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Sensitivity study of the EIF-calculations in DREAM 2.0

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ABSTRACT

The sensitivity of DREAM (version 1.8 and 2.0+) to variations in input parameters has been evaluated and quantified by multivariate design and response modelling. Two studies are reported;

i) Previous design and results from Mona Hjelsvold et al. focusing on selected non-compositional parameters and their effect on EIF peak calculation (using DREAM version 1.8);
ii) New study focusing on variation in compositional profiles and concentration levels and their effect on EIF-peak, EIF-average and risk profile (using DREAM version 2.0+)

The parameters of major importance are, as expected, the PNEC values and the selected biodegradation rates, explaining 40% and 25% of the magnitude of EIF peak. Thus these parameters were locked on standard values when effects of variation in discharge composition to EIF and risk profiles were examined.
The thirteen compound classes were systematically varied within +/- 20% deviation from average concentration values. The most important compound classes are those dominating the risk profile. When a few compound classes (e.g. 1-3) strongly dominate the risk profile, the uncertainity of the EIFs are a factor of 1.0-1.5 the size of their variation, i.e ranging within an uncertainity of 20-30%. The ranking of risks from the risk profile is affected less from varying the compound classes +/- 20% as in this case the three compound classes dominate anyway.

The relative standard error (RSD) from calculation of EIF average is very precise, 0.6% as compared to the less precise 5% RSD from the EIF peak calculation. The calculations all have a high accuracy.

Summary: The accuracy of EIF and risk calculations (with locked values of PNEC and biodegradation rates) of a specific field site are very dependent on the analytical accuracy of the compound classes that dominate the risk profile. The accuracy of the EIF will be on the same level as that of these input data.

KEYWORDS	ENGLISH	NORWEGIAN
GROUP 1		
GROUP 2		
SELECTED BY AUTHOR		

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1. Introduction

Note: Throughout this document the words "model" and "modelling" refer to statistical regression models developed as part of the analysis. The numerical model DREAM is always referred to by its proper name to avoid confusion.

The sensitivity of DREAM (EIF-peak, EIF-average and risk profile) to variations in input parameters has been evaluated and quantified by multivariate design and response modelling. Two studies are reported:

i) Previous design and results from Mona Hjelsvold et al. focusing on selected non-compositional parameters (DREAM version 1.8);
ii) New study focusing on variation in compositional profiles and concentration levels (DREAM version 2.0+).

2. Methods

2.1 Design and modelling

All design and analyses were performed by APIS Baccos version 1.11.2 (www.prediktor.com), except the design of the first study (Mona Hjelsvold at. al), which used Modde V4.0 (www.umetrics.com). The response modelling has been performed by Partial Least Squares (PLS) regression [1], while the designs are variants of fractional factorial designs [2]. All variables are given equal weights by so-called "auto scaling". In this procedure each parameter is given a variation of unity by dividing by its standard deviation.

2.2 Evaluation of model quality and interpretation of significance

The quality of both data and model highly influence our conclusions. As such we have followed the same procedure and criteria for quality evaluation of data and model.

Before the building of regression models, with subsequent interpretation, the quality of the input data is examined. In this study we have used precision of replicates, leverage validation and model smoothness as evaluation tools. All models have to pass these data quality criteria before the next step, evaluation of model quality. The model quality is defined by the percent of the variance in the DREAM response explained by the model (should be above 90%), normal distribution of response residuals, and high prediction power. (The simulated responses from Dream should be highly correlated to responses calculated from the PLS models).

When the data and model quality has passed the criteria, the significance of model parameters is decided from scaled regression coefficients. Statistical significance of these is evaluated from the normal distribution.

2.3 Selection of responses, parameters and their variation ranges

2.3.a Discharge Composition Study

The influence of changes in compositional profile to the following responses:

1) EIF-peak,
2) EIF-average and
3) Risk profile,

were investigated by selecting a typical discharge profile from the North Sea, and varying each compound group (as defined in dream) +/- 20 % from the average profile. Thus we expect to find and quantify:

1) How much the natural variation in compositional groups influences the responses;
2) The relative importance of the compositional groups to the response variation.

A typical compositional profile was estimated from the average of the discharge from several of Statoil's fields. The representatives of the compound groups and their compositional ranges are shown in Table 1.

Table 1 The compound classes of a typical discharge profile and their average concentrations (ppm). All were varied +/- 20%.

Dispersed oil	30	Zinc	0,06
BTEX	28	Mercury	0,00008
Naphtalens	1	KI-3036	0,5
2-3 ring PAH	0,12	SI-4059	23
4ring+ PAH	0,003	EB-8100	1,5
Phenol C0-C3 alky	8	Phenol C6+ alkyl	0,002
Phenol C4-C5 alky	0,13		

The design was constructed as a 2^{13-9} fractional factorial design resulting in 16 runs. In addition two extremes (all high and all low), and 5 replicates were included, resulting in 23 simulations on last version of Dream 2.1. Each simulation calculates 1) EIF-average, 2) EIF-peak and 3) the risk profile. These 23 simulations are described in detail in the appendices.

2.3.b Other Parameters

The other parameters and variation span are shown in Table 2. In this study only the influence on EIF peak has been investigated.

Table 2 Other parameters and their variation span

Parameter type	Parameter	Range of variation Min	Max
Model parameter	Time Step (hours)	**0.5**	**2.0**
Model parameter	No. of Particles	**250**	**1000**
Model parameter	Duration of simulation (days)	**10**	**30**
Environmental parameter	Air Temperature (^{o}C)	**5**	**20**
Environmental parameter	Water Temperature (^{o}C)	**5**	**20**
Model parameter	Size of Grid cells (area x height)	**100000**	**400000**
Discharge parameter	Settling Velocity (m/day)	**1,5**	**6**
Discharge parameter	Suspended Sediment Concentration (mg/l)	**5**	**20**
Discharge parameter	Depth of Discharge point (m)	**5**	**20**
Discharge parameter	Number of chemicals	**1**	**4**
Chemical parameters	KOC	**690**	**2760**
Chemical parameters	Vapour Pressure (atm)	**0,006**	**0,026**
Chemical parameters	Biodegradation rate (k-value)	**0,695**	**2,780**
Chemical parameters	Molecular weight (g/mol)	**53**	**212**
Chemical parameters	PNEC (ppb)	**8,00**	**34**

3. Results

3.1 The Discharge Composition Study

In this part of the project we tested how expected natural variation in compound classes influences on EIF-average, EIF peak and the risk profile.

3.1.a Effect on EIFs

The 23 simulations induced the variation in the EIFs as shown in Figure 3. The replicate simulations (runs no.1,7,12,17,23) yield roughly the same values of EIF-peak and EIF-averages, indicating very precise calculations from the Dream package.

The 40% variation from minimum profile (all component classes –20%) to maximum profile (all component classes +20%) induce a 68% and 77% variation span in the calculation of the EIF-average and the EIF-peak, correspondingly. This implies that sampling procedures for the oil in water analysis is of great importance. A similar deviation of 20% in all component classes in either direction (to much or too little), will give a 30% offset in the EIF value.

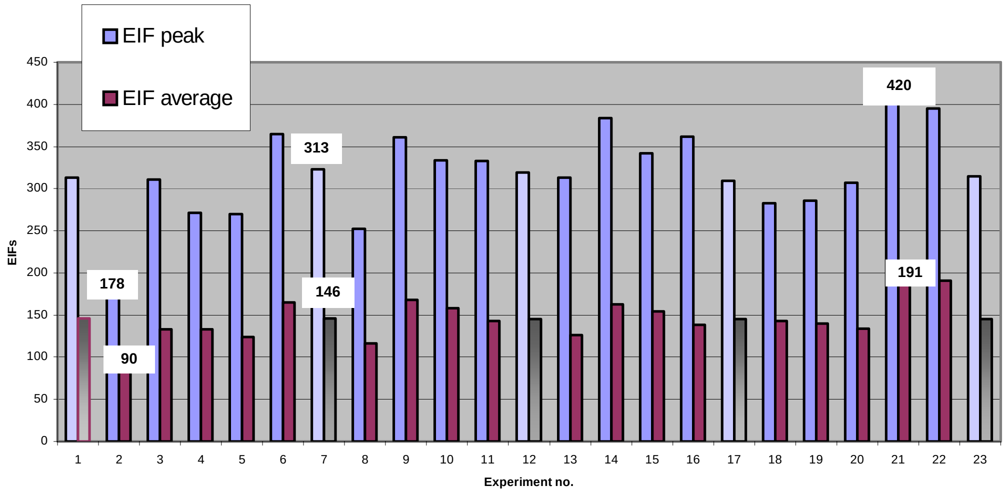

Figure 3 The 23 simulations and their induced variation in the EIFs.

3.1.b Importance of the different component classes to the EIFs

The PLS regression model that relates the compound classes to the response "EIF-average" turned out to be a very precise and good model. All data and model characteristics were very good, i.e. 98% of the variation in the EIF-average was explained by the model, all residuals were normally distributed and the correlation coefficient of the simulated EIF-average and the one calculated from the PLS regression model was as high as 0.9994 (a value of 1 is perfect correlation). The relative importance of the different compound classes to explain variation in EIF-average is shown in Figure 4, showing the scaled regression coefficients (i.e. the magnitude of these is directly correlated to the importance) from the PLS regression model.

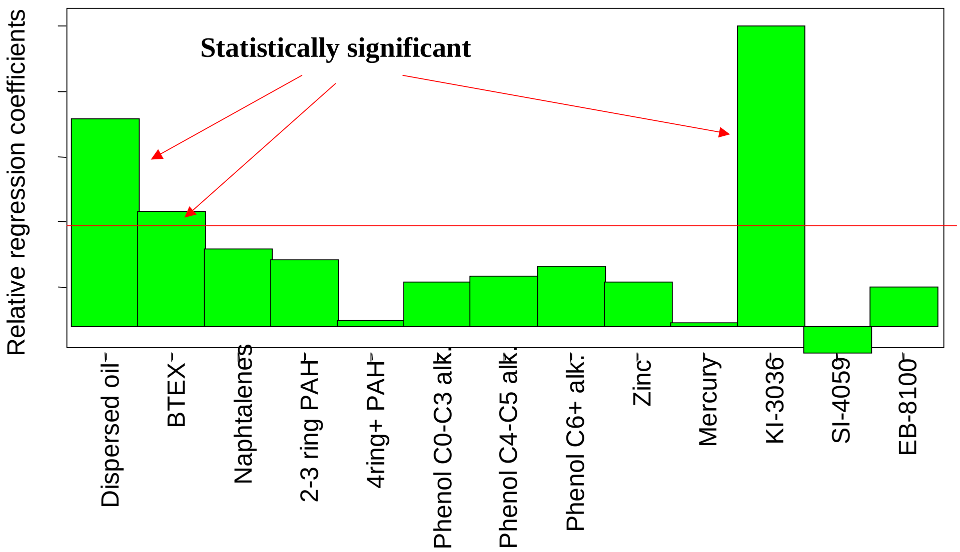

*Figure 4 Scaled regression coefficients showing **the relative importance** of the different compound classes to explain variation in EIF-average. In this study only dispersed oil, the BTEXs and the corrosion inhibitor (KI3036) significantly effect the EIF when the concentrations are varied +/- 20%. The apparent negative regression coefficient associated with the scaling inhibitor SI-4059 is only an expression of arbitrary noise, since the magnitude of this regression coefficient is close to zero.*

The statistical significance of the importance of the different compound classes has been decided by normal distribution plot, and shows that the only statistical influence in this study is from corrosion inhibitor (50% influence), dispersed oil (30% influence) and the BTEX (20% influence).

Of course this only reflects the selected profile and the selected PNECs of the different groups. The profile is an average profile from several of Statoil's fields including in this case several condensate fields (i.e. relatively high in e.g. BTEX). In practical work the importance from each compound group to the EIF is decided from the risk profile. However, it is important to bear in mind that the main conclusion to be found in this study is to determine how much variation (as e.g. analytical variation) in the discharge affects the EIFs and the risk profile.

The main conclusion from this part of the study is that a 20% variation of the chemical compound class may result in a corresponding 20% variation in the calculated EIFs from DREAM. As a rule of thumb; in fields where the risk profile is dominated by one or two compounds, the precision of the calculated EIF will correspond to the precision (analytical variance) of these compounds. When several compound groups are important as seen from the risk profile, the precision of EIF will improve, because the variation from analytical variance (assumed to be arbitrary and normal distributed) from each compound group will partly mask each other.

One exception is of course where all compound groups are too high or too low as a result of wrong sampling, work-up procedure or constant instrument failures (as from e.g. poor standards). In this case this will sum up to significantly affect the calculated EIF. In this work we have found that such constant failure of 20% off in all compounds gives an offset of EIF-average of roughly 70% in the EIF-average.

We have mainly presented the results associated with the EIF-average in this study. The conclusion and findings are the same for EIF-peak, although the estimation of EIF-average is much more precise (standard error 0.5%) than the corresponding estimation of EIF-peak. (standard error 5%).

3.1.c The importance of the different component classes to the risk profiles

The risk profile is relatively precise when all compound groups are either too low or too high, as shown in Fig. 5. We have shown the two extremes (20% + and 20%-) along with one average concentration profile. The difference between the risk profiles is, as expected, insignificant. As the risk profile consists of relative values, it is of course to be expected that constant increase or decrease in discharge should give the same risk profile (although the magnitude of the EIFs of course will vary).

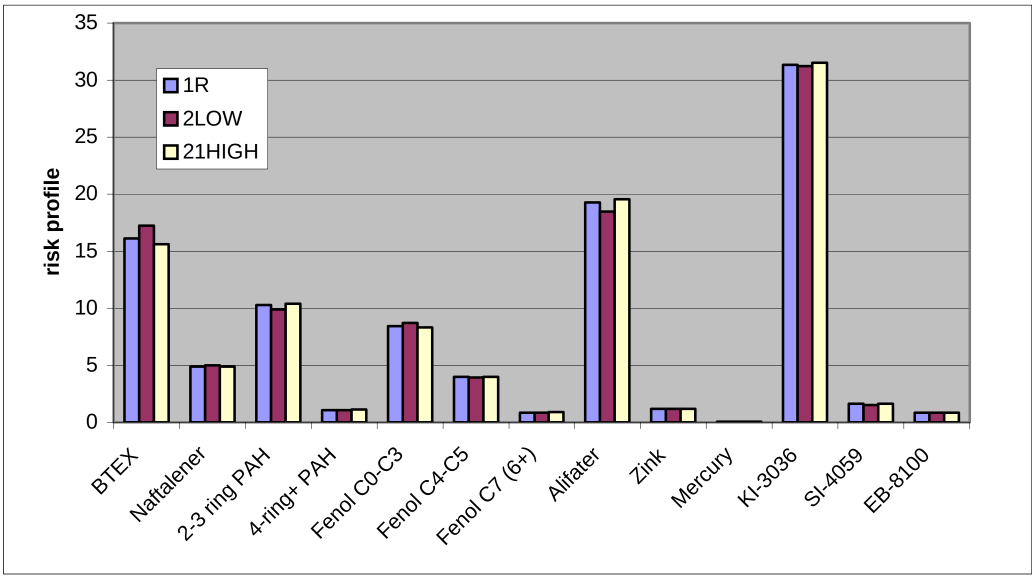

Figure 5. Risk profile from the extremes (sample 2:–20% in all compound groups, sample 21:+20%in all compound groups) as compared to the average discharge (sample 1R).

What happens to the risk profile when the most important compound groups (i.e. BTEX, aliphatics / dispersed oil and KI-3036) are varied? As seen from Figure 6, the difference in the risk profiles is now a little more evident.

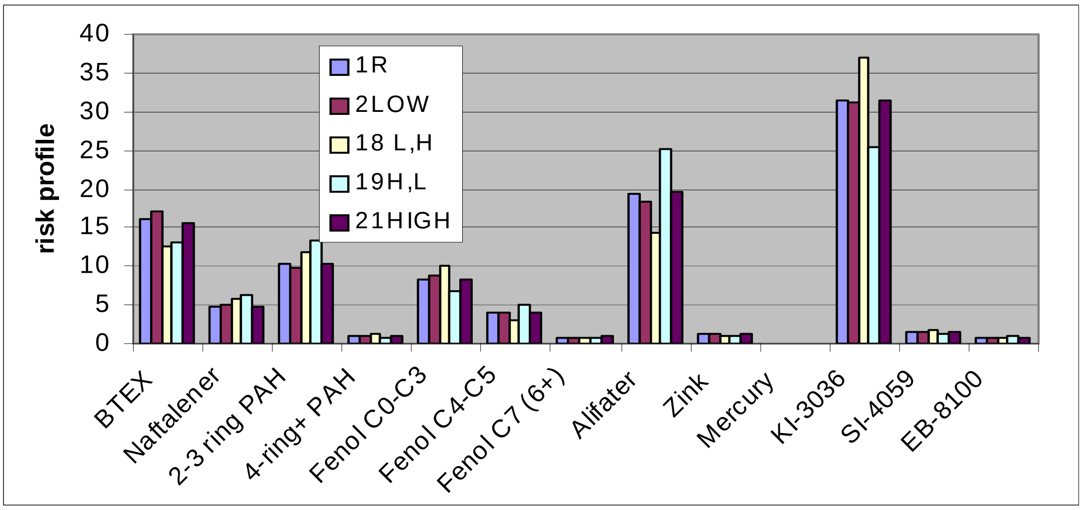

Figure 6. Risk profiles from the simulation of various extreme profiles. The extremes (2LOW: all –20%, 2HIGH: all +20%) are similar to the average 1R as shown in previous Figure 5, while the sample 18 (-20% in aliphatics, +20% in KI3036) and the sample 19(+ 20% in aliphatics, -20% in KI3036) do have the most different risk profiles in this study.

However, the variation does not change our conclusion; the compound classes with the highest risk profile are KI-3036, the aliphatics (dispersed oil) and the BTEX group. The +/-20% variations in the two most significant groups show a corresponding +/-15% change in the risk profile. For compound groups that dominate the risk profile (as aliphatics and KI3036 in this case), such a minor change will not influence on the overall risk profile and conclusion.

3.2 Other Parameters

The PLS regression model explains 74% of the variation of the EIF peak. The standard error of prediction is 0.041. The model shows a slight non-linearity, which is corrected for by including the cross terms of the parameters "biodegradation" and "PNEC" (and the interaction between these two). Thereafter the PLS model explains 90% of the variation in the EIF peak.
As shown in Figure 1 the only non-compositional parameters that influence the EIF-peak calculation are:

1) PNEC,
2) Biodegradation rate
3) The interaction between the PNEC and the biodegradation rate
4) To some extent the size of the grid cell.

These four are all statistically significant according to their distribution in a normal probability plot. Their relative importance is correlated to the size of the regression coefficients (as shown in Figure 1).

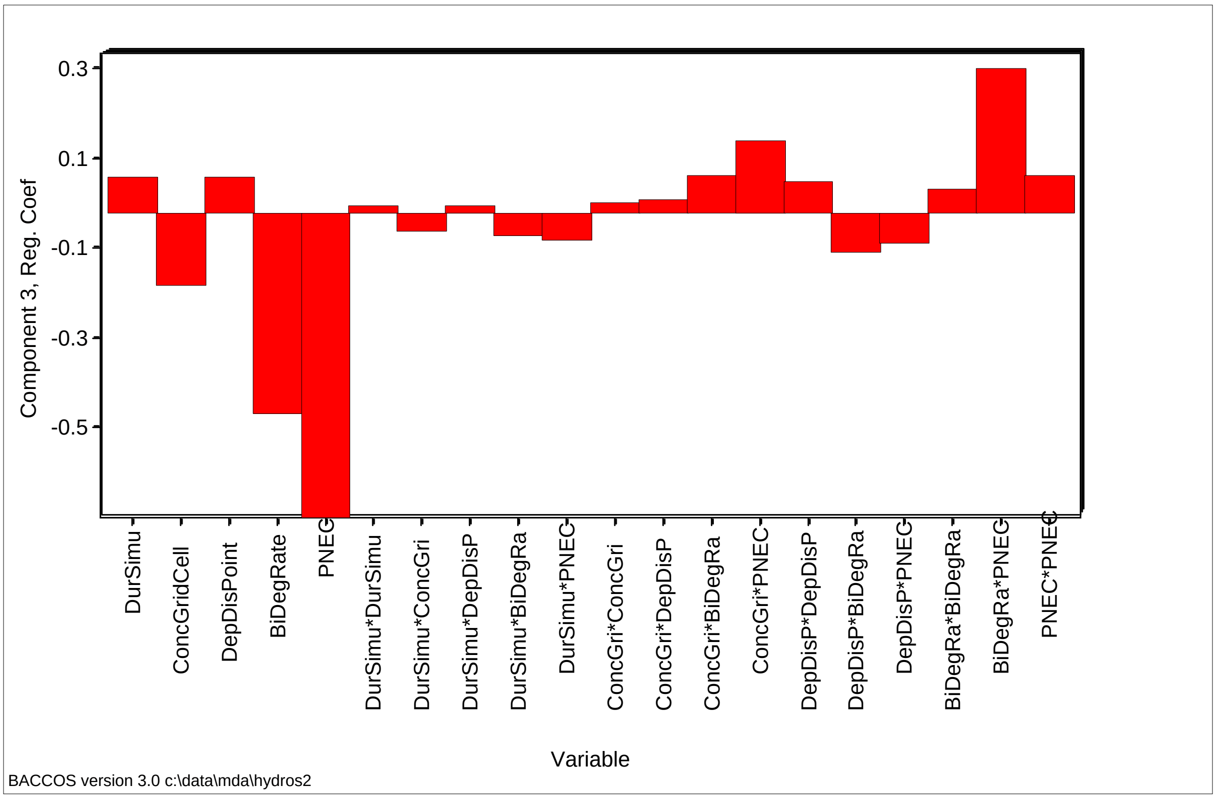

Figure 2. The scaled regression coefficients. The size corresponds to the relative importance of the parameters for calculating the EIF peak.

The main influence on the EIF peak comes from the parameters "PNEC" and the "biodegradation rates". As a consequence, any variation of these will largely influence on the calculated EIF. Thus, it is highly recommended to agree on accepted standard biodegradation rate and PNEC values, and to lock these, before performing further sensitivity analysis on variation in compositional profile.

4. Conclusion

This study has revealed the following:

The most dominating parameters with respect to calculation of the EIF are:

1) The PNEC values (explain 40% of the EIF);
2) The biodegradation rate (explains 25% of the EIF).

All variations or possible future changes in these parameters will significantly affect the EIF. As a consequence Part II of this study, quantifying the influence of analytical variance in component classes to the EIFs and the risk profiles, has been performed on standardised and fixed values of PNEC and biodegradation rates.

Variation of the compound groups by +/- 20% affects the calculation of the EIFs and risk profiles mainly in three ways:

1) When few compound classes (1-3) dominate the risk profile and the analytical variance is arbitrary and normally distributed, the accuracy of the EIF calculation will be of the same order as the accuracy of these compound classes. For example, if a chemical A has an analytical variance of 25%, and this chemical dominates the risk profile, the uncertainty of the calculated EIF will be on the same level (25%). If more (>4) compound classes contribute to the risk the uncertainty of the calculated EIF will be the squared root of the sum of their analytical variance.

2) When all compound classes are either too low or too high, the error in the EIF value may be almost twice the error in the individual classes. For example, in our case the two extremes (all compound classes either +20% or –20%) differing in 40% gave two calculated EIFs differing in roughly 70%.

3) The variation in compound classes +/- 20% gave the same main impression of the risk profiles. When all compound groups are increased or decreased at same level, the risk profile is of course the same (although the calculated EIF will vary)..In this study, where the most important compound classes were varied in opposite extremes (e.g. one at high level and the other at low level), the risk profile was slightly influenced. This is to be expected when there are a few compound classes that dominate the risk profile.

The estimation of EIF-average from the DREAM package is highly precise when performed by a skilled user of DREAM. The relative standard error of calculation is as low as 0.6% for the EIF-average, while the relative standard error of EIF-peak is 5%. Thus we recommend the EIF average to be used in risk calculation by future versions of Dream.

In a final verification and sensitivity test of the DREAM model we suggest that the sensitivity testing be expanded to include different compositional profiles (extremes), and various operators.

Summary: The accuracy of EIF and risk calculations (with locked values of PNEC and biodegradation rates) of a specific field site are very dependent on the analytical accuracy of the compound classes that dominate the risk profile. The accuracy of the EIF will be on the same level as that of these input data.

5. References

1. Wold, H (1982) *Soft modelling: the basic design and some extensions*. Systems under indirect observations II. North-Holland, Amsterdam, pp.1-54
2. Box, Hunter and Hunter (1978) Statistics for experimenters. An introduction to design, data analysis and modelbuilding, , John Wiley & Sons, p.374.

6. Appendices

6.1 The fixed parameters of the simulations in the compositional study

Setup parameters for the simulations:
Release site: Longitude: 2° 12.41 min, Latitude: 61° 31.36 min
Release depth: 1 meter
Release rate: 20 000 tons/day

Start time: May 1, 1990, 01:00
Duration of release: 30 days
Duration of simulation: 30 days

We have used the same wind and current data for all the simulations, Air and wind temperature are set to 10°C, suspended sediments :0.

Model parameters:
Number of surface particles: 100
Number of subsurface particles: 1000
Number of cells in concentration grid (xyz): 100x100x10
Size of the habitat grid: 11.5 x 11.5 km

Lower Concentration Limit (ppb): 0.001
Depth for Concentration grid (m): min: 0 – max: 100
Output interval: 12 hours
Time step: 5 minutes

6.2 Collection of results from all 23 simulations in the compositional study

The tables show the input concentration of each component in the produced water, and the PNEC values for each.
The pie-chart below shows the contribution of environmental risk for each component.

Table 1 Calculated EIF for Case 1.

Case tiltak	Kjøring 1 - følsomhetstest							Simulert EIF	227	Time-averaged EIF: 106		
		Utslipp, tonn/dag		Konsentrasjon, ppm		PNEC ppb						
Komponentgruppe	Produktnavn	Basis	Ny	Basis	Ny	Basis	Ny	Bidrag til risiko	Bidrag EIF	Vekter	Vektet bidrag	EIF
Total		20000	20000					%				
BTEX		[redacted]	[redacted]	28	28	17	17	22.28	50.5756	1	50.5756	[redacted]
Naftalener		[redacted]	[redacted]	1	1	2.1	2.1	6.75	15.3225	1	15.3225	[redacted]
2-3 ring PAH		[redacted]	[redacted]	0.12	0.12	0.15	0.15	14.15	32.1205	1	32.1205	[redacted]
4-ring+ PAH		[redacted]	[redacted]	0.003	0.003	0.05	0.05	0.75	1.7025	2	3.405	[redacted]
Fenol C0-C3		[redacted]	[redacted]	8	8	10	10	11.61	26.3547	1	26.3547	[redacted]
Fenol C4-C5		[redacted]	[redacted]	0.13	0.13	0.36	0.36	5.5	12.485	1	12.485	[redacted]
Fenol C7 (6+)		[redacted]	[redacted]	0.002	0.002	0.04	0.04	0.6	1.362	2	2.724	[redacted]
Alifater		[redacted]	[redacted]	30	30	40.4	40.4	13.29	30.1683	2	60.3366	[redacted]
Zink	Metaller I (Zn,	[redacted]	[redacted]	0.06	0.06	0.46	0.46	1.64	3.7228	1	3.7228	[redacted]
Mercury	Metaller II (Hg,	[redacted]	[redacted]	0.00008	0.00008	0.008	0.008	0.1	0.227	1	0.227	[redacted]
Korrosjonshemmer	KI-3036	[redacted]	[redacted]	0.5	0.5	0.4	0.4	21.65	49.1455	2	98.291	[redacted]
Avleiringshemmer	SI-4059	[redacted]	[redacted]	23	23	283	283	1.11	2.5197	2	5.0394	[redacted]
Emulsjonsbryter	EB-8100	[redacted]	[redacted]	1.5	1.5	30	30	0.59	1.3393	2	2.6786	[redacted]
		[redacted]	[redacted]					100.02	227.0454		313.2827	313

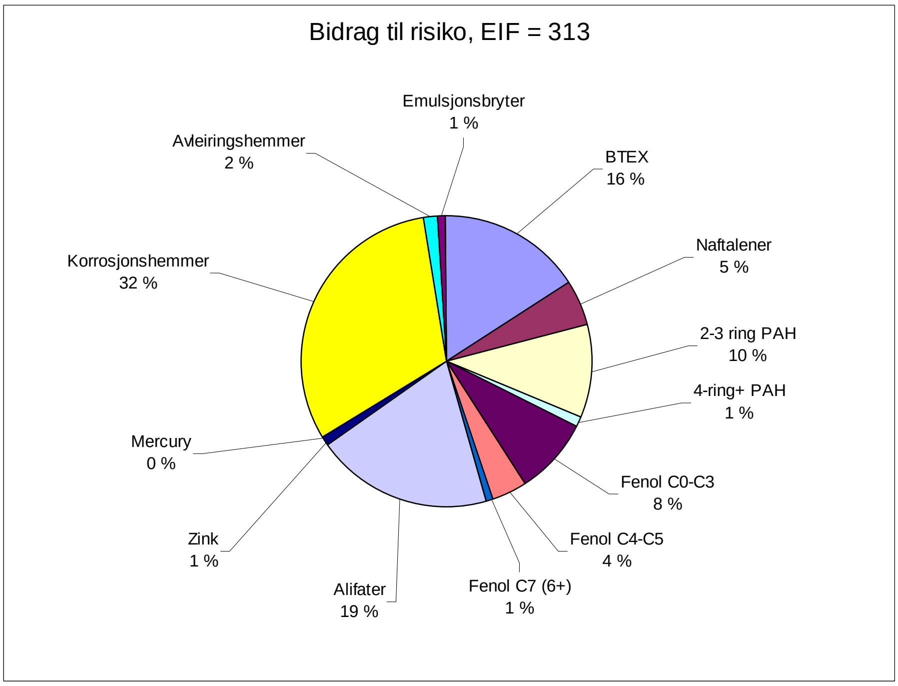

Table 2 Calculated EIF for Case 2.

Case tiltak	Kjøring 2 - følsomhetstest							Simulert EIF	130	Time-averaged EIF:		66
		Utslipp, tonn/dag		Konsentrasjon, ppm		PNEC ppb						
Komponentgruppe	Produktnavn	Basis	Ny	Basis	Ny	Basis	Ny	Bidrag til risiko	Bidrag EIF	Vekter	Vektet bidrag	EIF
Total		20000	20000					%				
BTEX		[redacted]	[redacted]	22.4	22.4	17	17	23.59	30.667	1	30.667	
Naftalener		[redacted]	[redacted]	0.8	0.8	2.1	2.1	6.83	8.879	1	8.879	
2-3 ring PAH		[redacted]	[redacted]	0.096	0.096	0.15	0.15	13.57	17.641	1	17.641	
4-ring+ PAH		[redacted]	[redacted]	0.0024	0.0024	0.05	0.05	0.72	0.936	2	1.872	
Fenol C0-C3		[redacted]	[redacted]	6.4	6.4	10	10	11.89	15.457	1	15.457	
Fenol C4-C5		[redacted]	[redacted]	0.104	0.104	0.36	0.36	5.39	7.007	1	7.007	
Fenol C7 (6+)		[redacted]	[redacted]	0.0016	0.0016	0.04	0.04	0.59	0.767	2	1.534	
Alifater		[redacted]	[redacted]	24	24	40.4	40.4	12.64	16.432	2	32.864	
Zink	Metaller I (Zn,	[redacted]	[redacted]	0.048	0.048	0.46	0.46	1.65	2.145	1	2.145	
Mercury	Metaller II (Hg,	[redacted]	[redacted]	0.000064	0.000064	0.008	0.008	0.09	0.117	1	0.117	
Korrosjonshemmer	KI-3036	[redacted]	[redacted]	0.4	0.4	0.4	0.4	21.4	27.82	2	55.64	
Avleiringshemmer	SI-4059	[redacted]	[redacted]	18.4	18.4	283	283	1.05	1.365	2	2.73	
Emulsjonsbryter	EB-8100	[redacted]	[redacted]	1.2	1.2	30	30	0.58	0.754	2	1.508	
		[redacted]	[redacted]					**99.99**	**129.987**		**178.061**	**178**

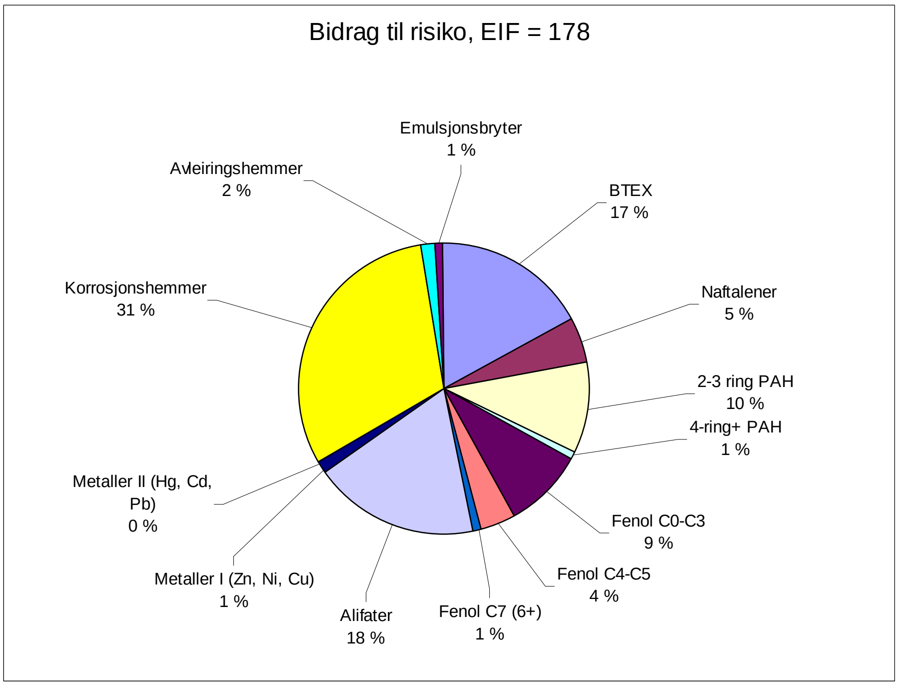

Table 3 Calculated EIF for Case 3.

Case tiltak	Kjøring 3 - følsomhetstest							Simulert EIF	215	Time-averaged EIF:		92
		Utslipp, tonn/dag		Konsentrasjon, ppm		PNEC ppb						
Komponentgruppe	Produktnavn	Basis	Ny	Basis	Ny	Basis	Ny	Bidrag til risiko	Bidrag EIF	Vekter	Vektet bidrag	EIF
Total		20000	20000					%				
BTEX		[redacted]		22.4	22.4	17	17	19.66	42.269	1	42.269	
Naftalener				0.8	0.8	2.1	2.1	5.89	12.6635	1	12.6635	
2-3 ring PAH				0.096	0.096	0.15	0.15	12.46	26.789	1	26.789	
4-ring+ PAH				0.0024	0.0024	0.05	0.05	0.65	1.3975	2	2.795	
Fenol C0-C3				6.4	6.4	10	10	10.14	21.801	1	21.801	
Fenol C4-C5				0.104	0.104	0.36	0.36	4.8	10.32	1	10.32	
Fenol C7 (6+)				0.0016	0.0016	0.04	0.04	0.52	1.118	2	2.236	
Alifater				24	24	40.4	40.4	11.72	25.198	2	50.396	
Zink	Metaller I (Zn,			0.072	0.072	0.46	0.46	2.22	4.773	1	4.773	
Mercury	Metaller II (Hg,			0.000064	0.000064	0.008	0.008	0.08	0.172	1	0.172	
Korrosjonshemmer	KI-3036			0.6	0.6	0.4	0.4	29.51	63.4465	2	126.893	
Avleiringshemmer	SI-4059			27.6	27.6	283	283	1.54	3.311	2	6.622	
Emulsjonsbryter	EB-8100			1.8	1.8	30	30	0.81	1.7415	2	3.483	
								100.00	215		311.2125	311

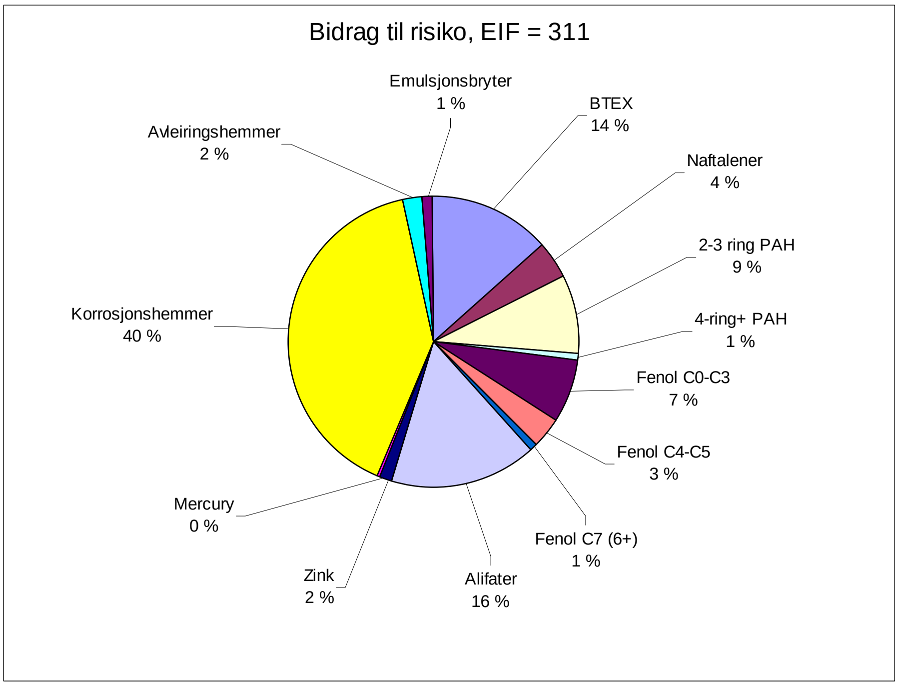

Table 4 Calculated EIF for Case 4.

Case tiltak	**Kjøring 4 - følsomhetstest**							**Simulert EIF**	**196**	**Time-averaged EIF:**		**96**
		Utslipp, tonn/dag		Konsentrasjon, ppm		PNEC ppb						
Komponentgruppe	Produktnavn	Basis	Ny	Basis	Ny	Basis	Ny	Bidrag til risiko	Bidrag EIF	Vekter	Vektet bidrag	EIF
Total		20000	20000					%				
BTEX		[redacted]	[redacted]	22.4	22.4	17	17	19.18	37.5928	1	37.5928	
Naftalener		[redacted]	[redacted]	0.8	0.8	2.1	2.1	5.71	11.1916	1	11.1916	
2-3 ring PAH		[redacted]	[redacted]	0.096	0.096	0.15	0.15	11.71	22.9516	1	22.9516	
4-ring+ PAH		[redacted]	[redacted]	0.0036	0.0036	0.05	0.05	0.98	1.9208	2	3.8416	
Fenol C0-C3		[redacted]	[redacted]	9.6	9.6	10	10	15.5	30.38	1	30.38	
Fenol C4-C5		[redacted]	[redacted]	0.156	0.156	0.36	0.36	7.25	14.21	1	14.21	
Fenol C7 (6+)		[redacted]	[redacted]	0.0016	0.0016	0.04	0.04	0.5	0.98	2	1.96	
Alifater		[redacted]	[redacted]	36	36	40.4	40.4	17.18	33.6728	2	67.3456	
Zink	Metaller I (Zn,	[redacted]	[redacted]	0.072	0.072	0.46	0.46	2.2	4.312	1	4.312	
Mercury	Metaller II (Hg,	[redacted]	[redacted]	0.000096	0.000096	0.008	0.008	0.13	0.2548	1	0.2548	
Korrosjonshemmer	KI-3036	[redacted]	[redacted]	0.4	0.4	0.4	0.4	18.26	35.7896	2	71.5792	
Avleiringshemmer	SI-4059	[redacted]	[redacted]	18.4	18.4	283	283	0.91	1.7836	2	3.5672	
Emulsjonsbryter	EB-8100	[redacted]	[redacted]	1.2	1.2	30	30	0.5	0.98	2	1.96	
								100.01	**196.0196**		**271.1464**	**271**

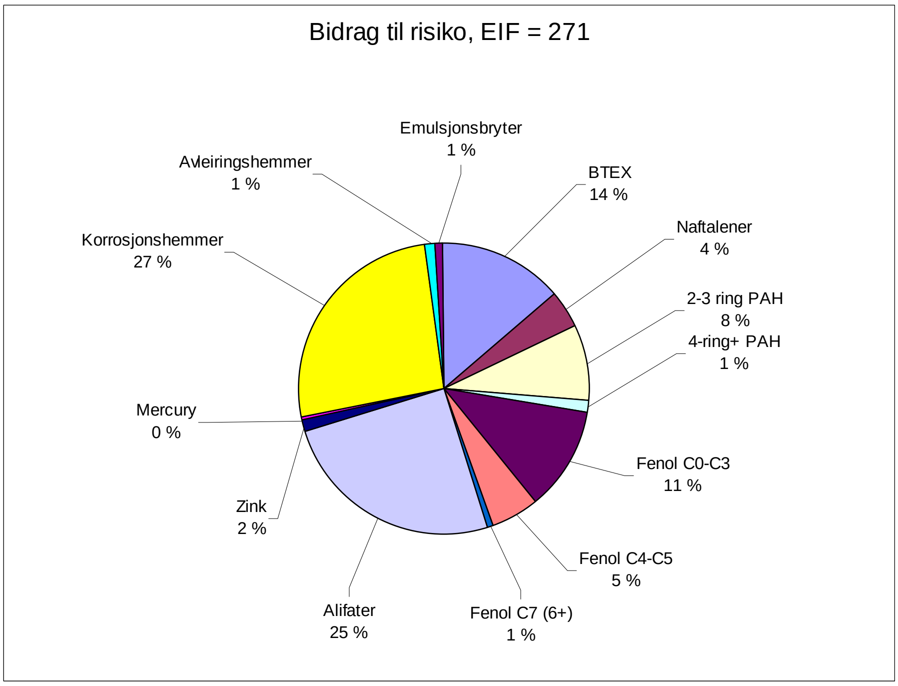

Table 5 Calculated EIF for Case 5.

Case tiltak	**Kjøring 5 - følsomhetstest**							**Simulert EIF**	**204**	**Time-averaged EIF:**		**94**
		Utslipp, tonn/dag		Konsentrasjon, ppm		PNEC ppb						
Komponentgruppe	Produktnavn	Basis	Ny	Basis	Ny	Basis	Ny	Bidrag til risiko	Bidrag EIF	Vekter	Vektet bidrag	EIF
Total		20000	20000					%				
BTEX				33.6	33.6	17	17	29.42	60.0168	1	60.0168	
Naftalener				0.8	0.8	2.1	2.1	5.62	11.4648	1	11.4648	
2-3 ring PAH				0.096	0.096	0.15	0.15	11.53	23.5212	1	23.5212	
4-ring+ PAH				0.0036	0.0036	0.05	0.05	0.97	1.9788	2	3.9576	
Fenol C0-C3				9.6	9.6	10	10	15.28	31.1712	1	31.1712	
Fenol C4-C5				0.104	0.104	0.36	0.36	4.53	9.2412	1	9.2412	
Fenol C7 (6+)				0.0024	0.0024	0.04	0.04	0.78	1.5912	2	3.1824	
Alifater				24	24	40.4	40.4	10.79	22.0116	2	44.0232	
Zink	Metaller I (Zn,			0.048	0.048	0.46	0.46	1.37	2.7948	1	2.7948	
Mercury	Metaller II (Hg,			0.000064	0.000064	0.008	0.008	0.08	0.1632	1	0.1632	
Korrosjonshemmer	KI-3036			0.4	0.4	0.4	0.4	17.97	36.6588	2	73.3176	
Avleiringshemmer	SI-4059			18.4	18.4	283	283	0.9	1.836	2	3.672	
Emulsjonsbryter	EB-8100			1.8	1.8	30	30	0.77	1.5708	2	3.1416	
								100.01	**204.0204**		**269.6676**	**270**

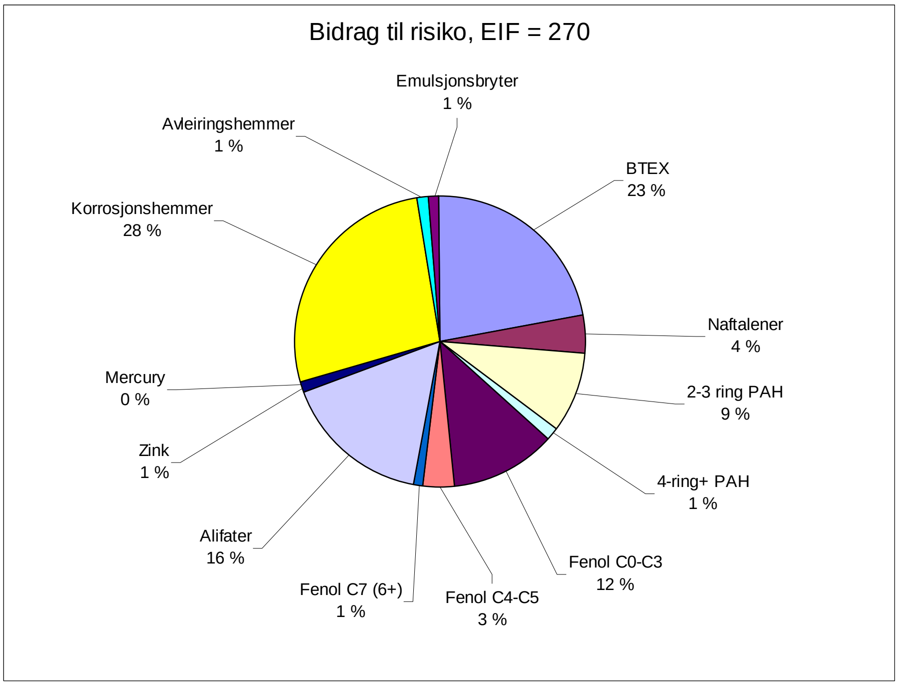

Table 6 Calculated EIF for Case 6.

Case tiltak	**Kjøring 6 - følsomhetstest**							**Simulert EIF**	**255**	**Time-averaged EIF:**		**115**
		Utslipp, tonn/dag		Konsentrasjon, ppm		PNEC ppb						
Komponentgruppe	Produktnavn	Basis	Ny	Basis	Ny	Basis	Ny	Bidrag til risiko	Bidrag EIF	Vekter	Vektet bidrag	EIF
Total		20000	20000					%				
BTEX		[redacted]		33.6	33.6	17	17	25.38	64.719	1	64.719	
Naftalener				0.8	0.8	2.1	2.1	4.93	12.5715	1	12.5715	
2-3 ring PAH				0.096	0.096	0.15	0.15	10.38	26.469	1	26.469	
4-ring+ PAH				0.0024	0.0024	0.05	0.05	0.54	1.377	2	2.754	
Fenol C0-C3				6.4	6.4	10	10	8.5	21.675	1	21.675	
Fenol C4-C5				0.156	0.156	0.36	0.36	6.34	16.167	1	16.167	
Fenol C7 (6+)				0.0024	0.0024	0.04	0.04	0.69	1.7595	2	3.519	
Alifater				36	36	40.4	40.4	15.3	39.015	2	78.03	
Zink	Metaller I (Zn, [redacted]			0.048	0.048	0.46	0.46	1.2	3.06	1	3.06	
Mercury	Metaller II (Hg, [redacted]			0.000096	0.000096	0.008	0.008	0.11	0.2805	1	0.2805	
Korrosjonshemmer	KI-3036			0.6	0.6	0.4	0.4	24.9	63.495	2	126.99	
Avleiringshemmer	SI-4059			27.6	27.6	283	283	1.28	3.264	2	6.528	
Emulsjonsbryter	EB-8100			1.2	1.2	30	30	0.43	1.0965	2	2.193	
								99.98	**254.949**		**364.956**	**365**

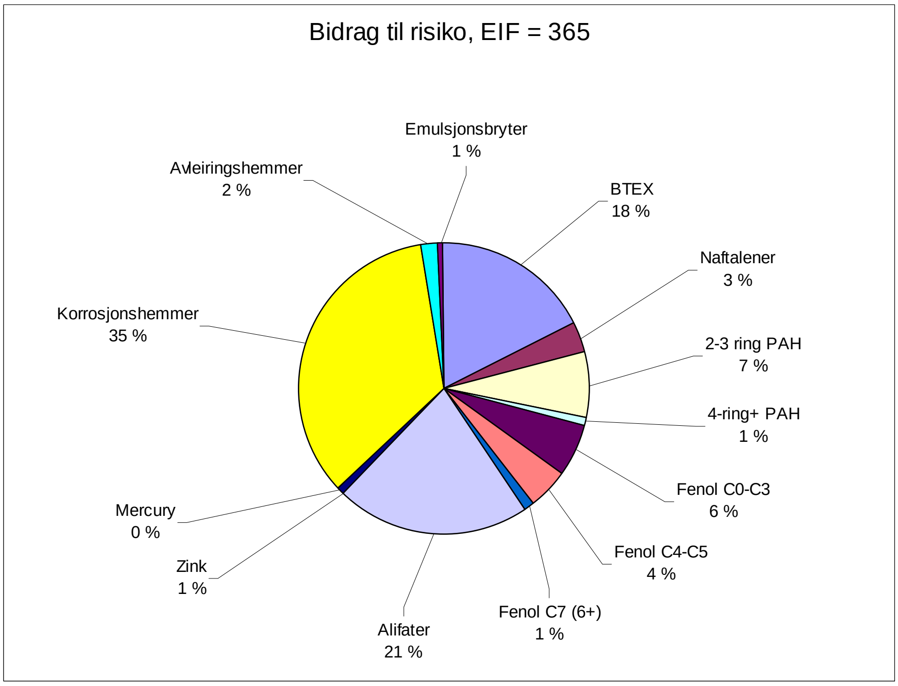

Table 7 Calculated EIF for Case 7.

Case tiltak	Kjøring 7 - følsomhetstest							Simulert EIF	234	Time-averaged EIF:		106
		Utslipp, tonn/dag		Konsentrasjon, ppm		PNEC ppb						
Komponentgruppe	Produktnavn	Basis	Ny	Basis	Ny	Basis	Ny	Bidrag til risiko	Bidrag EIF	Vekter	Vektet bidrag	EIF
Total		20000	20000					%				
BTEX		[redacted]	[redacted]	28	28	17	17	22.25	52.065	1	52.065	
Naftalener		[redacted]	[redacted]	1	1	2.1	2.1	6.74	15.7716	1	15.7716	
2-3 ring PAH		[redacted]	[redacted]	0.12	0.12	0.15	0.15	14.17	33.1578	1	33.1578	
4-ring+ PAH		[redacted]	[redacted]	0.003	0.003	0.05	0.05	0.75	1.755	2	3.51	
Fenol C0-C3		[redacted]	[redacted]	8	8	10	10	11.6	27.144	1	27.144	
Fenol C4-C5		[redacted]	[redacted]	0.13	0.13	0.36	0.36	5.5	12.87	1	12.87	
Fenol C7 (6+)		[redacted]	[redacted]	0.002	0.002	0.04	0.04	0.6	1.404	2	2.808	
Alifater		[redacted]	[redacted]	30	30	40.4	40.4	13.31	31.1454	2	62.2908	
Zink	Metaller I (Zn,	[redacted]	[redacted]	0.06	0.06	0.46	0.46	1.63	3.8142	1	3.8142	
Mercury	Metaller II (Hg,	[redacted]	[redacted]	0.00008	0.00008	0.008	0.008	0.1	0.234	1	0.234	
Korrosjonshemmer	KI-3036	[redacted]	[redacted]	0.5	0.5	0.4	0.4	21.65	50.661	2	101.322	
Avleiringshemmer	SI-4059	[redacted]	[redacted]	23	23	283	283	1.11	2.5974	2	5.1948	
Emulsjonsbryter	EB-8100	[redacted]	[redacted]	1.5	1.5	30	30	0.59	1.3806	2	2.7612	
								100.00	234		322.9434	323

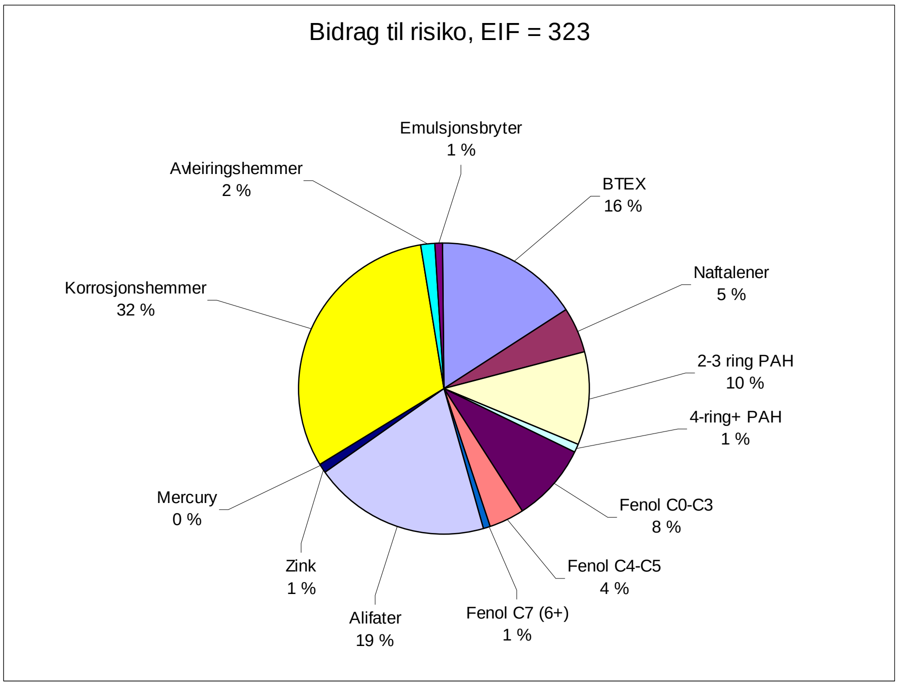

Table 8 Calculated EIF for Case 8.

Case tiltak	**Kjøring 8 - følsomhetstest**							**Simulert EIF**	**185**	**Time-averaged EIF:**		**85**
		Utslipp, tonn/dag		Konsentrasjon, ppm		PNEC ppb						
Komponentgruppe	Produktnavn	Basis	Ny	Basis	Ny	Basis	Ny	Bidrag til risiko	Bidrag EIF	Vekter	Vektet bidrag	EIF
Total		20000	20000					%				
BTEX		[redacted]	[redacted]	22.4	22.4	17	17	21.01	38.8685	1	38.8685	
Naftalener		[redacted]	[redacted]	1.2	1.2	2.1	2.1	9.81	18.1485	1	18.1485	
2-3 ring PAH		[redacted]	[redacted]	0.096	0.096	0.15	0.15	12.89	23.8465	1	23.8465	
4-ring+ PAH		[redacted]	[redacted]	0.0036	0.0036	0.05	0.05	1.07	1.9795	2	3.959	
Fenol C0-C3		[redacted]	[redacted]	6.4	6.4	10	10	10.77	19.9245	1	19.9245	
Fenol C4-C5		[redacted]	[redacted]	0.156	0.156	0.36	0.36	7.92	14.652	1	14.652	
Fenol C7 (6+)		[redacted]	[redacted]	0.0024	0.0024	0.04	0.04	0.87	1.6095	2	3.219	
Alifater		[redacted]	[redacted]	24	24	40.4	40.4	12.08	22.348	2	44.696	
Zink	Metaller I (Zn,	[redacted]	[redacted]	0.048	0.048	0.46	0.46	1.5	2.775	1	2.775	
Mercury	Metaller II (Hg,	[redacted]	[redacted]	0.000064	0.000064	0.008	0.008	0.09	0.1665	1	0.1665	
Korrosjonshemmer	KI-3036	[redacted]	[redacted]	0.4	0.4	0.4	0.4	19.88	36.778	2	73.556	
Avleiringshemmer	SI-4059	[redacted]	[redacted]	27.6	27.6	283	283	1.58	2.923	2	5.846	
Emulsjonsbryter	EB-8100	[redacted]	[redacted]	1.2	1.2	30	30	0.54	0.999	2	1.998	
		[redacted]	[redacted]					**100.01**	**185.0185**		**251.6555**	**252**

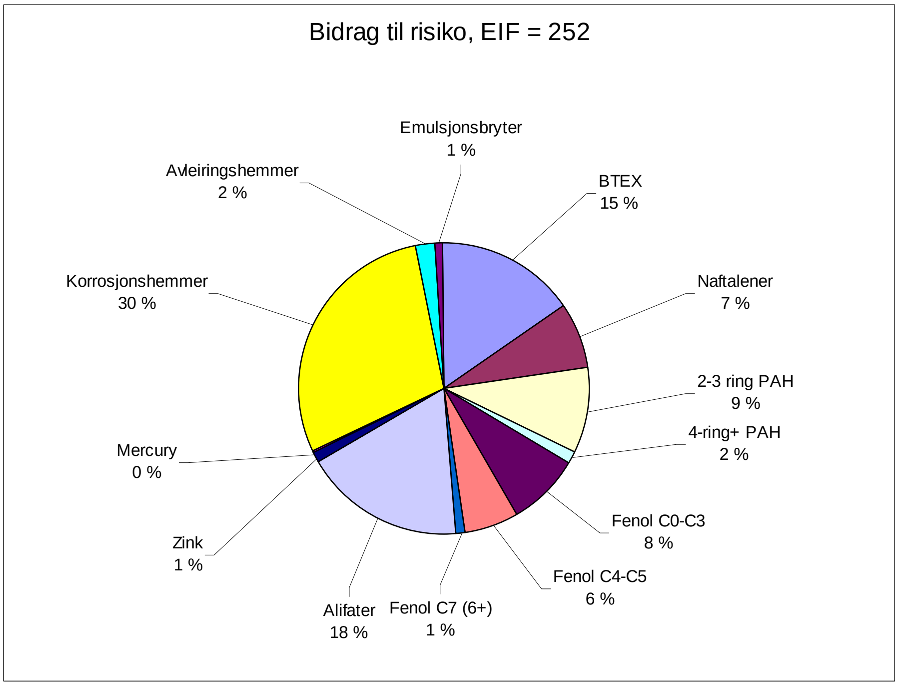

Table 9 Calculated EIF for Case 9.

Case tiltak	**Kjøring 9 - følsomhetstest**							**Simulert EIF**	**249**	**Time-averaged EIF:**		**116**
		Utslipp, tonn/dag		Konsentrasjon, ppm		PNEC ppb						
Komponentgruppe	Produktnavn	Basis	Ny	Basis	Ny	Basis	Ny	Bidrag til risiko	Bidrag EIF	Vekter	Vektet bidrag	EIF
Total		20000	20000					%				
BTEX		[redacted]	[redacted]	22.4	22.4	17	17	16.72	41.6328	1	41.6328	
Naftalener		[redacted]	[redacted]	1.2	1.2	2.1	2.1	8.02	19.9698	1	19.9698	
2-3 ring PAH		[redacted]	[redacted]	0.096	0.096	0.15	0.15	10.98	27.3402	1	27.3402	
4-ring+ PAH		[redacted]	[redacted]	0.0024	0.0024	0.05	0.05	0.57	1.4193	2	2.8386	
Fenol C0-C3		[redacted]	[redacted]	9.6	9.6	10	10	13.72	34.1628	1	34.1628	
Fenol C4-C5		[redacted]	[redacted]	0.104	0.104	0.36	0.36	4.2	10.458	1	10.458	
Fenol C7 (6+)		[redacted]	[redacted]	0.0024	0.0024	0.04	0.04	0.72	1.7928	2	3.5856	
Alifater		[redacted]	[redacted]	36	36	40.4	40.4	16.25	40.4625	2	80.925	
Zink	Metaller I (Zn,	[redacted]	[redacted]	0.048	0.048	0.46	0.46	1.23	3.0627	1	3.0627	
Mercury	Metaller II (Hg,	[redacted]	[redacted]	0.000096	0.000096	0.008	0.008	0.11	0.2739	1	0.2739	
Korrosjonshemmer	KI-3036	[redacted]	[redacted]	0.6	0.6	0.4	0.4	25.91	64.5159	2	129.0318	
Avleiringshemmer	SI-4059	[redacted]	[redacted]	18.4	18.4	283	283	0.86	2.1414	2	4.2828	
Emulsjonsbryter	EB-8100	[redacted]	[redacted]	1.8	1.8	30	30	0.71	1.7679	2	3.5358	
		[redacted]	[redacted]					**100.00**	**249**		**361.0998**	**361**

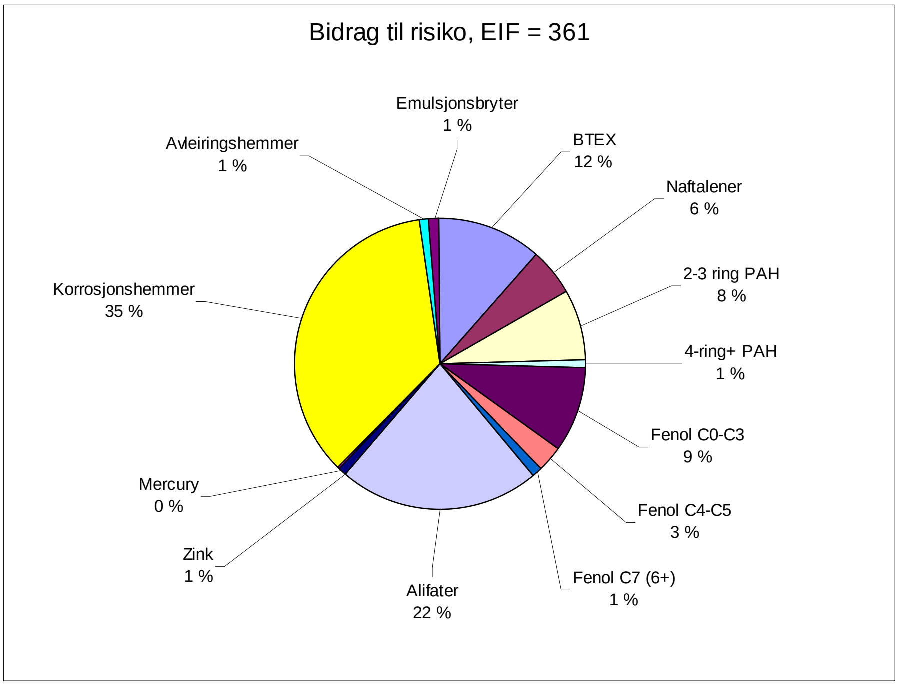

Table 10 Calculated EIF for Case 10.

Case tiltak	**Kjøring 10 - følsomhetstest**							**Simulert EIF**	**245**	**Time-averaged EIF:**		**116**
		Utslipp, tonn/dag		Konsentrasjon, ppm		PNEC ppb						
Komponentgruppe	Produktnavn	Basis	Ny	Basis	Ny	Basis	Ny	Bidrag til risiko	Bidrag EIF	Vekter	Vektet bidrag	EIF
Total		20000	20000					%				
BTEX		[redacted]	[redacted]	33.6	33.6	17	17	24.71	60.5395	1	60.5395	
Naftalener		[redacted]	[redacted]	1.2	1.2	2.1	2.1	7.61	18.6445	1	18.6445	
2-3 ring PAH		[redacted]	[redacted]	0.096	0.096	0.15	0.15	10.22	25.039	1	25.039	
4-ring+ PAH		[redacted]	[redacted]	0.0024	0.0024	0.05	0.05	0.54	1.323	2	2.646	
Fenol C0-C3		[redacted]	[redacted]	9.6	9.6	10	10	13.05	31.9725	1	31.9725	
Fenol C4-C5		[redacted]	[redacted]	0.156	0.156	0.36	0.36	6.24	15.288	1	15.288	
Fenol C7 (6+)		[redacted]	[redacted]	0.0016	0.0016	0.04	0.04	0.43	1.0535	2	2.107	
Alifater		[redacted]	[redacted]	24	24	40.4	40.4	9.61	23.5445	2	47.089	
Zink	Metaller I (Zn,	[redacted]	[redacted]	0.072	0.072	0.46	0.46	1.86	4.557	1	4.557	
Mercury	Metaller II (Hg,	[redacted]	[redacted]	0.000064	0.000064	0.008	0.008	0.07	0.1715	1	0.1715	
Korrosjonshemmer	KI-3036	[redacted]	[redacted]	0.6	0.6	0.4	0.4	24.44	59.878	2	119.756	
Avleiringshemmer	SI-4059	[redacted]	[redacted]	18.4	18.4	283	283	0.8	1.96	2	3.92	
Emulsjonsbryter	EB-8100	[redacted]	[redacted]	1.2	1.2	30	30	0.43	1.0535	2	2.107	
								100.01	**245.0245**		**333.837**	**334**

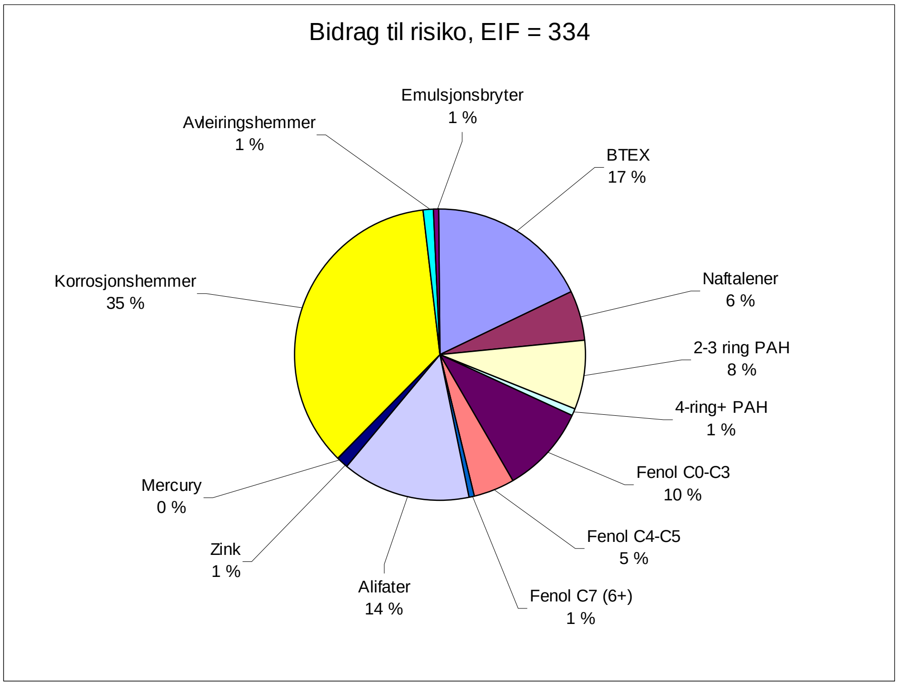

Table 11 Calculated EIF for Case 11.

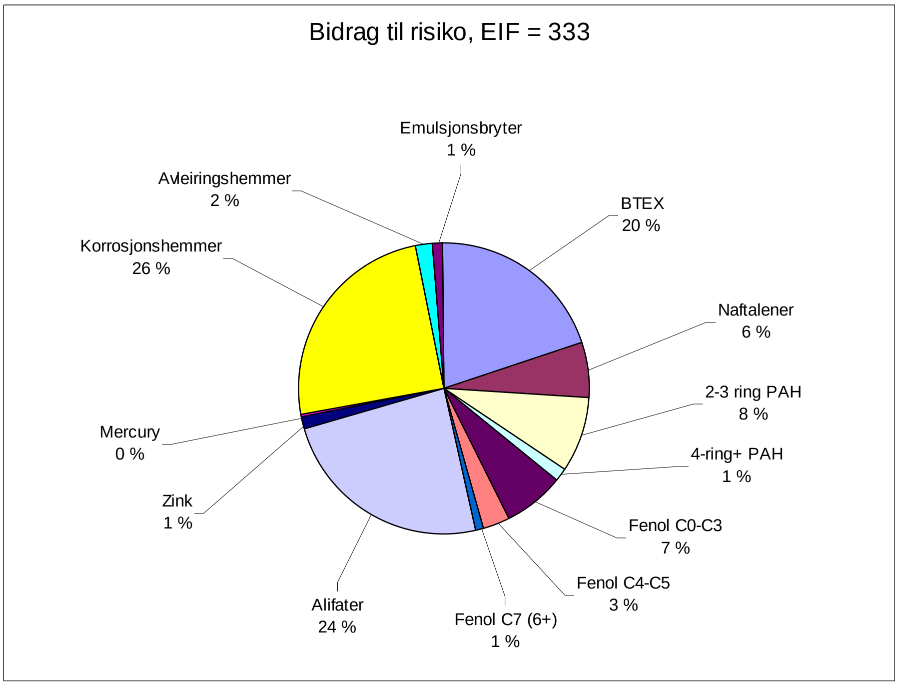

Table 12 Calculated EIF for Case 12.

Case tiltak	Kjøring 12 - følsomhetstest							Simulert EIF	231	Time-averaged EIF:		105
		Utslipp, tonn/dag		Konsentrasjon, ppm		PNEC ppb						
Komponentgruppe	Produktnavn	Basis	Ny	Basis	Ny	Basis	Ny	Bidrag til risiko	Bidrag EIF	Vekter	Vektet bidrag	EIF
Total		20000	20000					%				
BTEX		[redacted]	[redacted]	28	28	17	17	22.31	51.5361	1	51.5361	[redacted]
Naftalener		[redacted]	[redacted]	1	1	2.1	2.1	6.75	15.5925	1	15.5925	[redacted]
2-3 ring PAH		[redacted]	[redacted]	0.12	0.12	0.15	0.15	14.15	32.6865	1	32.6865	[redacted]
4-ring+ PAH		[redacted]	[redacted]	0.003	0.003	0.05	0.05	0.75	1.7325	2	3.465	[redacted]
Fenol C0-C3		[redacted]	[redacted]	8	8	10	10	11.62	26.8422	1	26.8422	[redacted]
Fenol C4-C5		[redacted]	[redacted]	0.13	0.13	0.36	0.36	5.5	12.705	1	12.705	[redacted]
Fenol C7 (6+)		[redacted]	[redacted]	0.002	0.002	0.04	0.04	0.6	1.386	2	2.772	[redacted]
Alifater		[redacted]	[redacted]	30	30	40.4	40.4	13.29	30.6999	2	61.3998	[redacted]
Zink	Metaller I (Zn, [redacted]	[redacted]	[redacted]	0.06	0.06	0.46	0.46	1.63	3.7653	1	3.7653	[redacted]
Mercury	Metaller II (Hg, [redacted]	[redacted]	[redacted]	0.00008	0.00008	0.008	0.008	0.1	0.231	1	0.231	[redacted]
Korrosjonshemmer	KI-3036	[redacted]	[redacted]	0.5	0.5	0.4	0.4	21.62	49.9422	2	99.8844	[redacted]
Avleiringshemmer	SI-4059	[redacted]	[redacted]	23	23	283	283	1.11	2.5641	2	5.1282	[redacted]
Emulsjonsbryter	EB-8100	[redacted]	[redacted]	1.5	1.5	30	30	0.59	1.3629	2	2.7258	[redacted]
		[redacted]	[redacted]					100.02	231.0462		318.7338	319

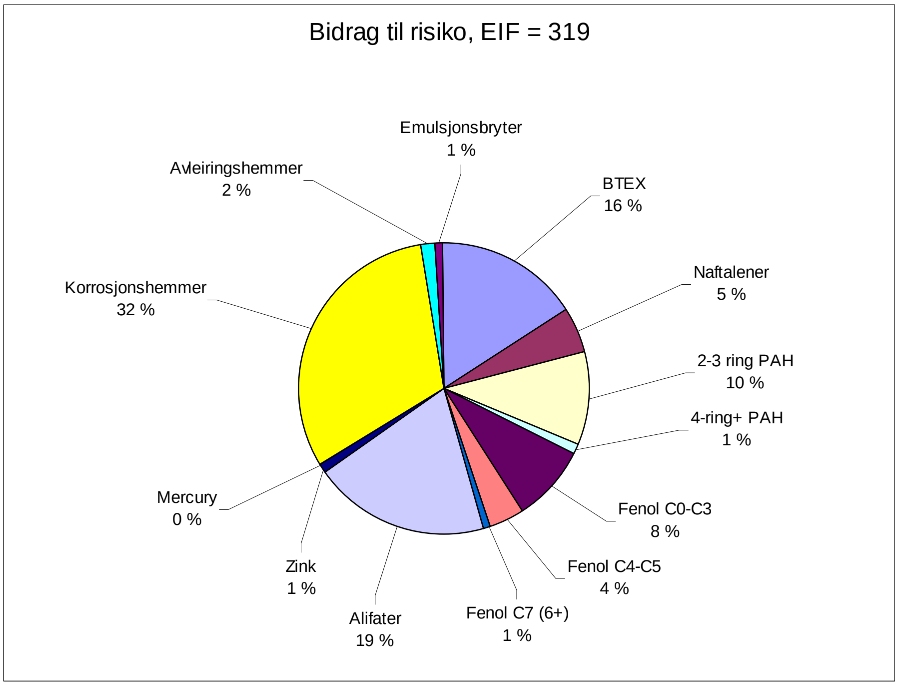

Table 13 Calculated EIF for Case 13.

Case tiltak	**Kjøring 13 - følsomhetstest**							**Simulert EIF**	**236**	**Time-averaged EIF:**		**95**
		Utslipp, tonn/dag		Konsentrasjon, ppm		PNEC ppb						
Komponentgruppe	Produktnavn	Basis	Ny	Basis	Ny	Basis	Ny	Bidrag til risiko	Bidrag EIF	Vekter	Vektet bidrag	EIF
Total		20000	20000					%				
BTEX		[redacted]	[redacted]	22.4	22.4	17	17	18.98	44.7928	1	44.7928	
Naftalener		[redacted]	[redacted]	0.8	0.8	2.1	2.1	5.63	13.2868	1	13.2868	
2-3 ring PAH		[redacted]	[redacted]	0.144	0.144	0.15	0.15	18.2	42.952	1	42.952	
4-ring+ PAH		[redacted]	[redacted]	0.0024	0.0024	0.05	0.05	0.61	1.4396	2	2.8792	
Fenol C0-C3		[redacted]	[redacted]	9.6	9.6	10	10	15.28	36.0608	1	36.0608	
Fenol C4-C5		[redacted]	[redacted]	0.156	0.156	0.36	0.36	7.16	16.8976	1	16.8976	
Fenol C7 (6+)		[redacted]	[redacted]	0.0024	0.0024	0.04	0.04	0.78	1.8408	2	3.6816	
Alifater		[redacted]	[redacted]	24	24	40.4	40.4	10.88	25.6768	2	51.3536	
Zink	Metaller I (Zn, [redacted]	[redacted]	[redacted]	0.072	0.072	0.46	0.46	2.15	5.074	1	5.074	
Mercury	Metaller II (Hg, [redacted]	[redacted]	[redacted]	0.000096	0.000096	0.008	0.008	0.12	0.2832	1	0.2832	
Korrosjonshemmer	KI-3036	[redacted]	[redacted]	0.4	0.4	0.4	0.4	18	42.48	2	84.96	
Avleiringshemmer	SI-4059	[redacted]	[redacted]	27.6	27.6	283	283	1.43	3.3748	2	6.7496	
Emulsjonsbryter	EB-8100	[redacted]	[redacted]	1.8	1.8	30	30	0.77	1.8172	2	3.6344	
		[redacted]	[redacted]					**99.99**	**235.9764**		**312.6056**	**313**

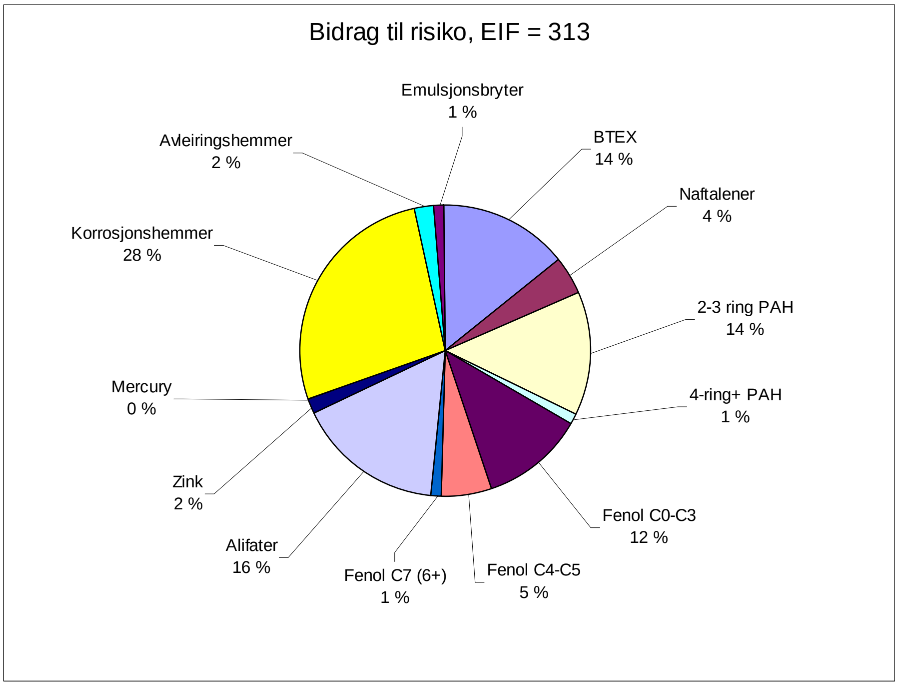

Table 14 Calculated EIF for Case 14.

Case tiltak	**Kjøring 14 - følsomhetstest**							**Simulert EIF**	**264**	**Time-averaged EIF:**		**112**
		Utslipp, tonn/dag		Konsentrasjon, ppm		PNEC ppb						
Komponentgruppe	Produktnavn	Basis	Ny	Basis	Ny	Basis	Ny	Bidrag til risiko	Bidrag EIF	Vekter	Vektet bidrag	EIF
Total		20000	20000					%				
BTEX		[redacted]	[redacted]	22.4	22.4	17	17	17.13	45.2232	1	45.2232	[redacted]
Naftalener		[redacted]	[redacted]	0.8	0.8	2.1	2.1	5.18	13.6752	1	13.6752	[redacted]
2-3 ring PAH		[redacted]	[redacted]	0.144	0.144	0.15	0.15	17.19	45.3816	1	45.3816	[redacted]
4-ring+ PAH		[redacted]	[redacted]	0.0036	0.0036	0.05	0.05	0.91	2.4024	2	4.8048	[redacted]
Fenol C0-C3		[redacted]	[redacted]	6.4	6.4	10	10	8.92	23.5488	1	23.5488	[redacted]
Fenol C4-C5		[redacted]	[redacted]	0.104	0.104	0.36	0.36	4.24	11.1936	1	11.1936	[redacted]
Fenol C7 (6+)		[redacted]	[redacted]	0.0024	0.0024	0.04	0.04	0.73	1.9272	2	3.8544	[redacted]
Alifater		[redacted]	[redacted]	36	36	40.4	40.4	16.17	42.6888	2	85.3776	[redacted]
Zink	Metaller I (Zn,	[redacted]	[redacted]	0.072	0.072	0.46	0.46	1.99	5.2536	1	5.2536	[redacted]
Mercury	Metaller II (Hg,	[redacted]	[redacted]	0.000064	0.000064	0.008	0.008	0.07	0.1848	1	0.1848	[redacted]
Korrosjonshemmer	KI-3036	[redacted]	[redacted]	0.6	0.6	0.4	0.4	26.17	69.0888	2	138.1776	[redacted]
Avleiringshemmer	SI-4059	[redacted]	[redacted]	18.4	18.4	283	283	0.85	2.244	2	4.488	[redacted]
Emulsjonsbryter	EB-8100	[redacted]	[redacted]	1.2	1.2	30	30	0.46	1.2144	2	2.4288	[redacted]
		[redacted]	[redacted]					**100.01**	**264.0264**		**383.592**	**384**

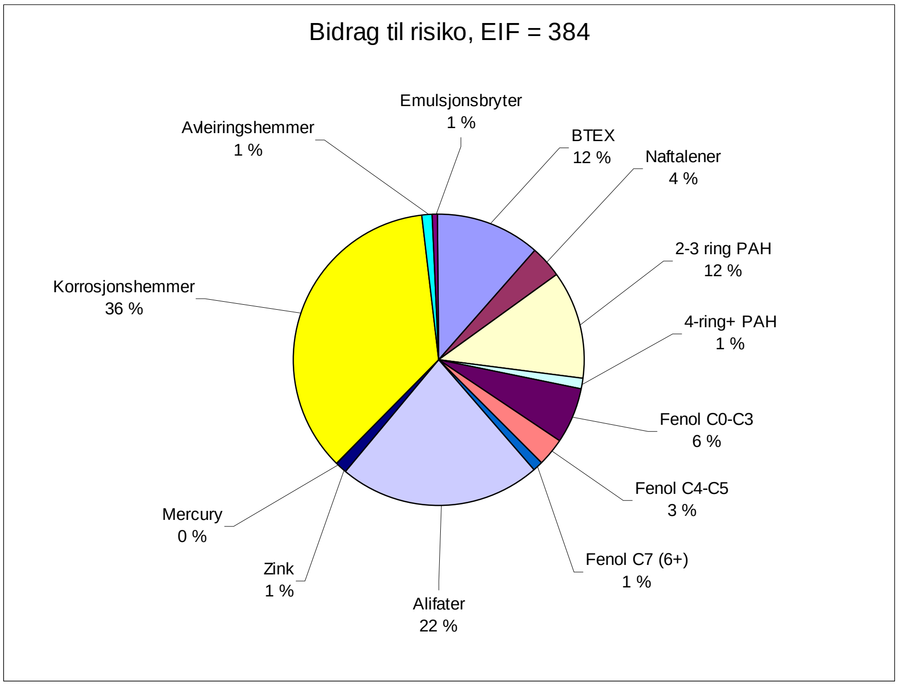

Table 15 Calculated EIF for Case 15.

Case tiltak	**Kjøring 15 - følsomhetstest**							**Simulert EIF**	**249**	**Time-averaged EIF:**		**112**
		Utslipp, tonn/dag		Konsentrasjon, ppm		PNEC ppb						
Komponentgruppe	Produktnavn	Basis	Ny	Basis	Ny	Basis	Ny	Bidrag til risiko	Bidrag EIF	Vekter	Vektet bidrag	EIF
Total		20000	20000					%				
BTEX		[redacted]	[redacted]	33.6	33.6	17	17	25.5	63.495	1	63.495	
Naftalener		[redacted]	[redacted]	0.8	0.8	2.1	2.1	4.94	12.3006	1	12.3006	
2-3 ring PAH		[redacted]	[redacted]	0.144	0.144	0.15	0.15	16.15	40.2135	1	40.2135	
4-ring+ PAH		[redacted]	[redacted]	0.0036	0.0036	0.05	0.05	0.86	2.1414	2	4.2828	
Fenol C0-C3		[redacted]	[redacted]	6.4	6.4	10	10	8.52	21.2148	1	21.2148	
Fenol C4-C5		[redacted]	[redacted]	0.156	0.156	0.36	0.36	6.32	15.7368	1	15.7368	
Fenol C7 (6+)		[redacted]	[redacted]	0.0016	0.0016	0.04	0.04	0.44	1.0956	2	2.1912	
Alifater		[redacted]	[redacted]	24	24	40.4	40.4	9.66	24.0534	2	48.1068	
Zink	Metaller I (Zn,	[redacted]	[redacted]	0.048	0.048	0.46	0.46	1.2	2.988	1	2.988	
Mercury	Metaller II (Hg,	[redacted]	[redacted]	0.000096	0.000096	0.008	0.008	0.11	0.2739	1	0.2739	
Korrosjonshemmer	KI-3036	[redacted]	[redacted]	0.6	0.6	0.4	0.4	24.82	61.8018	2	123.6036	
Avleiringshemmer	SI-4059	[redacted]	[redacted]	18.4	18.4	283	283	0.8	1.992	2	3.984	
Emulsjonsbryter	EB-8100	[redacted]	[redacted]	1.8	1.8	30	30	0.68	1.6932	2	3.3864	
								100.00	**249**		**341.7774**	**342**

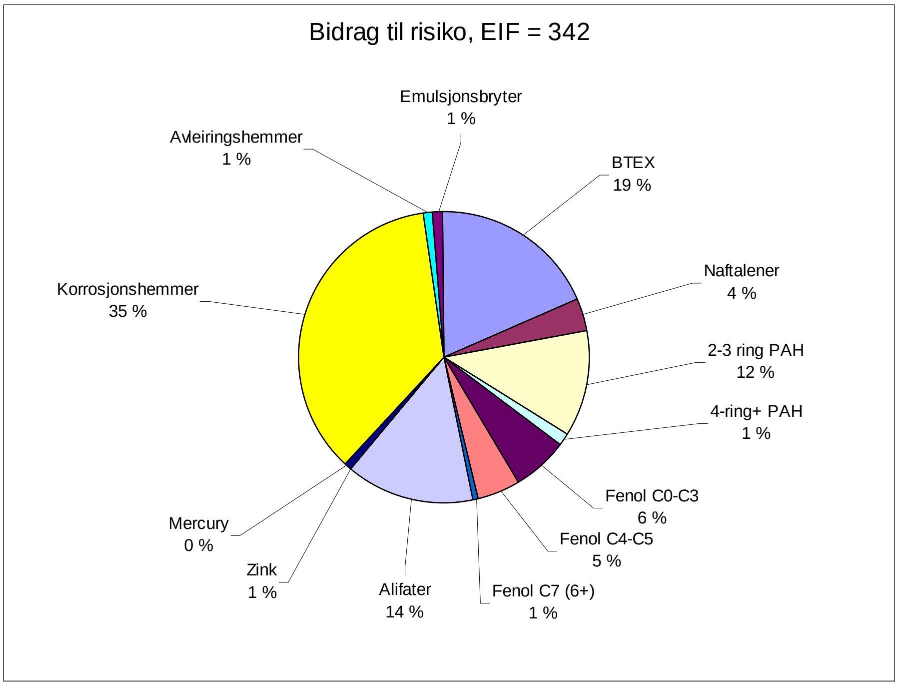

Table 16 Calculated EIF for Case 16.

Case tiltak	Kjøring 16 - følsomhetstest							Simulert EIF	269	Time-averaged EIF:		103
		Utslipp, tonn/dag		Konsentrasjon, ppm		PNEC ppb						
Komponentgruppe	Produktnavn	Basis	Ny	Basis	Ny	Basis	Ny	Bidrag til risiko	Bidrag EIF	Vekter	Vektet bidrag	EIF
Total		20000	20000					%				
BTEX		[redacted]	[redacted]	33.6	33.6	17	17	25.33	68.1377	1	68.1377	
Naftalener		[redacted]	[redacted]	0.8	0.8	2.1	2.1	4.97	13.3693	1	13.3693	
2-3 ring PAH		[redacted]	[redacted]	0.144	0.144	0.15	0.15	16.53	44.4657	1	44.4657	
4-ring+ PAH		[redacted]	[redacted]	0.0024	0.0024	0.05	0.05	0.55	1.4795	2	2.959	
Fenol C0-C3		[redacted]	[redacted]	9.6	9.6	10	10	13.4	36.046	1	36.046	
Fenol C4-C5		[redacted]	[redacted]	0.104	0.104	0.36	0.36	4.08	10.9752	1	10.9752	
Fenol C7 (6+)		[redacted]	[redacted]	0.0016	0.0016	0.04	0.04	0.45	1.2105	2	2.421	
Alifater		[redacted]	[redacted]	36	36	40.4	40.4	15.55	41.8295	2	83.659	
Zink	Metaller I (Zn,	[redacted]	[redacted]	0.048	0.048	0.46	0.46	1.21	3.2549	1	3.2549	
Mercury	Metaller II (Hg,	[redacted]	[redacted]	0.000064	0.000064	0.008	0.008	0.07	0.1883	1	0.1883	
Korrosjonshemmer	KI-3036	[redacted]	[redacted]	0.4	0.4	0.4	0.4	16.13	43.3897	2	86.7794	
Avleiringshemmer	SI-4059	[redacted]	[redacted]	27.6	27.6	283	283	1.3	3.497	2	6.994	
Emulsjonsbryter	EB-8100	[redacted]	[redacted]	1.2	1.2	30	30	0.44	1.1836	2	2.3672	
								100.01	**269.0269**		**361.6167**	**362**

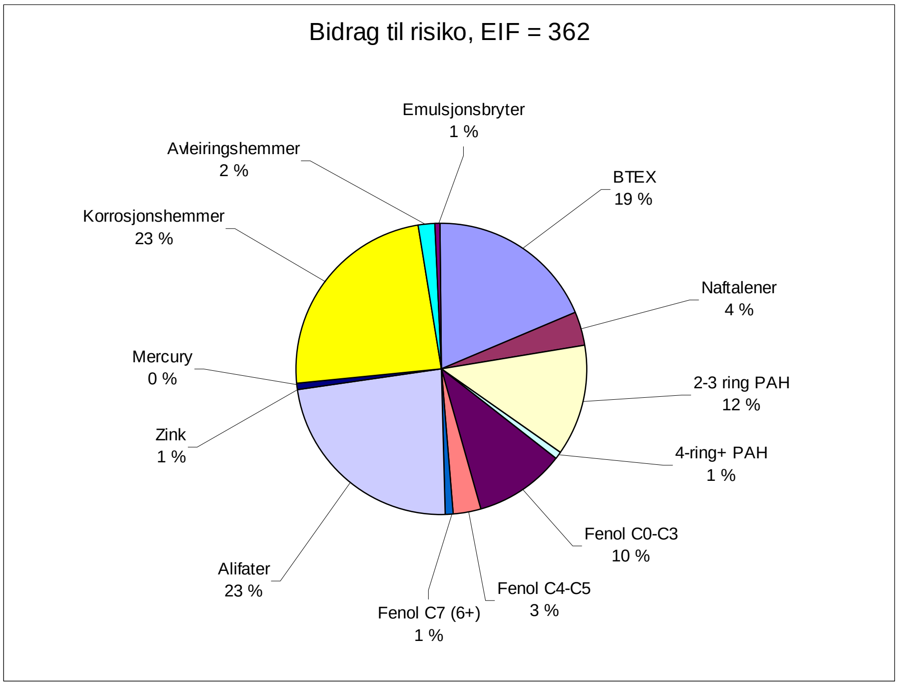

Table 17 Calculated EIF for Case 17.

Case tiltak	**Kjøring 17 - følsomhetstest**							**Simulert EIF**	**224**	**Time-averaged EIF:**		**105**
		Utslipp, tonn/dag		Konsentrasjon, ppm		PNEC ppb						
Komponentgruppe	Produktnavn	Basis	Ny	Basis	Ny	Basis	Ny	Bidrag til risiko	Bidrag EIF	Vekter	Vektet bidrag	EIF
Total		20000	20000					%				
BTEX				28	28	17	17	22.28	49.9072	1	49.9072	
Naftalener				1	1	2.1	2.1	6.75	15.12	1	15.12	
2-3 ring PAH				0.12	0.12	0.15	0.15	14.15	31.696	1	31.696	
4-ring+ PAH				0.003	0.003	0.05	0.05	0.75	1.68	2	3.36	
Fenol C0-C3				8	8	10	10	11.62	26.0288	1	26.0288	
Fenol C4-C5				0.13	0.13	0.36	0.36	5.5	12.32	1	12.32	
Fenol C7 (6+)				0.002	0.002	0.04	0.04	0.6	1.344	2	2.688	
Alifater				30	30	40.4	40.4	13.29	29.7696	2	59.5392	
Zink	Metaller I (Zn,			0.06	0.06	0.46	0.46	1.64	3.6736	1	3.6736	
Mercury	Metaller II (Hg,			0.00008	0.00008	0.008	0.008	0.1	0.224	1	0.224	
Korrosjonshemmer	KI-3036			0.5	0.5	0.4	0.4	21.65	48.496	2	96.992	
Avleiringshemmer	SI-4059			23	23	283	283	1.11	2.4864	2	4.9728	
Emulsjonsbryter	EB-8100			1.5	1.5	30	30	0.59	1.3216	2	2.6432	
								100.03	**224.0672**		**309.1648**	**309**

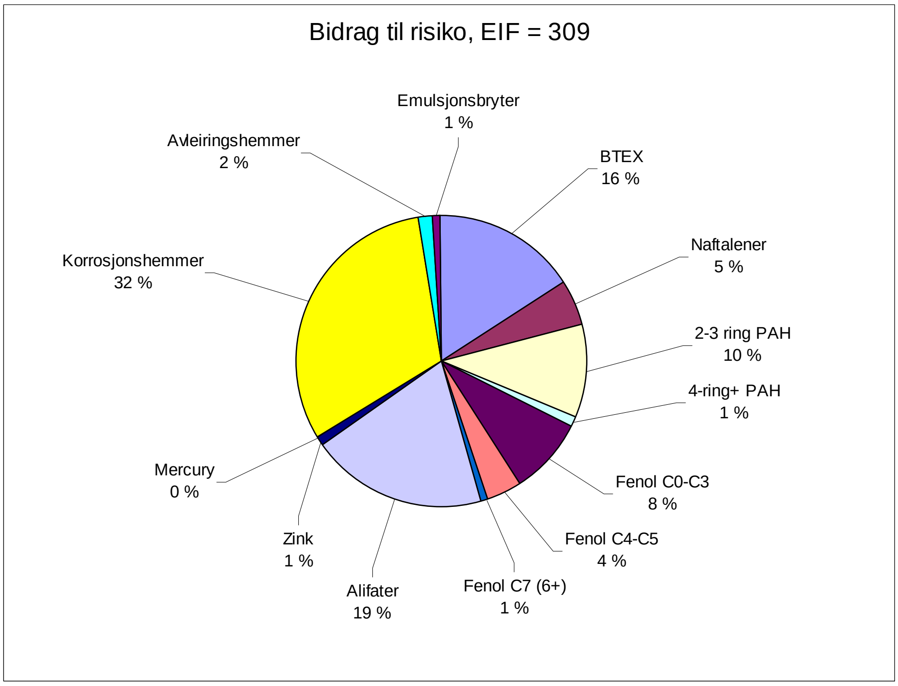

Table 18 Calculated EIF for Case 18.

Case tiltak	**Kjøring 18 - følsomhetstest**							**Simulert EIF**	**204**	**Time-averaged EIF:**		**103**
		Utslipp, tonn/dag		Konsentrasjon, ppm		PNEC ppb						
Komponentgruppe	Produktnavn	Basis	Ny	Basis	Ny	Basis	Ny	Bidrag til risiko	Bidrag EIF	Vekter	Vektet bidrag	EIF
Total		20000	20000					%				
BTEX		[redacted]	[redacted]	22.4	22.4	17	17	17.3	35.292	1	35.292	
Naftalener		[redacted]	[redacted]	1.2	1.2	2.1	2.1	8.1	16.524	1	16.524	
2-3 ring PAH		[redacted]	[redacted]	0.144	0.144	0.15	0.15	16.51	33.6804	1	33.6804	
4-ring+ PAH		[redacted]	[redacted]	0.0036	0.0036	0.05	0.05	0.88	1.7952	2	3.5904	
Fenol C0-C3		[redacted]	[redacted]	9.6	9.6	10	10	13.98	28.5192	1	28.5192	
Fenol C4-C5		[redacted]	[redacted]	0.104	0.104	0.36	0.36	4.14	8.4456	1	8.4456	
Fenol C7 (6+)		[redacted]	[redacted]	0.0016	0.0016	0.04	0.04	0.45	0.918	2	1.836	
Alifater		[redacted]	[redacted]	24	24	40.4	40.4	9.85	20.094	2	40.188	
Zink	Metaller I (Zn,	[redacted]	[redacted]	0.048	0.048	0.46	0.46	1.26	2.5704	1	2.5704	
Mercury	Metaller II (Hg,	[redacted]	[redacted]	0.000096	0.000096	0.008	0.008	0.11	0.2244	1	0.2244	
Korrosjonshemmer	KI-3036	[redacted]	[redacted]	0.6	0.6	0.4	0.4	25.67	52.3668	2	104.7336	
Avleiringshemmer	SI-4059	[redacted]	[redacted]	27.6	27.6	283	283	1.29	2.6316	2	5.2632	
Emulsjonsbryter	EB-8100	[redacted]	[redacted]	1.2	1.2	30	30	0.45	0.918	2	1.836	
		[redacted]	[redacted]					**99.99**	**203.9796**		**282.7032**	**283**

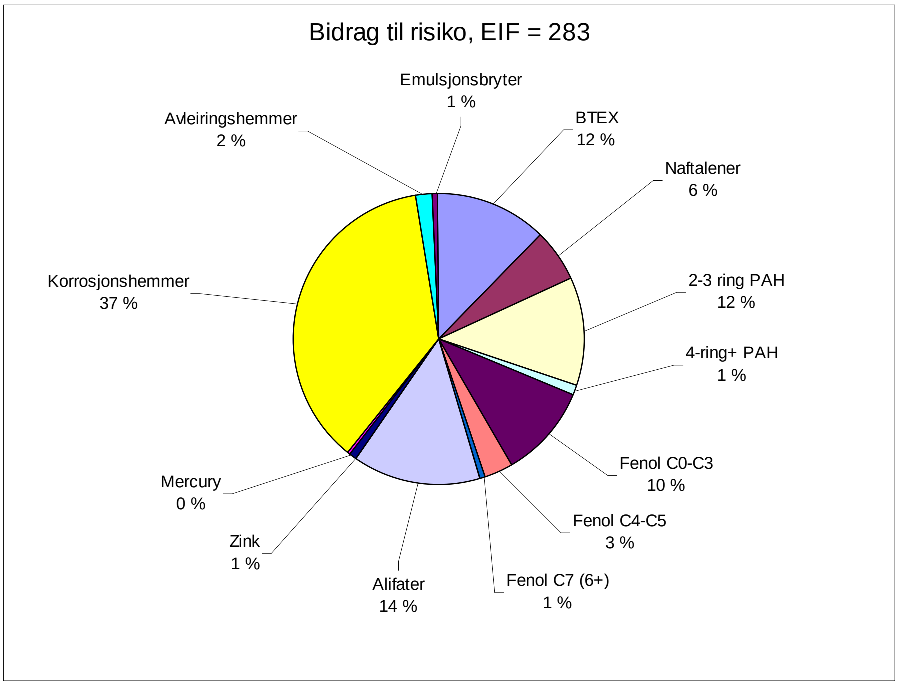

Table 19 Calculated EIF for Case 19.

Case tiltak	**Kjøring 19 - følsomhetstest**							**Simulert EIF**	**208**	**Time-averaged EIF:**		**102**
		Utslipp, tonn/dag		Konsentrasjon, ppm		PNEC ppb						
Komponentgruppe	Produktnavn	Basis	Ny	Basis	Ny	Basis	Ny	Bidrag til risiko	Bidrag EIF	Vekter	Vektet bidrag	EIF
Total		20000	20000					%				
BTEX		[redacted]	[redacted]	22.4	22.4	17	17	17.92	37.2736	1	37.2736	
Naftalener		[redacted]	[redacted]	1.2	1.2	2.1	2.1	8.5	17.68	1	17.68	
2-3 ring PAH		[redacted]	[redacted]	0.144	0.144	0.15	0.15	18.38	38.2304	1	38.2304	
4-ring+ PAH		[redacted]	[redacted]	0.0024	0.0024	0.05	0.05	0.6	1.248	2	2.496	
Fenol C0-C3		[redacted]	[redacted]	6.4	6.4	10	10	9.27	19.2816	1	19.2816	
Fenol C4-C5		[redacted]	[redacted]	0.156	0.156	0.36	0.36	7	14.56	1	14.56	
Fenol C7 (6+)		[redacted]	[redacted]	0.0016	0.0016	0.04	0.04	0.48	0.9984	2	1.9968	
Alifater		[redacted]	[redacted]	36	36	40.4	40.4	17.38	36.1504	2	72.3008	
Zink	Metaller I (Zn,	[redacted]	[redacted]	0.048	0.048	0.46	0.46	1.27	2.6416	1	2.6416	
Mercury	Metaller II (Hg,	[redacted]	[redacted]	0.000064	0.000064	0.008	0.008	0.08	0.1664	1	0.1664	
Korrosjonshemmer	KI-3036	[redacted]	[redacted]	0.4	0.4	0.4	0.4	17.45	36.296	2	72.592	
Avleiringshemmer	SI-4059	[redacted]	[redacted]	18.4	18.4	283	283	0.92	1.9136	2	3.8272	
Emulsjonsbryter	EB-8100	[redacted]	[redacted]	1.8	1.8	30	30	0.75	1.56	2	3.12	
		[redacted]	[redacted]					**100.00**	**208**		**286.1664**	**286**

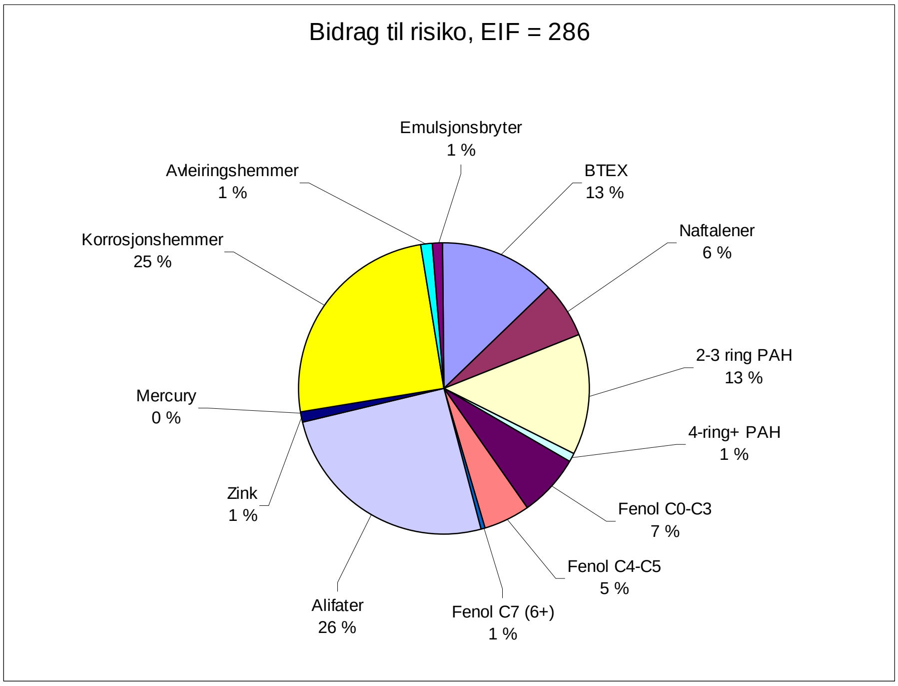

Table 20 Calculated EIF for Case 20.

Case tiltak	**Kjøring 20 - følsomhetstest**							**Simulert EIF**	**235**	**Time-averaged EIF:**		**103**
		Utslipp, tonn/dag		Konsentrasjon, ppm		PNEC ppb						
Komponentgruppe	Produktnavn	Basis	Ny	Basis	Ny	Basis	Ny	Bidrag til risiko	Bidrag EIF	Vekter	Vektet bidrag	EIF
Total		20000	20000					%				
BTEX		[redacted]	[redacted]	33.6	33.6	17	17	27.67	65.0245	1	65.0245	[redacted]
Naftalener		[redacted]	[redacted]	1.2	1.2	2.1	2.1	8.42	19.787	1	19.787	[redacted]
2-3 ring PAH		[redacted]	[redacted]	0.144	0.144	0.15	0.15	17.65	41.4775	1	41.4775	[redacted]
4-ring+ PAH		[redacted]	[redacted]	0.0024	0.0024	0.05	0.05	0.59	1.3865	2	2.773	[redacted]
Fenol C0-C3		[redacted]	[redacted]	6.4	6.4	10	10	9.23	21.6905	1	21.6905	[redacted]
Fenol C4-C5		[redacted]	[redacted]	0.104	0.104	0.36	0.36	4.36	10.246	1	10.246	[redacted]
Fenol C7 (6+)		[redacted]	[redacted]	0.0024	0.0024	0.04	0.04	0.75	1.7625	2	3.525	[redacted]
Alifater		[redacted]	[redacted]	24	24	40.4	40.4	10.57	24.8395	2	49.679	[redacted]
Zink	Metaller I (Zn,	[redacted]	[redacted]	0.072	0.072	0.46	0.46	2.04	4.794	1	4.794	[redacted]
Mercury	Metaller II (Hg,	[redacted]	[redacted]	0.000096	0.000096	0.008	0.008	0.12	0.282	1	0.282	[redacted]
Korrosjonshemmer	KI-3036	[redacted]	[redacted]	0.4	0.4	0.4	0.4	17.25	40.5375	2	81.075	[redacted]
Avleiringshemmer	SI-4059	[redacted]	[redacted]	18.4	18.4	283	283	0.88	2.068	2	4.136	[redacted]
Emulsjonsbryter	EB-8100	[redacted]	[redacted]	1.2	1.2	30	30	0.47	1.1045	2	2.209	[redacted]
		[redacted]	[redacted]					**100.00**	**235**		**306.6985**	**307**

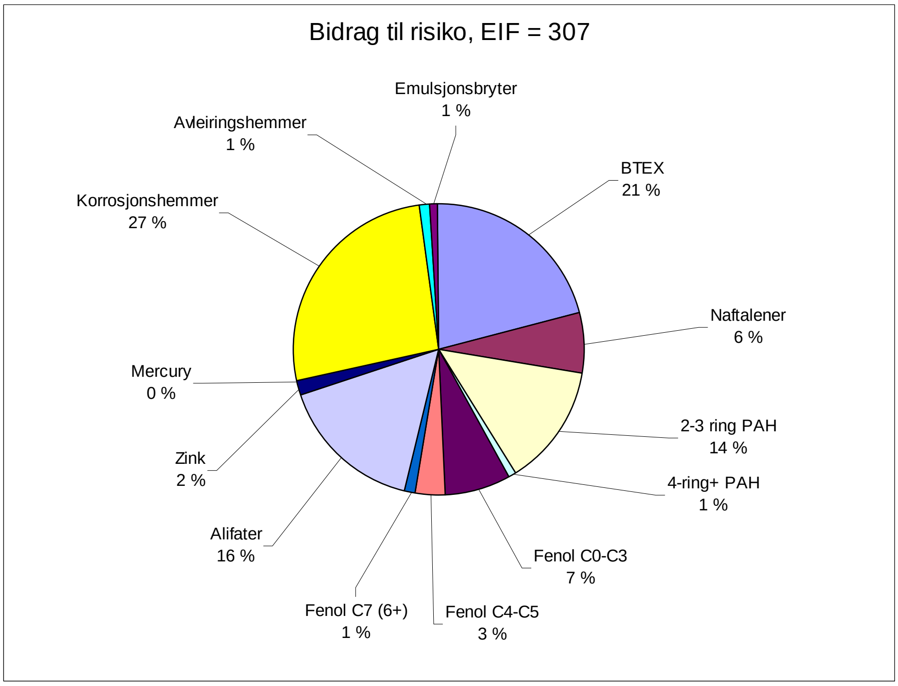

Table 21 Calculated EIF for Case 21.

Case tiltak	**Kjøring 21 - følsomhetstest**							**Simulert EIF**	**303**	**Time-averaged EIF:**		**137**
		Utslipp, tonn/dag		Konsentrasjon, ppm		PNEC ppb						
Komponentgruppe	Produktnavn	Basis	Ny	Basis	Ny	Basis	Ny	Bidrag til risiko	Bidrag EIF	Vekter	Vektet bidrag	EIF
Total		20000	20000					%				
BTEX		[redacted]	[redacted]	33.6	33.6	17	17	21.57	65.3571	1	65.3571	
Naftalener				1.2	1.2	2.1	2.1	6.71	20.3313	1	20.3313	
2-3 ring PAH				0.144	0.144	0.15	0.15	14.42	43.6926	1	43.6926	
4-ring+ PAH				0.0036	0.0036	0.05	0.05	0.76	2.3028	2	4.6056	
Fenol C0-C3				9.6	9.6	10	10	11.48	34.7844	1	34.7844	
Fenol C4-C5				0.156	0.156	0.36	0.36	5.56	16.8468	1	16.8468	
Fenol C7 (6+)				0.0024	0.0024	0.04	0.04	0.61	1.8483	2	3.6966	
Alifater				36	36	40.4	40.4	13.59	41.1777	2	82.3554	
Zink	Metaller I (Zn,			0.072	0.072	0.46	0.46	1.64	4.9692	1	4.9692	
Mercury	Metaller II (Hg,			0.000096	0.000096	0.008	0.008	0.1	0.303	1	0.303	
Korrosjonshemmer	KI-3036			0.6	0.6	0.4	0.4	21.83	66.1449	2	132.2898	
Avleiringshemmer	SI-4059			27.6	27.6	283	283	1.13	3.4239	2	6.8478	
Emulsjonsbryter	EB-8100			1.8	1.8	30	30	0.6	1.818	2	3.636	
								100.00	**303**		**419.7156**	**420**

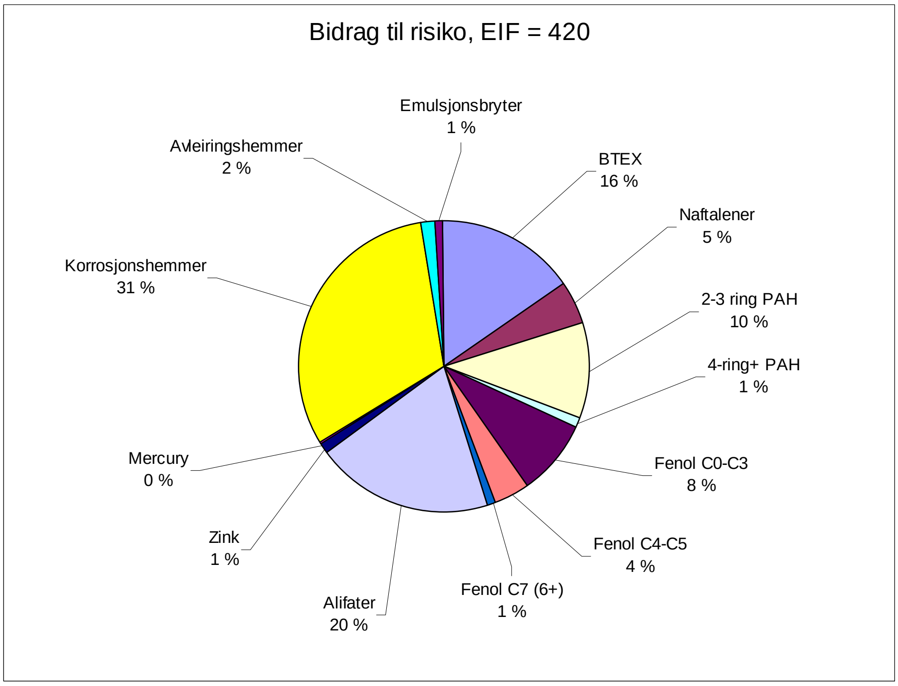

Table 22 Calculated EIF for Case 22.

Case tiltak	**Kjøring 22 - følsomhetstest**							**Simulert EIF**	**285**	**Time-averaged EIF:**		**138**
		Utslipp, tonn/dag		Konsentrasjon, ppm		PNEC ppb						
Komponentgruppe	Produktnavn	Basis	Ny	Basis	Ny	Basis	Ny	Bidrag til risiko	Bidrag EIF	Vekter	Vektet bidrag	EIF
Total		20000	20000					%				
BTEX		[redacted]	[redacted]	33.6	33.6	17	17	21.66	61.731	1	61.731	
Naftalener		[redacted]	[redacted]	1.2	1.2	2.1	2.1	6.73	19.1805	1	19.1805	
2-3 ring PAH		[redacted]	[redacted]	0.144	0.144	0.15	0.15	14.38	40.983	1	40.983	
4-ring+ PAH		[redacted]	[redacted]	0.0036	0.0036	0.05	0.05	0.76	2.166	2	4.332	
Fenol C0-C3		[redacted]	[redacted]	9.6	9.6	10	10	11.52	32.832	1	32.832	
Fenol C4-C5		[redacted]	[redacted]	0.156	0.156	0.36	0.36	5.56	15.846	1	15.846	
Fenol C7 (6+)		[redacted]	[redacted]	0.0024	0.0024	0.04	0.04	0.61	1.7385	2	3.477	
Alifater		[redacted]	[redacted]	36	36	40.4	40.4	13.55	38.6175	2	77.235	
Zink	Metaller I (Zn,	[redacted]	[redacted]	0.072	0.072	0.46	0.46	1.64	4.674	1	4.674	
Mercury	Metaller II (Hg,	[redacted]	[redacted]	0.000064	0.000064	0.008	0.008	0.06	0.171	1	0.171	
Korrosjonshemmer	KI-3036	[redacted]	[redacted]	0.6	0.6	0.4	0.4	21.81	62.1585	2	124.317	
Avleiringshemmer	SI-4059	[redacted]	[redacted]	27.6	27.6	283	283	1.13	3.2205	2	6.441	
Emulsjonsbryter	EB-8100	[redacted]	[redacted]	1.8	1.8	30	30	0.6	1.71	2	3.42	
		[redacted]	[redacted]					**100.01**	**285.0285**		**394.6395**	**395**

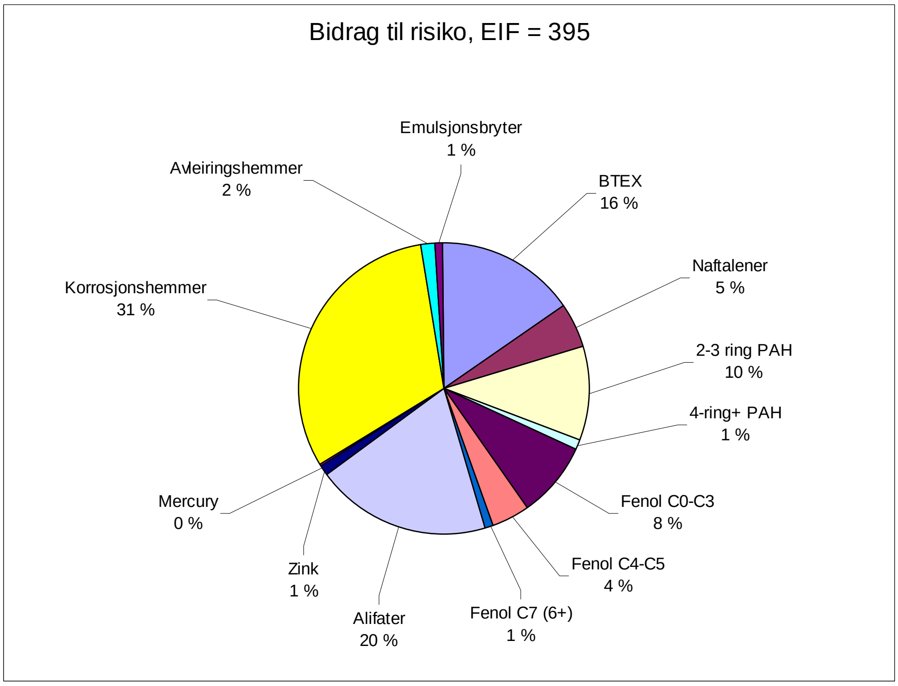

Table 23 Calculated EIF for Case 23.

Case tiltak	Kjøring 23 - følsomhetstest							Simulert EIF	228	Time-averaged EIF:		106
		Utslipp, tonn/dag		Konsentrasjon, ppm		PNEC ppb						
Komponentgruppe	Produktnavn	Basis	Ny	Basis	Ny	Basis	Ny	Bidrag til risiko	Bidrag EIF	Vekter	Vektet bidrag	EIF
Total		20000	20000					%				
BTEX		[redacted]	[redacted]	28	28	17	17	22.24	50.7072	1	50.7072	[redacted]
Naftalener		[redacted]	[redacted]	1	1	2.1	2.1	6.74	15.3672	1	15.3672	[redacted]
2-3 ring PAH		[redacted]	[redacted]	0.12	0.12	0.15	0.15	14.17	32.3076	1	32.3076	[redacted]
4-ring+ PAH		[redacted]	[redacted]	0.003	0.003	0.05	0.05	0.75	1.71	2	3.42	[redacted]
Fenol C0-C3		[redacted]	[redacted]	8	8	10	10	11.6	26.448	1	26.448	[redacted]
Fenol C4-C5		[redacted]	[redacted]	0.13	0.13	0.36	0.36	5.5	12.54	1	12.54	[redacted]
Fenol C7 (6+)		[redacted]	[redacted]	0.002	0.002	0.04	0.04	0.6	1.368	2	2.736	[redacted]
Alifater		[redacted]	[redacted]	30	30	40.4	40.4	13.32	30.3696	2	60.7392	[redacted]
Zink	Metaller I (Zn,	[redacted]	[redacted]	0.06	0.06	0.46	0.46	1.64	3.7392	1	3.7392	[redacted]
Mercury	Metaller II (Hg,	[redacted]	[redacted]	0.00008	0.00008	0.008	0.008	0.1	0.228	1	0.228	[redacted]
Korrosjonshemmer	KI-3036	[redacted]	[redacted]	0.5	0.5	0.4	0.4	21.65	49.362	2	98.724	[redacted]
Avleiringshemmer	SI-4059	[redacted]	[redacted]	23	23	283	283	1.11	2.5308	2	5.0616	[redacted]
Emulsjonsbryter	EB-8100	[redacted]	[redacted]	1.5	1.5	30	30	0.59	1.3452	2	2.6904	[redacted]
		[redacted]	[redacted]					100.01	228.0228		314.7084	315