprinodon variegatus*	Sheepshead Minnow, 24 hr larvae	2.9	7 d LC50	
AS[6] (86)	*Epinephelus adscensionis*	Rock hind, epinephlus adscensionis X/	3.2 2 4	24 hr EC50 24 hr LOEC 24 hr LOEC	Hatchability Hatchability Hatchability SW 36.2-36.5

Compound (Ref)	Species	Common name	Effect concentration	Endpoint	Notes
AS[6] (46)	*Fundulus heteroclitus*	Mummichog	5.6 5.6 5.6	24 hr LC50 48 hr LC50 96 hr LC50	
AS[6] (18)	*Fundulus heteroclitus*	Mummichog, adult 1.28 g	2.1-2.4	96 hr LC50	SW 29.98-31.28 ppt
AS[6] (1)	*Fundulus similis*	Longnose Killifish	4.7 4.7 4.5	24 hr LC50 48 hr LC50 96 hr LC50	
AS[6] (69)	*Gambusia holbrooki*	Eastern mosquitofish	15.1	96 hr LC50	
AS[6] (1)	*Menidia beryllina*	Inland silverside	2.8 2.8	48 hr LC50 96 hr LC50	SW 20 ppt
AS[6] (62)	*Menidia beryllina*	Inland silverside, 7 d larvae	1.8	7 d LC50	SW 5-32 ppt
AS[6] (32)	*Menidia beryllina*	Inland silverside, larva 28 d, 26.6 mg, 13.9 mm	1.48	96 hr LC50	
AS[6] (34)	*Menidia menidia*	Atlantic silverside	1.2	96 hr EC50	Immobilisation SW 29 ppt
AS[6] (84)	*Menidia menidia*	Atlantic silverside, 59.4 mm, 2.15 g	2.8, M	96 hr LC50	SW 36 ppt
AS[6] (86)	*Ocyurus chrysurus*	Yellow tail Snapper, embryo <2 hr, L128 cell stage	2.3 4	24 hr EC50 24 hr LOEC	Hatchability Hatchability SW 36 ppt
AS[6] (27)	*Squalus acanthias*	Spiny dogfish	0% mortality	72 hr, 10 mg kg^{-1}	Injection
AS (109)	*Cyprinodon variegatus*	Sheepshead minnow	0.46	E(L)C50 (mg/l)	34121

A2.3 DTDMAC

Compound (Ref)	Species	Common name	Effect concentration	Endpoint	Notes
DTDMAC[1] (22)	*Gymnodinium breve*	Dinoflagellate	12.5 66.67	48 hr mortality 48 hr population	SW, 25 C
DTDMAC (109)	*Penaeus duorarum*	Pink Shrimp	3.1	E(L)C50 (mg/l)	23609
DTDMAC (109)	*Penaeus duorarum*	Pink Shrimp	36	E(L)C50 (mg/l)	27192
DTDMAC (109)	*Mysidopsis bahia*	Mysid Shrimp	0.224	E(L)C50 (mg/l)	27192
DTDMAC (109)	*Cyprinodon variegatus*	Sheepshead minnow	4.8	E(L)C50 (mg/l)	27299
DTDMAC (109)	*Mysidopsis bahia*	Mysid Shrimp	0.42	E(L)C50 (mg/l)	27379
DTDMAC (109)	*Mysidopsis bahia*	Mysid Shrimp	0.075	NOEC	29094

[1] Quaternary ammonium compounds, dimethylditallow alkyl, CAS 0068783-78-8

A2.5 LAS

Compound (Ref)	Species	Common name	Effect concentration	Endpoint	Notes
LAS[7] (100)	*Carteria sp.* *Chlamydomonas sp.* *Chlorella sp.* *Chlorella stigmatophora* *Chlorococcum sp.* *Dunaliella euchlora* *Dunaliella primolecta*	Flagellate green algae Green algae Green algae Green algae Green algae Green algae Green algae	No growth in all cases	1-14 d and 12-14 d tests at 100	SW 22-27 ppt
LAS[7] (53)	*Gyrosigma spencerii*	Plankton	26.2	10 d EC50	Growth SW 34 ppt
LAS[7] (37)	*Laminaria cloustoni* *Laminaria hyperborea*	Tangleweed, zoospore	Decrease	1	Effect on Gametophyte Germination. Enriched SW
LAS[7] (36)	*Laminaria hyperborea*	Tangleweed, adult and zoospores	Respiration rate unaffected Decreased growth	24 hr, 1000 28 d, 1	Effect on physiology (cellular) Effect on population growth
LAS[7] (100)	*Nannochloris sp.*	Green algae	Decreased growth in both cases	1-14 d and 12-14 d, 1	SW 22-27 ppt
LAS[7] (53)	*Phaeodactylum tricornutum*	Alga	28.3 A.I.	10 d EC50	Growth SW 34 ppt

Compound (Ref)	Species	Common name	Effect concentration	Endpoint	Notes
LAS[7] (100)	*Phytoconis sp.*	Blue-green algae	Decreased growth in both cases	1-14 d and 12-14 d, 1000	SW 22-27 ppt
LAS[7] (100)	*Platymonas sp.*	Green flagellate	No growth in both cases	1-14 d and 12-14 d, 100	SW 22-27 ppt
LAS[7] (100)	*Pyramimonas grossii*	Green flagellate	No growth in both cases	1-14 d and 12-14 d, 100	SW 22-27 ppt
LAS[7] (100)	*Stichococcus sp.*	Green algae	No growth in both cases	1-14 d and 12-14 d, 1	SW 22-27 ppt
LAS[7] (37)	*Laminaria hyperborea*	Tangleweed, adult and zoospores	Respiration unaffected Decreased growth	24 hr, 1000 28 d, 1	Effect on cells Effect on population growth
LAS[7] (64)	*Arenicola marina*	Lugworm	Serious gill epidermis damage 12.5	48 hr, 10 48 hr LC50	Histological changes
LAS[7] (53)	*Artemia salina*	Brine shrimp, adult	7.3 A.I. 5.8 A.I.	48 hr LC50 96 hr LC50	
LAS[7] (50)	*Artemia salina*	Brine shrimp	40.4	24 hr LC50	
LAS[7] (96)	*Balanus balanoides*	Crustacean, adult & stage Ii nauplius	50 3 2.5	96 hr LC50 96 hr LC50 150 hr LC50	Adult stage Ii nauplius SW 33 ppt
LAS[7] (93)	*Capitella capitata*	Worm, adult	8-9 5.99 5.52	48 hr LC50 96 hr LC50 96 hr LC50	
LAS[7] (96)	*Carcinus maenas*	Common Shore Crab, adult	>100	96 hr LC50	SW 33 ppt
LAS[7] (53)	*Cardium edule*	Edible Cockle, adult	35 A.I. 15 A.I.	48 hr LC50 96 hr LC50	SW 34 ppt

Compound (Ref)	Species	Common name	Effect concentration	Endpoint	Notes
LAS[7] (96)	*Cardium edule*	Edible Cockle, adult	15 <5	96 hr LC50 96 hr LC50	SW 33 ppt
LAS[7] (53)	*Cerastoderma edule*	Edible Cockle, adult	35 A.I. 15 A.I.	48 hr LC50 96 hr LC50	SW 34 ppt
LAS[7] (96)	*Cerastoderma edule*	Edible Cockle, adult	15 <5	96 hr LC50 96 hr LC50	SW 33 ppt
LAS[7] (96)	*Chlamys opercularis*	Queen scallop, adult	<5	96 hr LC50	SW 33 ppt
LAS[7] (53)	*Crangon crangon*	Common shrimp	>100 A.I.	48-96 hr LC50	SW 34 ppt
LAS[7] (80)	*Crassostrea gigas*	Pacific oyster, embryo	Abnormal	48 hr 0.1	Effect on development
LAS[7] (79)	*Crassostrea gigas*	Pacific oyster, larva	100% increase	6 hr, 1	Effect on mortality
LAS[7] (96)	*Eupagurus bernhardus*	Crustacean, adult	>100	96 hr LC50	SW 33 ppt
LAS[7] (53)	*Gibbula umbilicalis*	Purple Top Shell, adult	31 A.I. 9 A.I.	48 hr LC50 96 hr LC50	SW 34 ppt
LAS[7] (85)	*Hyalella curvispina*	Scud	15 5 10	9 d LD50 13 d LD50 27 d LD50	
LAS[7] (96)	*Hyas araneus*	Crustacean, adult & stage I Zoea	>100 9	96 hr LC50 96 hr LC50	SW 33 ppt
LAS[7] (53)	*Littorina littorea*	Common Periwinkle, adult	>100 A.I. 17.5 A.I.	48 hr LC50 96 hr LC50	SW 34 ppt
LAS[7] (96)	*Mya arenaria*	Soft Shell Clam, adult	70 <25	96 hr LC50 96 hr LC50	SW 33 ppt

Compound (Ref)	Species	Common name	Effect concentration	Endpoint	Notes
LAS[7] (26)	*Mytilus edulis*	Common mussel, gametes & larva	Increase 99% decrease 27% decrease 33% decrease	Larva, 96 hr, 0.4 Gametes, 22 hr, 0.8 Gametes, 22 hr, 0.05 Larva, 90 hr, 0.4	
LAS[7] (53)	*Mytilus edulis*	Common mussel, adult	22 A.I. 6.2 A.I.	48 hr LC50 96 hr LC50	SW 34 ppt
LAS[7] (96)	*Mytilus edulis*	Common mussel, adult	>100 50	96 hr LC50 96 hr LC50	SW 33 ppt
LAS[7] (80)	*Ostrea edulis*	European Common Oyster, larva	Decrease Decrease 1	6hr, 1 6hr, 1 6 hr LC100	Effect on byssal attachment Effect on metamorphosis
LAS[7] (96)	*Palaemon adspersus*	Crustacean, adult	50 50 25	96 hr LC50 96 hr LC50 96 hr LC50	SW 33 ppt
LAS[7] (96)	*Palaemon elegans*	Leander Squilla, adult	>100	96 hr LC50	SW 33 ppt
LAS[7] (53)	*Palaemonetes varians*	Crustacean, adult	>100 A.I.	48-96 hr LC50	SW 34 ppt
LAS[7] (53)	*Patella vulgata*	Common Limpet, adult	15 A.I. 8.1 A.I.	48 hr LC50 96 hr LC50	SW 34 ppt
LAS[7] (96)	*Pecten maximus*	Coquille St. Jacques, adult	<5	96 hr LC50	SW 33 ppt
LAS[7] (85)	*Penaeus sp.*	Penaeidean shrimp, pendeus argentinus	Changed 10 10 5	0-27 d, 2.5-10 16 d LD50 21 d LD50 23 d LD50	Effect on oxygen consumption
LAS[7] (53)	*Purpura lapilus*	Mollusc, adult	30 A.I. 7.8 A.I.	48 hr LC50 96 hr LC50	SW 34 ppt

Compound (Ref)	Species	Common name	Effect concentration	Endpoint	Notes
LAS[7] (3)	*Tisbe holothuriae*	Crustacean, nauplius	Decrease	20 d, 0.5	Effect on mortality SW 35 ppt
LAS[7] (2)		Mullet	10.1	96 hr EC50	SW 20% salt
LAS[7] (53)	*Anguilla anguilla*	Common Eel, larva	3 A.I.	48-96 hr LC50	SW 34 ppt
LAS[7] (2)	*Anguilla rostrata*	American eel	7.5	96 hr EC50	SW 20% salt
LAS[7] (53)	*Anguilla vulgaris*	European Eel, larva	3 A.I.	48-96 hr LC50	SW 34 ppt
LAS[7] (2)	*Fundulus heteroclitus*	Mummichog	22.5	96 hr EC50	SW 20% salt
LAS[7] (96)	*Gadus morhua*	Atlantic Cod, adult	<1 1	96 hr LC50 96 hr LC50	SW 33 ppt
LAS (25)	*Mytilus edulis*	Common mussel	0.05 ppm 0.3 ppm	240 hr NOEC 240 hr	Fertility Larval development
LAS[7] (2)	*Menidia beryllina*	Silverside	7	96 hr EC50	SW 20% salt
LAS[7] (28)	*Perca fluviatilis*	Perch	100%, juvenile 0%, 5.8 cm juvenile	24 hr, 5	
LAS[7] (96)	*Platichthys flesus*	Flounder, adult	<1 1.5	96 hr LC50 96 hr LC50	SW 33 ppt
LAS[7] (96)	*Pleuronectes platessa*	European plaice, adult	>1	96 hr LC50	SW 33 ppt
LAS[7] (53)	*Pomatoschistus minutus*	Fish, adult	5 A.I. 5 A.I.	48 hr LC50 96 hr LC50	SW 34 ppt
LAS[7] (2)	*Pseudopleuronectes americanus*	Winter Flounder	8.2	96 hr EC50	SW 20% salt
LAS[7] (57)	*Hyrobia ulvae*	Marine snail	1.39	10d LC50	SW only
LAS[7] (57)	*Hyrobia ulvae*	Marine snail	0.15	10d LC50	Spiked Sediment only
LAS[7] (23)	*Palaemonetes africanus*	Brackish water shrimp	259 mg/kg	10 d LC50	OECD Mortality test

Compound (Ref)	Species	Common name	Effect concentration	Endpoint	Notes
LAS[7] (83)	*Corophium volutator*	Mud shrimp	0.8 – 1.2	2 d LC50	Mortality test Saline water
LAS[7] (83)	*Corophium volutator*	Mud shrimp	0.12 – 0.29	3 d LC50	Mortality test Saline water
LAS[7] (83)	*Corophium volutator*	Mud shrimp	0.67 – 0.79	5 d LC50	Mortality test Saline water
LAS[7] (83)	*Corophium volutator*	Mud shrimp	248 – 351 mg/kg	5 d LC50	Mortality test sediment from Oesterput
LAS[7] (83)	*Corophium volutator*	Mud shrimp	160-165 mg/kg	5 d LC50	Mortality test sediment from Cadiz
LAS[7] (83)	*Corophium volutator*	Mud shrimp	0.39-0.57	5 d LC50	Mortality test estimated pore toxicity from sediment from Oesterput
LAS[7] (83)	*Corophium volutator*	Mud shrimp	1.23 – 1.26	5 d LC50	Mortality test sediment estimated pore toxicity from from Cadiz
LAS[8] (56)	*Cylindrotheca closterium*	Marine diatom	46.9	72 hr ErC50	Algal growth rate
LAS[8] (56)	*Cylindrotheca closterium*	Marine diatom	13.9	72 hr EbC50	Algal growth rate
LAS[7] (56)	*Cylindrotheca closterium*	Marine diatom	0.007	72 hr ErC50	Algal growth rate sediment low value due to indirect effects of sediment

Compound (Ref)	Species	Common name	Effect concentration	Endpoint	Notes
LAS[7] (56)	*Cylindrotheca closterium*	Marine diatom	0.152	72 hr ErC50	Algal growth rate Water low value due to indirect effects of sediment
LAS[7] (56)	*Cylindrotheca closterium*	Marine diatom	0.002	72 hr EbC50	Algal growth rate sediment low value due to indirect effects of sediment
LAS[7] (56)	*Cylindrotheca closterium*	Marine diatom	0.112	72 hr EbC50	Algal growth rate Water only low value due to indirect effects of sediment
LAS[8] (56)	*Hydrobia ulvae*	Marine snail	139 mg/kg	10 d LC50	Mortality Test on sediment
LAS[8] (56)	*Hydrobia ulvae*	Marine snail	0.212	10 d LC50	Mortality Test dissolved in water
LAS[8] (59)	*Hydrobia ulvae*	Marine snail	101.77 mg/kg	96 hr LC50	Mortality, LC50 dry weight
LAS[8] (59)	*Hydrobia ulvae*	Marine snail	98.08 mg/kg	5 d LC50	Mortality LC50 dry weight
LAS[8] (59)	*Hydrobia ulvae*	Marine snail	97.28 mg/kg	6 d LC50	Mortality LC50 dry weight
LAS[8] (59)	*Hydrobia ulvae*	Marine snail	94.99 mg/kg	7 d LC50	Mortality LC50 dry weight
LAS[8] (59)	*Hydrobia ulvae*	Marine snail	94.30 mg/kg	8 d LC50	Mortality LC50 dry weight
LAS[8] (59)	*Hydrobia ulvae*	Marine snail	94.30 mg/kg	9 d LC50	Mortality LC50 dry weight

Compound (Ref)	Species	Common name	Effect concentration	Endpoint	Notes
LAS (109)	*Fundulus heterocyclus*	Saltwater Minnows	2.43	E(L)C50 (mg/l)	
LAS (109)	*Fundulus heterocyclus*	Saltwater Minnows	0.5	NOEC	
LAS (109)	*Crassostrea virgnica*	Oyster	7.4	E(L)C50 (mg/l)	
LAS (109)	*Crassostrea virgnica*	Oyster	3.2	NOEC	
LAS (109)	*Dunaliella*	Algae	MAC-5 = 2-4	NOEC	
LAS (109)	*Thalassiosira*	Algae	MAC-5 = 2	NOEC	
LAS (109)	*Dunaliella*	Algae	MAC-5 = 1-10	NOEC	
LAS (109)	*Crassostrea virgnica*	Oyster	1.72	E(L)C50 (mg/l)	
LAS (109)	*Crassostrea virgnica*	Oyster	0.16	NOEC	
LAS (109)	*Penaeus duorarum*	Pink Shrimp	19	E(L)C50 (mg/l)	
LAS (109)	*Penaeus duorarum*	Pink Shrimp	66	E(L)C50 (mg/l)	
LAS (109)	*Penaeus duorarum*	Pink Shrimp	10	NOEC	
LAS (109)	*Penaeus duorarum*	Pink Shrimp	129	E(L)C50 (mg/l)	
LAS (109)	*Penaeus duorarum*	Pink Shrimp	65	NOEC	
LAS (109)		Mysid Shrimp	1.4	E(L)C50 (mg/l)	
LAS (109)		Mysid Shrimp	0.7	NOEC	
LAS (109)		Pink Shrimp	8.4	NOEC	
LAS (109)	*Mysidopsis bahia*	Mysid Shrimp	3.6	E(L)C50 (mg/l)	
LAS (109)	*Penaeus duorarum*	Pink Shrimp	154	E(L)C50 (mg/l)	
LAS (109)	*Mysidopsis bahia*	Mysid Shrimp	2	E(L)C50 (mg/l)	
LAS (109)	*Mysidopsis bahia*	Mysid Shrimp	1.3	E(L)C50 (mg/l)	
LAS (109)	*Cyprinodon variegatus*	Sheepshead minnow	3.5	E(L)C50 (mg/l)	
LAS (109)	*Mysidopsis bahia*	Mysid Shrimp	1.4	E(L)C50 (mg/l)	
LAS (109)	*Cyprinodon variegatus*	Sheepshead minnow	1.4	E(L)C50 (mg/l)	
LAS (109)	*Palaemonetes vulgaris*	Shrimp	13.85	E(L)C50 (mg/l)	
LAS (109)	*Palaemonetes vulgaris*	Shrimp	1	NOEC	

Compound (Ref)	Species	Common name	Effect concentration	Endpoint	Notes
LAS (109)	*Callinoctes sapidus*	Bluecrab	29	E(L)C50 (mg/l)	
LAS (109)	*Callinoctes sapidus*	Bluecrab	5	NOEC	
LAS (109)	*Cyprinodon variegatus*	Sheepshead minnow	0.39	E(L)C50 (mg/l)	
LAS (109)	*Penaeus duorarum*	Pink Shrimp	350	E(L)C50 (mg/l)	
LAS (109)	*Crassostrea virgnica*	Oyster	27	E(L)C50 (mg/l)	

[1] Sodium lauryl ether sulphate, CAS 0009004-82-4
[2] Sulphuric acid, monooctyl ester, sodium salt (1:1), CAS 0000142-31-4
[3] Sodium n-decylsulphate (C10) anionic
[4] Sodium decylsulphate, CAS 0000142-87-0
[5] Sulphuric acid, monododecyl ester, ammonium salt (1:1), CAS 0002235-54-3
[6] Sodium lauryl sulphate, CAS 0000151-21-3
[7] Sodium dodecylbenzenesulphonate, CAS 0025155-30-0
[8] Commercial mixture C10- LAS, C11- LAS, C12 - LAS, CAS 68411-30-3

CIRCULATION

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