CAPITA

BESPOKE PERMIT APPLICATION – ENVIRONMENTAL RISK ASSESSMENT

Project:	London Southend Airport
Purpose:	Surface De-icer Drainage Discharge Permit Application
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ENVIRONMENTAL RISK ASSESSMENT FOR PROPOSED SURFACE DE-ICING OPERATIONS AT LONDON SOUTHEND AIRPORT

The proposal outlined in this bespoke permit application is that drained runoff containing surface de-icing chemicals (potassium acetate) will discharge to local watercourses.

An environmental risk assessment (ERA) is required as part of the bespoke permit application process because there is no suitable standard permit for the proposed de-icing activity.

This ERA report has been written with reference to Environment Agency (EA) document 'Horizontal Guidance Note H1 – Overview Document[1]'.

Report Structure

The structure of this report follows the guidance provided by the EA:

- Identify potential risks that your activity may present to the environment;
- Assess potentially significant risks in more detail if needed;
- Choose the right control measures, if needed;
- Report the assessment.

Identify Risks

The bespoke permit being applied for relates directly to the management of runoff containing de-icing chemicals from the runway and taxiway surfaces at London Southend Airport (LSA).

De-icing of these surfaces is critical to maintaining the operational capability of the airport and aircraft safety during the winter months; however the chemicals used in de-icing operations have the potential to negatively impact the environment.

The proposed de-icing chemical to be used on the pavements at the airport is a potassium acetate based liquid. Potassium acetate based de-icing chemicals are of low toxicity to aquatic organisms[2]. While the chemicals have the potential to increase the biological oxygen demand (BOD) of receiving watercourses the oxygen demand of acetate de-icing compounds in the aquatic environment is considered to be low.

[1] Document reference: GEHO0410BSHR-E-E v2.1 December 2011

[2] MURGATROYD, C. *De-icing Chemicals: Priorities for Environmental Quality Standards Development, WRc plc, R&D Technical Report P31*. Environment Agency, 1996.

This indicates that de-icing materials based on acetates have the potential to fully degrade in the aquatic environment without causing problems resulting from oxygen depletion from the water column[3].

At LSA, the three main environmental receptors at risk from the surface de-icing chemical are:

- Groundwater
- Discharge watercourses (Eastwood Brook and Prittle Brook)[4]
- Storm water drainage network

With reference to Table 1 – Assessment annexes to complete[5], the following assessment annexes need to be completed:

- (c) Accidents
- (e) Surface water (complex)
- (j) Groundwater
- (k) Justifying and cost & benefit analysis of control measures (if needed)

It should be noted that for the purposes of this bespoke permit application the runoff water containing de-icing chemicals is considered by the EA to be a trade effluent.

Assess Risks

H1 Annex C – Accident risks from sewage discharges and discharges to groundwater[6]

With reference to the EA guidance, this annex applies because the de-icer operations proposed for LSA "discharges sewage or trade effluent to surface water or to ground".

In carrying out the accident risk assessment the possible receptors that could be harmed by the de-icing chemicals are identified as:

- Groundwater[7]
- Discharge watercourses (Eastwood Brook and Prittle Brook)
- Storm water drainage network

The accident risk assessment table below has been completed in accordance with H1 Annex C:

[3] MURGATROYD, C. *De-icing Chemicals: Priorities for Environmental Quality Standards Development, WRc plc, R&D Technical Report P31.* Environment Agency, 1996.
[4] Refer to drawing plan 044190-CPI-BPA-ZZZ-DSK-CE-001-P00 for location of receiving watercourses
[5] Reference to EA document: "Horizontal Guidance Note H1 Overview Document"
[6] Reference to EA document: GEHO0410BSII-E-E v2.1
[7] With reference to a Surface Water Drainage Study carried out by Jacobs (circa September 2009) on behalf of the airport, the underlying soil is considered to be a 'non-aquifer'. However, the report concludes that infiltration of surface water to ground is not appropriate at this site because pollution from de-icing chemicals cannot be controlled.

Hazard	*Receptor*	*Pathway*	*Risk Management*	*Probability of exposure*	*Consequence*	*Overall risk*
Storm water drainage system overwhelmed (i.e. high peak flow)	Groundwater	Soft margins adjacent to gullies/ filter drains	Regular maintenance of storm water drainage network to ensure that siltation and blockages are removed. Greater volume of rainfall results in greater dilution of de-icing chemicals.	Low	Localised flooding of de-icer runoff resulting in contamination of groundwater	Low
Climate change creates longer/ more extreme winters – resulting in high number of de-icing events	Discharge watercourses	Site drainage	Record and monitor use of de-icing chemicals including when used, quantity, location and weather conditions.	Low	Increased concentration of chemical discharged to watercourses.	Low
De-icing chemicals applied in paved areas outside of de-icing area	Discharge watercourses	Site drainage	Operational procedures to include a clearly labelled plan showing areas of application.	Low	Increased concentration of chemical discharged to watercourses.	Low
Incorrect application of de-icing chemicals other than acetate based products	Discharge watercourses/ groundwater	Site drainage	Strict operational procedures to be implemented by airport defining which de-icing chemicals can be used on the pavements.	Low	More polluting de-icing chemicals enter watercourses	Medium

H1 Annex E – Surface Water Discharges (complex)[8]

With reference to the EA guidance, the proposed discharge will be classed as 'intermittent' – with discharge only occurring throughout the winter months.

No Deterioration

Water quality monitoring carried out to date has shown that allowing the de-icer runoff to discharge to the receiving watercourse without treatment will not cause deterioration to the watercourse environment[9].

With reference to an Environmental Statement written by Jacobs in 2009 on behalf of LSA: *"The Environment Agency has monitored water quality at three locations along Eastwood Brook (including a site adjacent to the airport), and one location along Prittle Brook for a number of years, but routine monitoring was discontinued for these sites in 2006."*

The report goes on to say: *"The results show that Eastwood Brook is generally Moderate to Poor with respect to BOD and ammonia although some improvement is evident in the more recent data from 2004-06. Dissolved oxygen levels are high in all cases."*

More recently, water quality monitoring has been carried out by NWQIS/EA over winter 2012/2013. During this time high resolution monitoring was carried out in parallel with de-icing operations taking place. Conclusions from this study state *"observed changes in water chemistry within the Eastwood Brook are caused by inputs unrelated to discharges from within the airport and are in fact correlated to the introduction of sodium salts to the watercourse as a result of gritting and de-icing of highways by third parties."*

Target Standards

As included in the above paragraph, the changes to the water chemistry observed correlate with gritting and de-icing of highways by third parties and were unrelated to discharges from within the airport. It is anticipated that de-icing operations using potassium acetate will not prevent the EA from improving the water quality within the receiving watercourse.

[8] Reference to EA document: GEHO0410BSIK-E-E v2.1

[9] In accordance with the requirements of the Water Framework Directive (WFD)

H1 Annex J – Groundwater[10]

With reference to the EA guidance, Annex J applies because there is a requirement to carry out an assessment of groundwater risks. However, the guidance in Annex J does not specifically apply in this instance because the guidance states that it does not apply to: *"activities where the source of potential pollution is deemed to be adequately contained or to be of minimal significance".* It is not clear who determines if the proposed system is deemed to be adequate or of minimal significance, therefore reference to Annex J has been made where it is deemed relevant. Consideration of the source-pathway-receptor method has been made in this groundwater risk assessment.

Manage the Risks

Control measures have been put in place in the proposed de-icer storage-treatment drainage system:

- Runway edge filter drains lined with impermeable membrane during surfacing works during 2010-2011. Liner added specifically to prevent runoff containing de-icing chemicals infiltrating to ground.
- Water quality monitoring systems have been utilised to provide a measure of the effects of de-icing chemicals on the receiving watercourse.
- Detailed airport management procedures relating to de-icing operations to be implemented and record of de-icing operations to be kept.

Chance of Harm

The potassium acetate de-icing chemical is considered a low toxicity pollutant. While this chemical has the potential to increase the BOD when discharged to an aquatic environment, this increase is considered low with full biodegradation expected.

Consideration of the chance of harm from the risks identified above is given below:

- The lined runway filter drains could become overwhelmed during a severe rainfall event which exceeds their capacity. A severe rainfall event would need to coincide with a de-icing activity to cause flooding of the adjacent grassland area (and infiltration to ground). The chance of this occurring is low as heavy rainfall is unlikely during freezing conditions. This risk is further mitigated by the fact that increased rainfall would create a larger dilution of the chemicals used.
- The airport management procedures will clearly define how de-icing activities are to be undertaken, with due regard to environmental protection. The procedures must be effectively implemented and supervised by those persons undertaking de-icing activities and other essential maintenance. The chance of the procedures not being followed correctly is considered low.

Severity of Harm

With reference to a previous investigation report[11], the ground conditions comprise silty clay and sandy clay River Terrace Deposits (designated Crouch First to Third Terraces) (4-10m in thickness), underlain by a thin sand and gravel layer (up to 5m in thickness). These deposits overlay London Clay that is up to 120m in thickness, which is underlain by Lower London Tertiaries (up to 55m in thickness) and Upper Chalk (around 85m).

The London Clay is significantly thick and therefore classified as Non-Aquifer by the EA. The London Clay should prevent any contaminants from entering the underlying major aquifer. Any waters in the major aquifer in this region are, therefore, considered to be protected.

[10] Reference to EA document: GEHO0410BSIP-E-E v2.1

[11] Jacobs Southend Runway Extension Environmental Statement October 2009

Superficially, the overlying River Terrace Deposits are classified in geological texts as a Minor Aquifer (perched aquifer in this instance) as they are of variable permeability and capable of supporting local groundwater abstractions and base flows to rivers. The deposits are highly variable in lithology and saturated thickness and subsequently have highly variable yields. Previous site investigations showed water to be present in this layer 2.1m – 7.5m below ground level.

The airport site lies mostly within the area of London Clay. The River Terrace Deposits are associated with the course of the Eastwood and Prittle Brooks that lie close to the development site.

From the above description it is concluded that the groundwater regime at the site is variable and pollution control would be difficult to predict and manage. There are no majorly significant receptors at risk from groundwater pollution and groundwater would appear to feed into Prittle Brook and Eastwood Brook, eventually converging at the River Roach. It is anticipated that biodegradation of the de-icing chemicals would occur prior to them reaching either Eastwood or Prittle Brook. The severity of harm of de-icing chemicals entering groundwater is considered low.

Conclusion

From the above assessment, it is considered unlikely that any surface water runoff containing potassium acetate would reach groundwater during de-icing operations. Any runoff that does reach groundwater is unlikely to have a negative effect. In conclusion the overall risk to groundwater is considered low.

H1 Annex K – Cost Benefit Analysis[12]

The risk assessment carried out in the previous annexes (above) indicate that the risks to the environment are low and as such it is not considered necessary to carry out a cost benefit analysis as outlined in Annex K.

[12] Reference to EA document: GEHO0410BSIQ-E-E v2.1