Surface Water Pollution Risk Assessment

Barking

S Norton & Co Ltd

Prepared by:

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SLR Project No.: 416.065442.00001

8 May 2024

Revision: 02

Revision Record

Revision	Date	Prepared By	Checked By	Authorised By
01	7 May 2024	R. Coldicott	M. Dutton	M. Dutton
02	8 May 2024	R. Coldicott	M. Dutton	M. Dutton
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Table of Contents

Tables in Text

1.0 Introduction

S Norton & Co Ltd (S Norton) has instructed SLR Consulting (SLR) to undertake a Surface Water Pollution Risk Assessment (often referred to as an H1 assessment) of effluent from their metals recycling site in Barking, London.

Effluent from the site consists of contaminated rainwater run-off from the metals processing areas of the yard which is collected in the Site drainage system. There is no process-derived effluent.

The effluent is discharged to a combined sewer operated by Thames Water after which it undergoes treatment at the Beckton sewage treatment works (STW), prior to discharge into the River Thames.

The Environment Agency (EA) requires a Surface Water Pollution Risk Assessment (hereinafter referred to as an H1 Assessment) to quantify the environmental impact of discharging hazardous pollutants to the receiving watercourse (i.e. River Thames). If a hazardous pollutant is screened from the Risk Assessment, it is deemed by the EA as not being liable to cause pollution to the receiving watercourse.

This report details the methodology, data inputs and findings from the H1 Assessment.

2.0 Surface Water Pollution Risk Assessment Methodology

An H1 Assessment is required when applying for a bespoke environmental permit that includes discharging hazardous pollutants to surface water or if a variation of an existing permit is required to cover an increase in quantity and/or concentration of hazardous pollutants to surface water under the Environmental Permitting Regulations[1].

The purpose of an H1 assessment is to quantify the environmental impact of discharging hazardous chemicals and elements to a receiving watercourse to assess whether they are a risk to the environment.

This includes discharging to:

- Freshwaters;
- Estuaries and coastal waters; and
- Sewers

The EA methodology contained in the "*Surface water pollution risk assessment for your environmental permit"* guidance[2] provides guidance on assessing effluent discharges containing hazardous pollutants to surface water. Hazardous pollutants are the pollutants listed in the tables of the guidance.

[1] Environmental Permitting (England and Wales) Regulations 2016

[2] Environment Agency and DEFRA, (2020). Surface water pollution risk assessment for your environmental permit. [Available at]: https://www.gov.uk/guidance/surface-water-pollution-risk-assessment-for-your-environmental-permit

Assessing whether a hazardous chemical or element is a risk to the environment is a two-phase process i.e., screening (phase 1) and modelling (phase 2).

If phase 1 screening show that a hazardous chemical or element is a potential risk to the receiving watercourse, then further tests called “phase 2 modelling” need to be undertaken. Modelling may result in a substance being shown to be low risk to the receiving water quality or otherwise maximum possible emission limit values (in order to pass the H1 assessment) can be determined.

2.1 Environmental Quality Standards

The surface water risk assessment guidance contains a list of environmental quality standards (EQS) for hazardous chemicals and elements.

There are two types of EQS values that might apply:

- Maximum Allowable Concentration EQS (MAC-EQS) - to evaluate the short-term environmental impact of emissions to a receiving watercourse; and
- Annual Average (AA-EQS) - to evaluate the long-term environmental impact of emissions to a receiving watercourse.

A hazardous chemical or element may only have a corresponding AA-EQS value, a MAC-EQS value or both an AA-EQS and MAC-EQS value.

2.2 Screening Phase

Phase 1 screening eliminates all hazardous chemicals and elements which are considered to not be a risk to the environment. This phase uses precautionary raw data which has not been “cleaned-up” (e.g., the minimum reporting values (MRVs) are taken at “face-value”).

Phase 1 screening is composed of two parts – part A for all hazardous chemicals and elements and part B for priority hazardous substances.

The EA has developed a Risk Assessment software tool[3] to perform many of the calculations involved in the Risk Assessment to aid in the quantification of the impact of releases from the regulated activities.

2.2.1 Screening Tests

Phase 1-part A screening comprises of a series of tests. These tests vary depending on whether the receiving water is freshwater or coastal/Estuarine. The tests are described in Table 1 and Table 2.

Table 1: Freshwater Screening Tests Descriptions

Freshwater Screening Test	Test Detail
Test 1	This test is devised to quickly screen out hazardous pollutants.

[3] Environment Agency (2016). Environment Agency H1 Software Tool, Version 2.7.6, February 2016 (64-bit). Available upon request from the Environment Agency.

Freshwater Screening Test	Test Detail
	If the concentration of the hazardous pollutant in the effluent exceeds 10% of the EQS, it is potentially significant and should be carried forward to Test 2.
Test 2	This test introduces the dilution available in the receiving watercourse by calculating the Process Contribution (PC). PC is the concentration of the discharged hazardous pollutant in the receiving water after dilution. If the PC exceeds 4% of the EQS, it is potentially significant and should be carried on to Tests 3 and 4.
Test 3	This test introduces the existing concentration of the hazardous pollutants in the receiving watercourse. The Predicted Environmental Concentration (PEC) is the predicted concentration in the receiving water downstream of the discharge. If the difference between the upstream quality and the PEC is >10% of the EQS, the hazardous pollutant is potentially significant and will fail the Risk Assessment screening process and require further modelling. If it is not, then Test 4 must be carried out.
Test 4	This test assesses whether the discharge, when combined with the existing upstream water quality, will contribute to an EQS failure in the receiving watercourse. It therefore takes into account the combination effects with existing discharges. If the PEC exceeds the EQS, the hazardous pollutant is potentially significant and will fail the Risk Assessment screening process and require further modelling.

Table 2: Estuary and Coastal Waters Screening Test Descriptions

Estuary/Coastal Screening Test	Test Detail
Test 1	This test is devised to quickly screen out hazardous pollutants. If the concentration of the hazardous pollutant in the effluent exceeds its EQS (both AA and MAC limits if available), it is potentially significant and should be carried forward to Test 2.
Test 2	This test applies for discharges to low water channels in the upper parts of an estuary where the water is mainly fresh. If this is the case, the screening tests for freshwaters needs to be carried out (starting at Test 2). If the discharge point isn't to a low water channel, Test 2 for estuaries and coastal waters can be skipped.
Test 3	This test asks if the point of discharge has restricted dispersion or dilution (for example, coves, docks and ports). If this is the case, extra modelling is required. If it is not, then Test 4 can be carried out.
Test 4	This test requires a chart datum point to be identified (i.e. this is the point where the water depths are shown on nautical charts as zero). The discharge point must be at least 1m below and at least 50m away from the chart datum point.

Estuary/Coastal Screening Test	Test Detail
	If this is not the case, then further modelling is required. If it is, then Test 5 can be undertaken.
Test 5	This test only applies if the discharge is buoyant. If the discharge is not buoyant, then further modelling is required. The effective volume flux of the discharge is calculated and compared to the allowable effective volume flux (which is proportional to the water depth). If the effective volume flux is outside the allowable limits, further modelling is required.

2.2.2 Significant Load Assessment

Phase 1-part B screening assesses whether the discharge exceeds pre-determined significant load limits and is only carried out on Priority Hazardous Pollutants. Priority Hazardous Pollutants must be screened out in the Part A assessment and the Part B assessment (where applicable) to be deemed to require no further detailed assessment.

3.0 Effluent Management and Treatment

3.1 Effluent Management

Rainwater run-off from hardstanding areas of the site is collected by a drainage system and discharge to combined sewer under a trade effluent discharge consent (TEDC) with Thames Water.

It is assumed that the effluent is processed at Beckton sewage treatment works (STW) where it is treated prior to discharge into the river Thames at National Grid Reference TQ 45478 81645.

According to the Urban Waste Water Treatment Directive Treatment Plants[4], Beckton STW has an average load entering the STW of 3,380,000 population equivalent (year unknown).

In accordance with Metcalf & Eddy[5], 1.p.e. equates to 200l per head per day; therefore, the volume of effluent at Beckton STW is estimated to be 676,000 m^3/day. This equates to a flow rate of 7.82 m^3/s, assuming continuous discharge.

3.2 Sewage Treatment Reduction Factors

The effluent will undergo treatment at Beckton STW. The current Risk Assessment guidance document references generic sewage treatment reduction factors (STRFs) for various hazardous pollutants, providing an expected removal rate of a hazardous pollutant passing through a STW.

STRFs have been applied to the effluent contaminant concentrations when entered into the H1 assessment tool. Where relevant, metals STRF values have been based on total metals

[4] Environment Agency STW Dataset - https://www.data.gov.uk/dataset/0f76a1c3-1368-476b-a4df-7ef32bfd9a8b/urban-waste-water-treatment-directive-treatment-plants

[5] Metcalf & Eddy (2003), *Wastewater Engineering Treatment and Reuse. 4th Ed. Published by McGraw-Hill*

removal as opposed to dissolved metals removal on the basis that the concentration data for metals in the effluent is total metals.

The STRF values used are shown in Table 3.

4.0 Data Inputs to Surface Water Pollution Risk Assessment

4.1 Assumptions

The following assumptions have been made by SLR in preparing this Risk Assessment:

- The effluent quality data obtained from S Norton is accurate and representative of conditions which are present on site;
- Data relating to hazardous chemicals and elements referenced in the EA guidance[6] only has been reviewed; and
- Hazardous chemicals which are referenced in the EA guidance and for which no data has been provided, have not been considered in this report.

4.2 Effluent Quality

S Norton routinely monitor the effluent quality being discharged from the site. The average and maximum concentration for each of the hazardous contaminants has been taken.

Table 3 shows the quality of the effluent obtained from S Norton sampling data recorded between November 2022 and February 2024. In total, 13 hazardous contaminants have been assessed in the H1 assessment.

Data for Chromium was assumed to be Chromium (VI) since Chromium (III) does not have either an AA or MAC EQS for Coastal and Estuarine environments.

Table 3: Effluent Concentrations of Contaminants

Contaminant	Average Effluent Concentration (µg/l)	Maximum Effluent Concentration (µg/l)	STRF
Arsenic, Total	75.61	457	0.89
Cadmium, Total	0.998	3.3	0.37
Chromium, Total	6.6	18	0.16
Copper, Total	57.8	130	0.21
Cyanide	15.8	48	0.32
Lead, Total	168.6	390	0.17
Mercury, Total	0.187	1	0.67

[6] Environment Agency and DEFRA, (2020). *Surface water pollution risk assessment for your environmental permit.* [Available at]: https://www.gov.uk/guidance/surface-water-pollution-risk-assessment-for-your-environmental-permit

Contaminant	Average Effluent Concentration (µg/l)	Maximum Effluent Concentration (µg/l)	STRF
Nickel, Total	20.24	29	0.76
Zinc, Total	852.8	1,900	0.33
Silver, Total	0.73	1	1
Tin, Total	2.08	4.1	1
Vanadium, Total	4.28	8.42	1
Phenol	22.15	100	0.17
pH	7.48	8	N/A

4.3 Effluent Flow Rate

The volume and flow rate of effluent discharge is entirely rainfall dependent. In the absence of any flow meter monitoring data from the site, assumptions were made using rainfall data, based on Flood Estimation Handbook (FEH) data.

The standard average rainfall for the site (National Grid Reference TQ 45858 81670) is 554mm, making the average daily rainfall rate 1.528mm.

The site area was estimated to be 18,000m^2. Therefore, an average daily volume of 27.5m^3 was calculated by multiplying by the average daily rainfall rate. Assuming a continuous discharge over 24 hours, this equates to an average discharge flow rate of 0.00032m^3/s.

The maximum discharge flow rate was calculated in the same way, using a 4% Annual Exceedance Probability (AEP) 1 in 25-year storm event of 24-hour duration. This implied a rainfall rate of 65.89mm. Therefore, a maximum daily discharge volume of 1,186m^3 was calculated, which equates to a maximum discharge flow rate of 0.014m^3/s.

4.4 Receiving Water Flow Rate

Data with respect for the river flow rate was obtained from an upstream gauging station with gauging records from between 1883 and 2022, at Thames at Kingston (NRFA ref: 39001). This shows that the River Thames has the following freshwater river flow rates at grid reference TQ 45478 81645:

- 95% exceedance (Q95): 7.54 m^3/s
- Mean flow: 65.31 m^3/s

4.5 EQS Values

Coastal and Estuarine EQS values were used in the assessment as shown in Table 4. It should be noted that the EQS values for metal contaminants are generally related to the concentration of dissolved metal concentration. The data for metal concentrations in the effluent refers to Total metal content. The use of total metals data in comparison to dissolved metals EQS values could be regarded as a conservative estimate of its impact.

Table 4: EQS Values

Contaminant	AA-EQS (µg/l)	MAC-EQS (µg/l)
Arsenic	25	N/A
Cadmium	0.2	1.5
Chromium	0.6	32
Copper	3.6	N/A
Cyanide	1	5
Lead	1.3	14
Mercury	N/A	0.07
Nickel	8.6	34
Zinc	6.8	N/A
Silver	0.5	1
Tin	10	N/A
Vanadium	100	N/A
Phenol	7.7	46
pH	N/A	6 – 8.5 (95th percentile)

5.0 Results from Screening

This section describes the results from the EA Risk Assessment software tool used for screening the hazardous pollutants listed in Table 3.

5.1 H1 Tool Screening Tests

5.1.1 Coastal and Estuarine Test 1

Test 1 is devised to quickly screen out hazardous chemicals and elements. If the concentration of the hazardous chemical or element in the discharge is less than its corresponding AA and/or MAC EQS value, then it cannot deteriorate the receiving watercourse beyond the EQS value.

The Test 1 assessment was carried out in the EA software model and screened out Tin and Vanadium.

All other contaminants were further assessed.

5.1.2 Coastal and Estuarine Test 2

The discharge from Beckton STW into the river Thames is into the upper part of the Estuary where fluvial flow and freshwater will dominate the mixing. Therefore, the Freshwater Tests were carried out using Coastal and Estuarine EQS values, as per EA guidance.

5.1.3 Freshwater Test 2

Freshwater Test 2 utilises the Q95 flow rate of the receiving water to determine the process contribution.

All contaminants were screened out by this test.

5.2 Significant Load Assessment

Part B screening is for hazardous pollutants considered to be priority hazardous pollutants by the EA. Out of hazardous pollutants that were detected and assessed in the Risk Assessment, there were 2 which were considered to be priority hazardous pollutants.

If a priority hazardous substance has an annual load less than its significant load limit, then it is not considered to be a risk to the environment.

Table 5 shows the annual load calculated for each priority hazardous substance compared to its significant load limit.

Table 5: Significant Load Assessment

Priority Hazardous Substances	Annual load (kg/year)	Significant load limit (kg/year)
Cadmium	0.0054	5
Mercury	0.0018	1

The annual loads for Cadmium, and Mercury are all lower than their corresponding significant load limit and therefore pass Part B screening.

5.3 pH

The average and maximum pH (7.48 and 8 respectively) of the effluent is within the MAC-EQS range of 6-9 and therefore deemed to be acceptable.

6.0 Conclusion

A surface water pollution risk assessment has been carried out for the discharge of contaminated rainwater run-off from S Norton's metals recycling site in Barking.

Effluent from the site is discharged to combined sewer after which it undergoes treatment at Beckton STW prior to discharge into the River Thames.

Given the flow rate of discharge is entirely rainfall dependant, average rainfall data was used to determine an average flow rate of 0.00032m^3/s based on an assumed continuous discharge over 24 hours, whilst a 4% AEP (1 in 25 year) 24-hour rainfall event was used to estimate a maximum flow rate of 0.014m^3/s.

Given the point of discharge from the STW is to a tidal section of the river Thames, the Coastal and Estuarine assessment methodology was used.

Estuarine Test 1 screened out Tin and Vanadium. Following this, the freshwater screening tests were employed utilising estuarine EQS values since the discharge is to an upper part of the estuary where the water will be mainly fresh and the fluvial flow will dominate mixing.

Freshwater test 2 screened out all other contaminants.

Cadmium and Mercury were found to pass the significant load test.

pH was found to be within the acceptable MAC-EQS range.

Therefore, according to the EA guidance, the assessment suggests that the discharge activity is not anticipated to cause significant deterioration of the receiving water quality.

7.0 Closure

Regards,

SLR Consulting Limited

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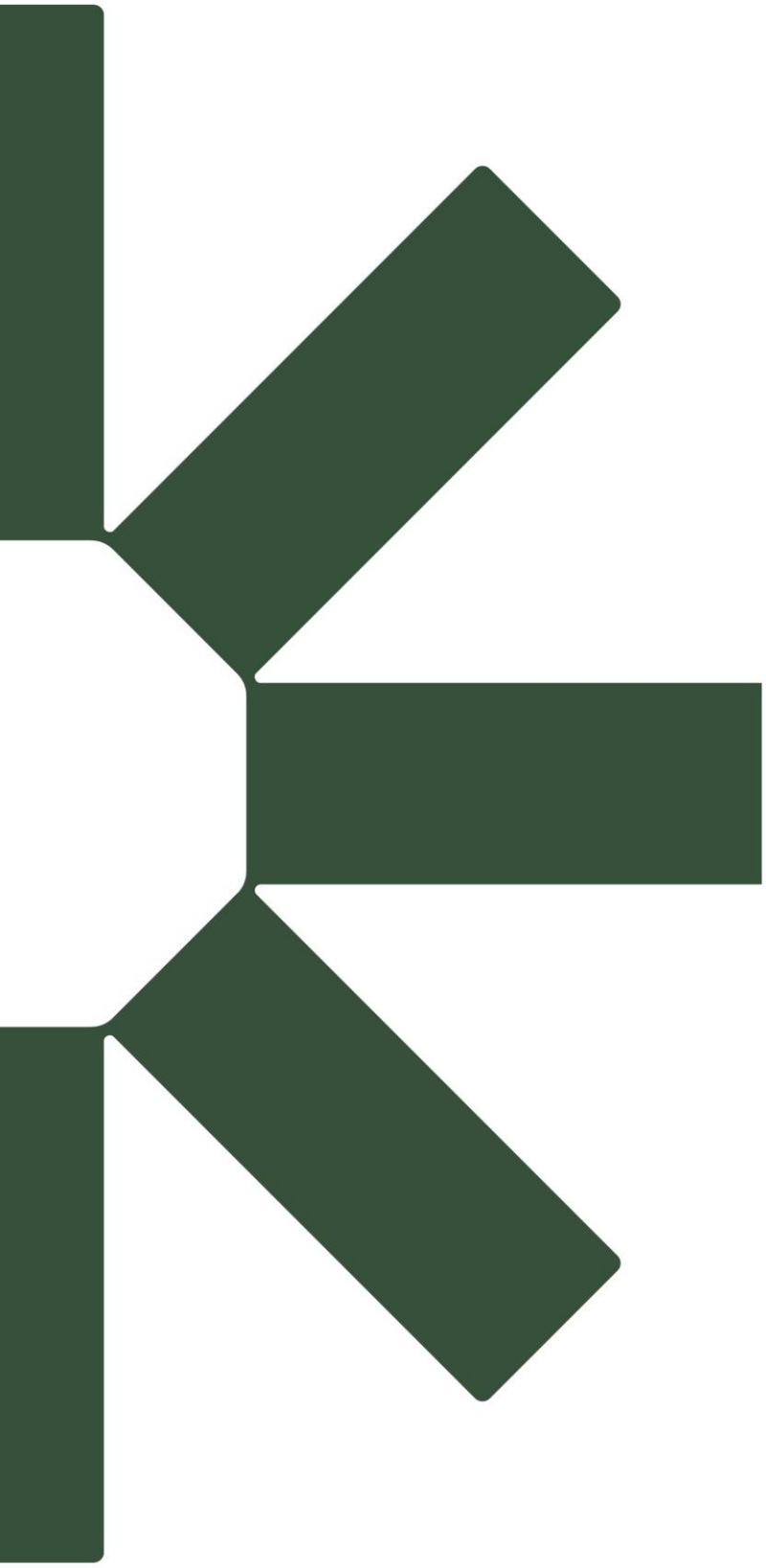

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