This Report has been cleared for submission to the Board by David Flynn, Programme Manager

Signed: **Dated: 16 August 2018**

OFFICE OF ENVIRONMENTAL SUSTAINABILITY

INSPECTOR'S REPORT ON AN APPLICATION FOR A CERTIFICATE OF AUTHORISATION FOR A CLOSED LANDFILL

TO:	Each Director	
FROM:	Magnus Amajirionwu, Inspector	Environmental Licensing Programme
DATE:	16 August 2018	
RE:	Application by **Kilkenny County Council** for a Certificate of Authorisation for a closed landfill at **Gowran, County Kildare.** Certificate of Authorisation Register Number **H0235-01.**	

1. Application details

Type of facility:	Closed landfill as defined in the Regulations[1]
Risk category of closed landfill:	Moderate risk (class B) • Reason(s): pollutant linkages: o Leachate migration to underlying regionally important aquifer, also classified as extremely vulnerable. o Off-site human receptors from landfill gas migration.
Section 22 register number:	S22-02572
Application received:	16/03/2018
AA screening determination:	23/07/2018 Screened out.
Regulation 7(4) notice:	None
Additional information received:	None

[1] Waste Management (Certification of Historic Unlicensed Waste Disposal and Recovery Activity) Regulations 2008 (S.I. No. 524 of 2008).

Name of Qualified Person:	Sean Moran (MSc, Eur. Geol., P. Geol.) of O'Callaghan Moran & Associates Credentials provided by Institute of Geologists of Ireland
EPA site inspection:	25/07/2018

2. Information on the closed landfill

Location of facility	The Gowran landfill is located approximately 300m to the northwest of Gowran (Figure 1). The site was used by Kilkenny County Council for the disposal of municipal waste. The site originally consisted of an old quarry. The Council backfilled the pit and covered the site with a clay cap. The site is owned by Kilkenny County Council. The site of the closed landfill is presently unused although a hardstanding area of the site was used over time by the Kilkenny County Council as a storage area for aggregate, piping and lamp posts. Kilkenny County Council propose to use the site as a Community Sports Play Area. Therefore, for the purposes of the risk assessment, a public amenity use has been envisaged by the Qualified Person.
Period of landfilling	Mid 1970s – mid 1990s
Surrounding area	The landfill is bound to the east by residential dwellings, to the west by scrub land, to the northwest by agricultural pasture and to the north by Rockfield Road. It is bounded to the south east by a disused playing field (see Figure 2). To the south west is a greenfield land parcel which has received planning permission for a residential development. There are four residential dwellings located immediately to the northeast of the site. The northwest of the site is uneven and poorly draining ground with scrub vegetation and a tree line along the northwest site boundary. In the south west of the site the ground is gravel paved and has been used as a parking and storage area by the Council. The site is accessed from Rockfield road which runs along the north-western boundary of the site. The nearest houses lie within 20 m of the north-eastern site boundary where the border between the property and site consists of a fence and wall and a treeline. The foul sewer servicing the residential development to the northeast of the site runs along the north-eastern boundary of the site and connects into the foul sewer running along the Rockfield road. There are a number of manhole covers along the sewer line within the site.
Area of the closed landfill	The site occupies an area of approximately 0.4 hectares.
Quantity of waste at the facility	12,000 m^3 is estimated from Tier 3 Risk Assessment. Assuming a density of 0.5 tonne/m^3 (to account for a predominantly municipal waste with small fractions of industrial waste) there are a maximum of approximately **6,000 tonnes** of waste present. The waste is covered by a clay cap that ranges in thickness from 0.4m in north and east of the site to 2.4m in the southwest of the site. The clay capping layer is thickest in the southwest where the waste is deepest.

Characterisation of waste deposited	The disused quarry was backfilled with domestic, commercial and industrial waste. Domestic waste includes plastics (wrappers, refuse sacks, bottles), textiles, glass, papers, brick, timber, bags of degraded black sludge/waste. It is reported that there is no evidence of any significant amounts of potentially hazardous waste (e.g. oils, solvents), staining or odours.

3. Site investigations

Current condition and appearance of closed landfill	Generally, the site is of poor quality and poorly drained grass-land with evidence of water logging. The landfill site slopes in a north-westerly direction. The north of the site is uneven, poorly draining ground with scrub vegetation and a tree line along the northwest site boundary. According to the risk assessment (2014), waste was deposited to a depth of 0.5m to >5m below ground level (bgl), including capping material. The maximum depth of waste was found in the south-west portion of the site. The thickness of the cap is reported as being between 0.4m and 2.4m of soft medium brown slightly sandy clay. There is some fly tipped household waste present on the site namely plastic bottles and bags.
Site investigations	Tier 1 Study, 2013: A Tier 1 study was conducted by Kilkenny County Council in 2013 and this concluded that in accordance with the EPA CoP the risk rating was 'Moderate' with potential for environmental contamination. This is due to the size of the landfill site (0.4 Ha), the importance of the underlying aquifer which is karstified and classified as regionally important, and the proximity of residential dwellings. Intrusive site investigations, 2014 and 2017: • 12 trial pits to depth 0.4 - 5.5 metres below ground; of which 3 within the facility were converted to combined leachate and gas monitoring wells. • 4 groundwater wells to depth 10.2 - 14.5 metres below ground, later used as groundwater monitoring wells. • 2 landfill gas monitoring wells. Further samples were taken from three deep private wells within 500 m of the subject site to compliment those taken from the drilled wells. Samples of waste, soil, leachate and groundwater were dispatched for analysis. In the Risk Assessment Report received in 2018, landfill gas monitoring took place *in situ* on twelve occasions between February 2014 and December 2017. Due to the proximity of the dwellings and the fact that Kilkenny County Council is considering an amenity use for the landfill site, a Ground Gas Risk Assessment was undertaken in accordance with CIRIA C665 *'Assessing risks posed by hazardous ground gases to buildings'.* Field screening for the presence of volatile organic compounds (VOC) was carried out using a hand-held VOC analyser, but no VOCs were recorded.
Monitoring and analysis of samples	Monitoring carried out between 2014 and 2017 were as follows: • 12 rounds of gas sampling were done at 9 locations.

(groundwater, gas, leachate & waste)	• 2 rounds of leachate sampling carried out at one location Two other monitoring wells were dry during monitoring events. • Eluate testing was carried out on 2 waste samples. • Groundwater was sampled in 3 locations, in addition to the 3 private well. One well was decommissioned as it was found to be damaged. • Soil was sampled in 2 locations.
Hydrology	The landfill site slopes in a north-westerly direction. The closest surface water feature is the Gowran River approximately 0.6 km to the south west of the site and which flows in an easterly direction before discharging into the Barrow about 5.5 km east of the site. There are no field drains or other surface water features connecting the site to the river. The site lies within the Gowran Tributary of the Barrow Water Body (E_SE_14_1879). While the physiochemical status of the water body is good the overall status of this Surface Water Body (SWB) is Poor due to impacts on ecological receptors.
Hydrogeology	The Geological Survey of Ireland (GSI) bedrock aquifer map identifies the bedrock underlying the site as a Regionally Important Aquifer (karstified aquifer with diffuse flow paths). The bedrock aquifer can supply groundwater yields of >400 m^3/d. Groundwater vulnerability for the site is classified as 'Extreme'. Groundwater flows from the north-east toward the south-west. The closest water supply borehole is 150 m south-west of the site at the Steeples Housing Estate. The log for this well, which was installed in 2006 to supply a housing scheme, describes the ground conditions as red-brown clay and limestone boulders underlain by a bed of weathered dolomite and then dark grey weathered limestone typical of the Butlersgrove Formation. The GSI estimates that groundwater recharge in the area is 489 mm per year. The site lies within the Bagnelstown_3 Groundwater Body (GWB). The GWB status is rated as 'Good'.
Leachate and water quality	Leachate results are indicative of a weak and aged leachate with approximately 90% of the values below the mean values for a landfill that is in Stage IV of the degradation process. When compared against published minimum and maximum observed ranges, the results show that the key leachate parameters BOD, COD, ammonia, total phosphorous and metals were all below the published ranges. Site inspections have confirmed that there is no evidence of leachate break out around the sides of the landfill. With the absence of a landfill liner or natural confining layer present, leachate will impact on the groundwater body beneath the site. Elevated levels of arsenic, chloride, manganese, potassium nitrates and ammonia have been observed in groundwater monitoring results at the south-west of the site. The closest down-hydraulic-gradient monitoring well used for potable supply is located at the Steeples Housing estate 150m south-west of the site. The water quality in this well has been monitored by the Health and Safety Executive (HSE) bi-annually since 2007. It has shown to be of consistently good quality over the past 10 years of monitoring. Accordingly, any potential impacts on the receiving environment associated with leachate are considered not significant, and are expected to continue to decline over time.
Landfill gas	The ongoing generation of landfill gas at the landfill and the close proximity of buildings and underground structures means there are conduits for gas to

	migrate and accumulate in a manner that potentially poses a risk to property and people. There is risk posed by the presence of methane from the site. Recorded concentrations of methane of 8.7%, 11% and 12.6% v/v above the upper explosive limit of 5% v/v were recorded at two onsite locations in 2017. No internal gas survey was carried out to confirm that gas has been migrating offsite and entering properties. When the site is fully capped, in accordance with the EPA landfill restoration requirements, the potential for lateral gas migration will be significant. Landfill gas generation and migration is the focus of the risk assessment and proposed remedial actions submitted by Kilkenny County Council. The remedial measures proposed include the installation of a landfill gas interception trench with passive gas venting. Condition 3 of the recommended Certificate of Authorisation (CoA) requires Kilkenny County Council to implement a number of remedial measures as contained in the 2017 Risk Assessment.
Conceptual site model	The conceptual site model developed in 2014 and provided with the original application was updated following the Tier 3 Risk Assessment. It identified the following pollutant linkages: • human health exposure via lateral and vertical migration of landfill gas; • migration of leachate into the underlying aquifer and discharge to users of groundwater for potable supply down hydraulic gradient of the site. The Gowran River (approximately 0.6 km to the south west of the site) may be a receptor for groundwater migrating through the site but this could not be definitively established given the karst nature of the bedrock; and • human health exposure pathway of off-site migration of landfill gas. The conceptual site model is shown in Figure 3. The source, pathways and receptors can be described as follows: Source: – Rainfall on the landfill will preferentially percolate through the cap and into the waste. – Leachate is generated in the waste albeit at low strength. – Gas is generated at the landfill. Pathway: – Leachate can potentially migrate through the gravels underlying the deeper sections of the waste into the underlying bedrock aquifer. – Leachate can migrate through the base of the landfill into the underlying aquifer beneath and discharge to the surface water body. – Gas migration can occur through the permeable cap and into silts, clays and karstified bedrock beneath the waste. – Gas migration beyond the site boundary through the foul sewer trench running along the site boundary with the houses to the east of the site. It is possible that the trench could act as a preferential pathway for gas migration, but this was not confirmed. Receptors: – Existing houses and users in close proximity of the site.

	– The bedrock aquifer. – Downgradient abstraction wells and the Gowran River.

4. SPR linkages and remedial actions

SPR linkage scenarios (applicable ones only)	Leachate migration through ground water pathway SPR 3, Receptor = Human. SPR 5, Receptor = Aquifer. Landfill gas migration through lateral and vertical pathway SPR 10, Receptor = Human SPR 11, Receptor = Human Summary: Upon the review of the monitoring data, - remedial action is warranted to address the risk of offsite migration of landfill gas. - remedial action is warranted to address the risk of leachate migration into groundwater.
Proposed remedial actions	The Tier 3 risk assessment has confirmed the risk ranking for the site is 'Moderate'. This moderate ranking is mainly associated with leachate migration to groundwater and potential landfill gas migration to the residential dwellings to the east of the site. The risk assessment and remedial actions are based on Kilkenny County Council's proposal to use the site as a Community Sports Play Area, as shown on Drawing GAC-D-401 in Figure 4. An access road will be constructed from the north of the site to a car park in the south-west. There will be a walking/running path around the perimeter of the site which will extend into the former playing pitch to the south. A storage building and running track will also be constructed on lands to the south of the landfill. The proposed remedial actions and the risk assessment completed by the Qualified Person takes into consideration the EPA Landfill Restoration and Aftercare Manual. Condition 3 of the recommended Certificate of Authorisation outlines the remedial works to be completed by Kilkenny County Council, which include additional capping, landfill gas collection and venting. Further capping is proposed in the application and risk assessment. There is varying thickness of capping across the landfill. Post capping, a minimum subsoil thickness of 1000 m cover will be achieved across the landfill. The overall landfill gas remediation strategy includes a landfill gas interception trench installed around the southern and eastern sides of the landfill. Vertical slotted uPVC pipes will be installed in the trench as vertical risers at intervals along the trench for passive venting of landfill gas. Three gas ventilation wells will be installed in the west of the site to allow passive ventilation of landfill gas. Gas Ventilation Wells will also be installed in each quadrant of the body of the waste to allow passive ventilation of landfill gas once the capping is placed and compacted. These measures are intended to: i. break the SPR linkages by preventing potential migration of landfill gas to offsite locations, and

	ii. vent the gas in a controlled manner to the atmosphere. As part of the proposed remedial measures, subsoil will be placed on the poorly drained northern part of the site which is heavily poached and water logged. A surface water collection drain will be constructed along the west and north of the site. The drain will be graded to fall to a low point where it will discharge to a lined attenuation pond to be constructed in the north-west corner of the site. Surface water from the pond will be discharged to the Irish Water storm sewer. Estimated cost: €180,000.
Proposed aftercare monitoring and assessment	Monitoring as specified in Condition 3.5 of the recommended certificate of authorisation. Validation report to be submitted within 30 months.
Adequacy of risk assessment	Regulation 7(7) of the Regulations states that the EPA must be satisfied with the risk assessment before proposing to grant a certificate of authorisation. The risk assessment submitted by Kilkenny County Council is adequate for the following reasons: • It has identified, assessed and adequately addressed the associated risks inherent with the landfill site. • A detailed ecological survey and Appropriate Assessment screening was also completed to evaluate the potential risk to the sensitive habitats associated with the adjoining receiving waters. • Report of Tier 2 intrusive investigation show that municipal waste deposited in the landfill was relatively low in biodegradable waste. Therefore, the waste deposits in the "closed landfill" will present relatively low risks of ongoing leachate and gas generation.

5. Appropriate assessment

A screening for Appropriate Assessment was undertaken to assess, in view of best scientific knowledge and the conservation objectives of the site, if the proposed activity, individually or in combination with other plans or projects is likely to have a significant effect on any European Site. In this context, particular attention was paid to the European Site at the Barrow and River Nore [SAC 002162].

The assessment is documented in Part III of the recommended certificate of authorisation.

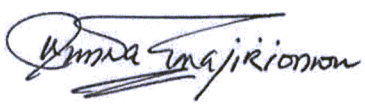
6. Consultation

I consulted with Mr John Gibbons (OEE) on landfill gas assessment and treatment.

7. Recommendation

I recommend granting the certificate of authorisation as proposed.

Signed



Magnus Amajirionwu

Inspector, Office of Environmental Sustainability

Procedural Note

Any representations received by the Agency within 30 days of the draft certificate of registration being made available will be considered by the Agency.

As soon as practicable after the expiry of the 30-day period the Agency will determine the certificate of authorisation, which may vary from the draft certificate, and shall issue an appropriately validated certificate of authorisation in accordance with the Waste Management (Certificate of Historic Unlicensed Waste Disposal and Recovery Activity) Regulations 2008.

Figure 1: Location of landfill (yellow boundary) as originally delineated in the section 22 register

Figure 2: The location of the site showing surrounding land use.

Figure 3: Conceptual site model

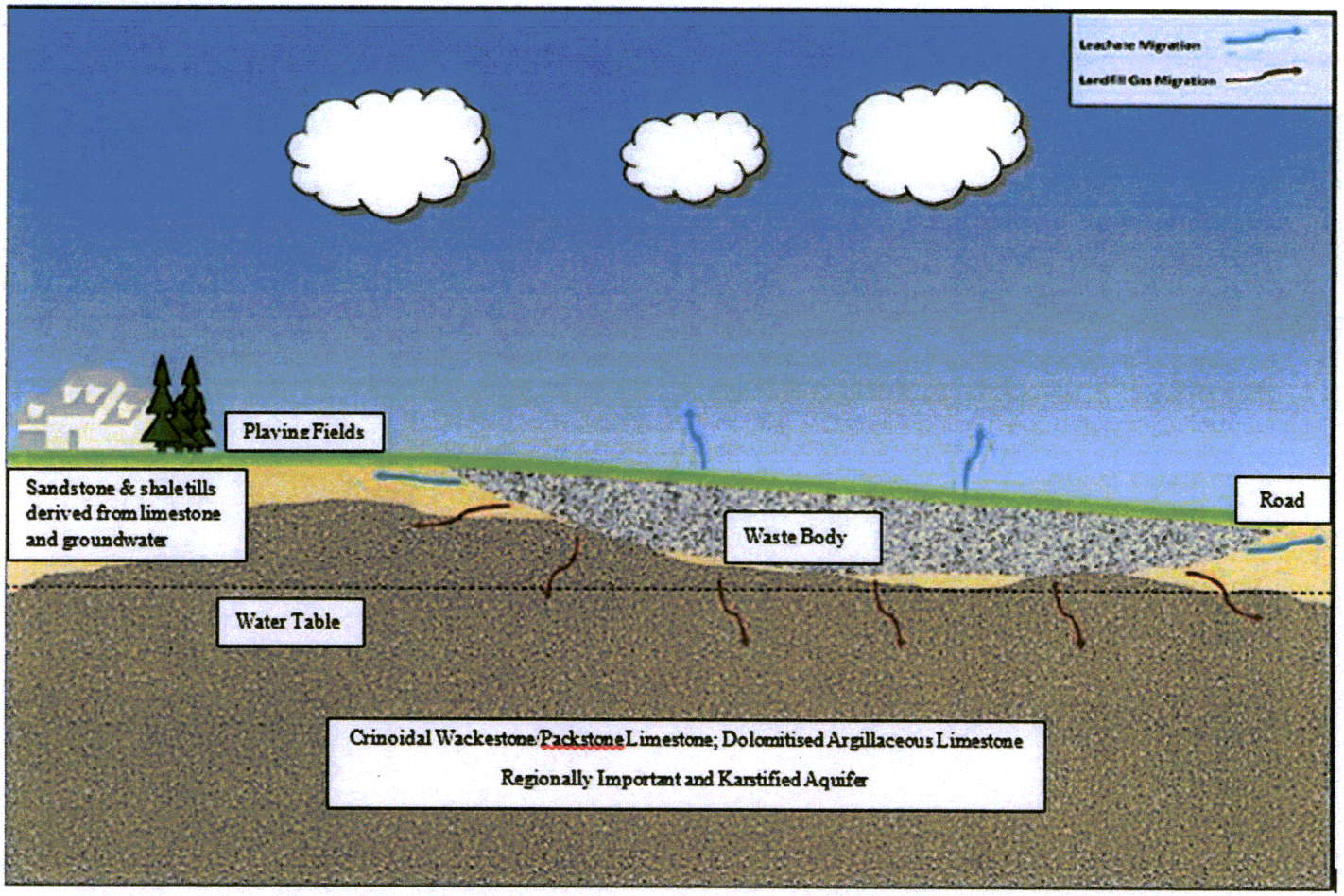


Figure 4: Proposed future land use