Lancashire Central

Drainage Strategy and Flood Risk Assessment

July 2022

Application for Outline Planning Permission

On behalf of Maple Grove Developments and Lancashire County Council

Lancashire County Council

MAPLE GROVE DEVELOPMENTS

Lancashire Central

Flood Risk Assessment & Drainage Strategy

June 2022

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This document has been prepared and checked in accordance with
Waterman Group's IMS (BS EN ISO 9001: 2008, BS EN ISO 14001: 2004 and BS OHSAS 18001:2007)

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Comments

Comments

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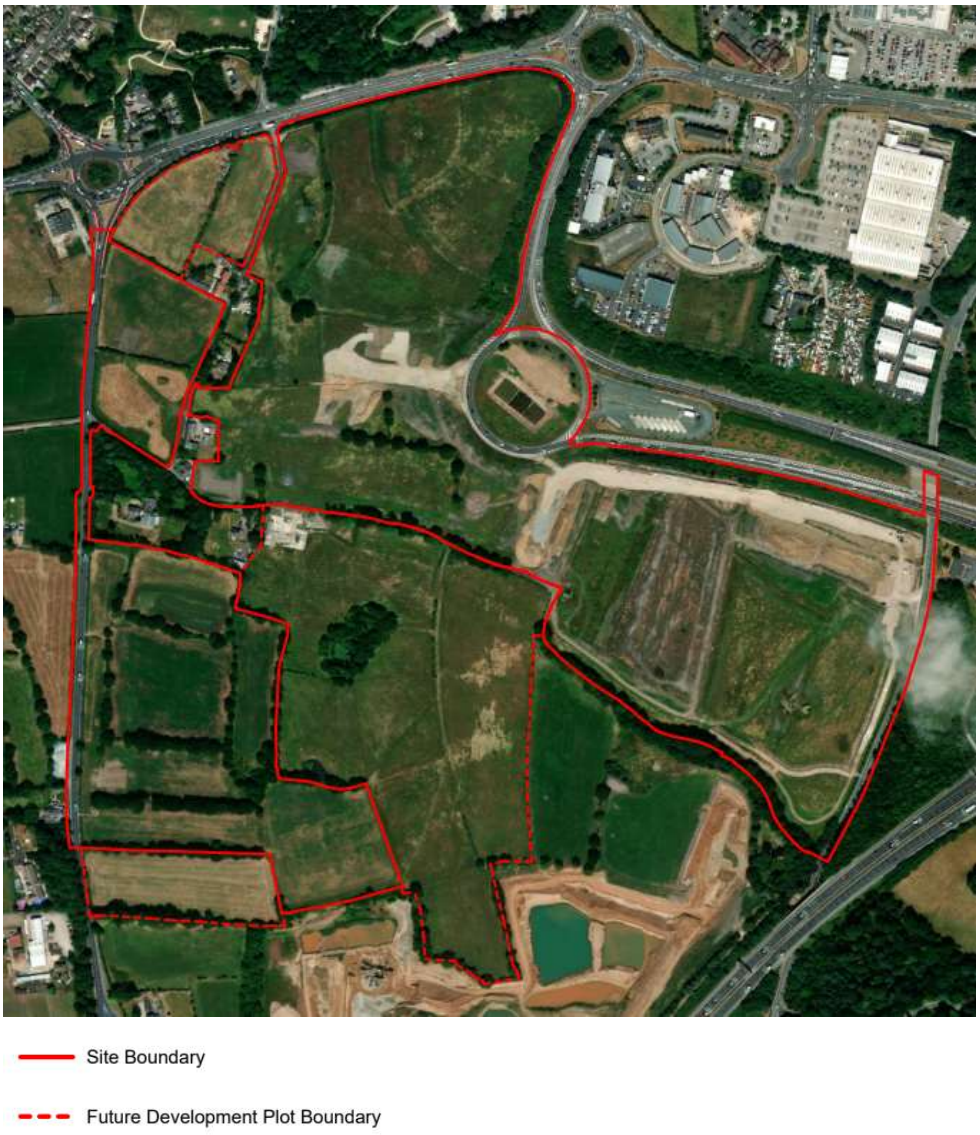
1. Introduction

1.1. Waterman has been commissioned by Maple Grove Developments & Lancashire County Council & Limited to undertake a Flood Risk Assessment (FRA) in relation to the proposed development known as Lancashire Central, Cuerden (hereafter referred to as the 'Site').

Site Description

1.2. The Site is approximately 65 hectares (ha) and comprises agricultural farmland. The Site is located off the M65 near Preston. The site is bound by the Wigan Road to the east, Lostock Lane to the north and Stanifield Lane and the Bottoms Farm / Quarry to the west and south respectively.

Figure 1: Site Location Plan



1.3. A topographic survey of the Site has been undertaken by Premier Surveys in November 2021 and is included in Appendix A. The survey shows the Site drains from the east to the west before ground levels begin to descend to the north near Lostock Lane. Levels on Site range between approximately 35.0m AOD to 56.0m AOD.

Development Proposals

1.4. The planning application seeks outline planning permission (with all matters reserved save for access from the public highway and strategic green infrastructure/landscaping) for a mixed-use development including the provision of Employment use (Use Classes B2/B8/E(g)); retail (use Class E(a)); food, drink and drive-through restaurant use (Use Class E(b)/Sui Generis Drive-Through); hotel use (Use Class C1); health, fitness and leisure use (Use Classes E(d)/F(e)/F2(b)); creche/nursery (Class E(f)); car showrooms (Use Class Sui Generis Car Showroom); Residential use (C3) the provision of associated car parking, access, public open space, landscaping and drainage. The existing ditches are to be realigned as part of the Development, with some localised culverting of the ditches, where highway crossings and site constraints require it. Adequate corridors are provided for future maintenance access.

As mentioned above, the application seeks outline planning permission with all matters reserved, except access. However, an illustrative masterplan has been produced to demonstrate how the development is likely to be implemented over time. This illustrative masterplan has been used to inform the overall drainage strategy for the site.

Planning Policy and Guidance

National Planning Policy Framework

1.5. The National Planning Policy Framework[i] (NPPF 2021) states that inappropriate development in areas at risk of flooding should be avoided by directing development away from areas at highest risk. Where development is necessary in higher risk areas, it must be made safe without increasing flood risk elsewhere.

1.6. The NPPF states that Local Plans should be supported by Strategic Flood Risk Assessments (SFRA) and policies developed in order to manage flood risk from all sources, taking into account advice from the Environment Agency and other relevant flood risk management bodies, such as lead local flood authorities and internal drainage boards. It advises that Local Plans should apply a sequential, risk-based approach to the location of development to avoid, where possible, flood risk to people and property and manage any residual risk, taking account of the impacts of climate change, by:

- Applying the Sequential Test and if necessary, the Exception Test;
- Safeguarding land from development that is required for current and future flood management;
- Using opportunities offered by new development to reduce the causes and impacts of flooding; and
- Where climate change is expected to increase flood risk so that some existing development may not be sustainable in the long-term, seeking opportunities to facilitate the relocation of development, including housing, to more sustainable locations.

1.7. The NPPF clarifies that the aim of the Sequential Test is to steer new development to areas with the lowest probability of flooding and that development should not be allocated or permitted if there are reasonably available sites appropriate for the proposed development in areas with a lower probability of flooding. If, following application of the Sequential Test, it is not possible (consistent with wider sustainability objectives) for the development to be located in zones with a lower probability of flooding, the Exception Test can be applied if appropriate. For the Exception Test to be passed:

- It must be demonstrated that the development provides wider sustainability benefits to the community that outweigh flood risk, informed by a SFRA where one has been prepared; and
- A site-specific FRA must demonstrate that the development will be safe for its lifetime, taking account of the vulnerability of its users without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.

1.8. As the Application Site is located within Flood Zone 1 and is considered to be at a low risk of tidal and fluvial flooding, the Sequential Test would be passed, and the Exception Test would not be required.

1.9. The NPPF states that when determining planning applications, Local Planning Authorities should ensure that flood risk is not increased elsewhere and only consider development in areas at risk of flooding where it can be demonstrated that:

- Within the site, the most vulnerable development is located in areas of lowest flood risk, unless there are overriding reasons to prefer a different location; and
- Development is appropriately flood resilient and resistant, includes safe access and escape routes where required, any residual risk can be safely managed (including emergency planning), and priority is given to the use of Sustainable Drainage Systems (SuDS).

1.10. Technical Guidance to the NPPF provides additional guidance to Local Planning Authorities, to ensure effective implementation of the planning policies set out within the NPPF regarding development in areas at risk of flooding. The guidance retains key elements of superseded Planning Policy Statement 25 (PPS25) as an interim measure, pending a wider review of guidance to support planning policy.

1.11. The Technical Guidance states that developers and Local Planning Authorities should seek opportunities to reduce the overall level of flood risk in the area and beyond through the layout and form of the development, and the appropriate application of SuDS. It provides advice on taking climate change into account, setting out recommended contingency allowances for net sea level rise and peak rainfall intensities, which should be increased by between 5% and 40% from now until the year 2115. It also advises on flood resilience and resistance measures when dealing with the residual risks remaining after applying the sequential approach and mitigating actions.

1.12. The Technical Guidance also includes advice on flood risk vulnerability and flood zone compatibility in Table 1. The following flood zones refer to the probability of river and sea flooding, ignoring the presence of defences:

- Zone 1 - low probability: less than 1 in 1,000 annual probability of river or sea flooding (<0.1%) in any year;
- Zone 2 - medium probability: between a 1 in 100 and 1 in 1000 annual probability of river flooding (1% - 0.1%) or between a 1 in 200 and 1 in 1,000 annual probability of sea flooding (0.5% - 0.1%) in any year;
- Zone 3a - high probability: 1 in 100 or greater annual probability of river flooding (>1%) or a 1 in 200 or greater annual probability flooding from the sea (>0.5%) in any year; and
- Zone 3b - the functional floodplain: where water has to flow or be stored in times of flood; identification should take account of local circumstances but would typically flood with an annual probability of 1 in 20 (5%) or greater in any year or is designed to flood in an extreme 1 in 1,000 (0.1%) flood.

1.13. Flood risk vulnerability is split into five classifications in Table 2 of the Technical Guidance, as follows, and the compatibility of these within each flood zone is set out in Table 3:

- Essential utility and transport infrastructure;
- Highly vulnerable, e.g., emergency services (those required to be operational during flooding), basement dwellings;
- More vulnerable, e.g., residential dwellings, hospitals, schools, hotels, drinking establishments;
- Less vulnerable, e.g., retail, offices, storage and distribution, leisure, restaurants; and
- Water compatible development, e.g., docks, marinas, wharves.

Flood and Water Management Act

1.14. The Flood and Water Management Act[ii] (FWMA, 2010) removes the automatic right of connection into public sewers.

Central Lancashire, Strategic Flood Risk Assessment

1.15. The Central Lancashire District Council Strategic Flood Risk Assessment (SFRA)[iii] was published in December 2007. The report was primarily produced as a planning tool to allow Preston City Council, South Ribble Borough Council and Chorley Borough Council to choose sites for development that would be sustainable and away from flood risk areas. It sets out procedures for the three councils to follow when choosing further sites for development and provides assistance when making planning decisions required as part of the Local Development Framework (LDF).

1.16. The main content of the SFRA includes:

- An overview of flood risk issues;
- Recommended policies to aid the councils in managing the flood risk;
- An outline of requirements for detailed Flood Risk Assessments; and
- Advice on SuDS and mitigation measures to consider as part of a development proposal.

1.17. Information from the SFRA regarding fluvial, tidal, pluvial and groundwater flooding is included within Chapter 2 of this report.

Scope of Report

1.18. This report assesses the potential effects of tidal, fluvial, groundwater, pluvial and artificial sources of flooding upon the Proposed Development. In line with current policy, the management of surface water is also assessed, and a strategy to effectively manage runoff whilst working within Site specific constraints is proposed, so as not to increase flood risk elsewhere.

2. Sources of Potential Flooding

Tidal and Fluvial

2.1. The Environment Agency's Flood Map (refer to Figure 2) shows the site being located within Flood Zone 1, indicating a low risk of flooding, less than 0.1% (1 in 1000) from rivers and tidal sources in any given year.

Figure 2: Environment Agency Flood Map

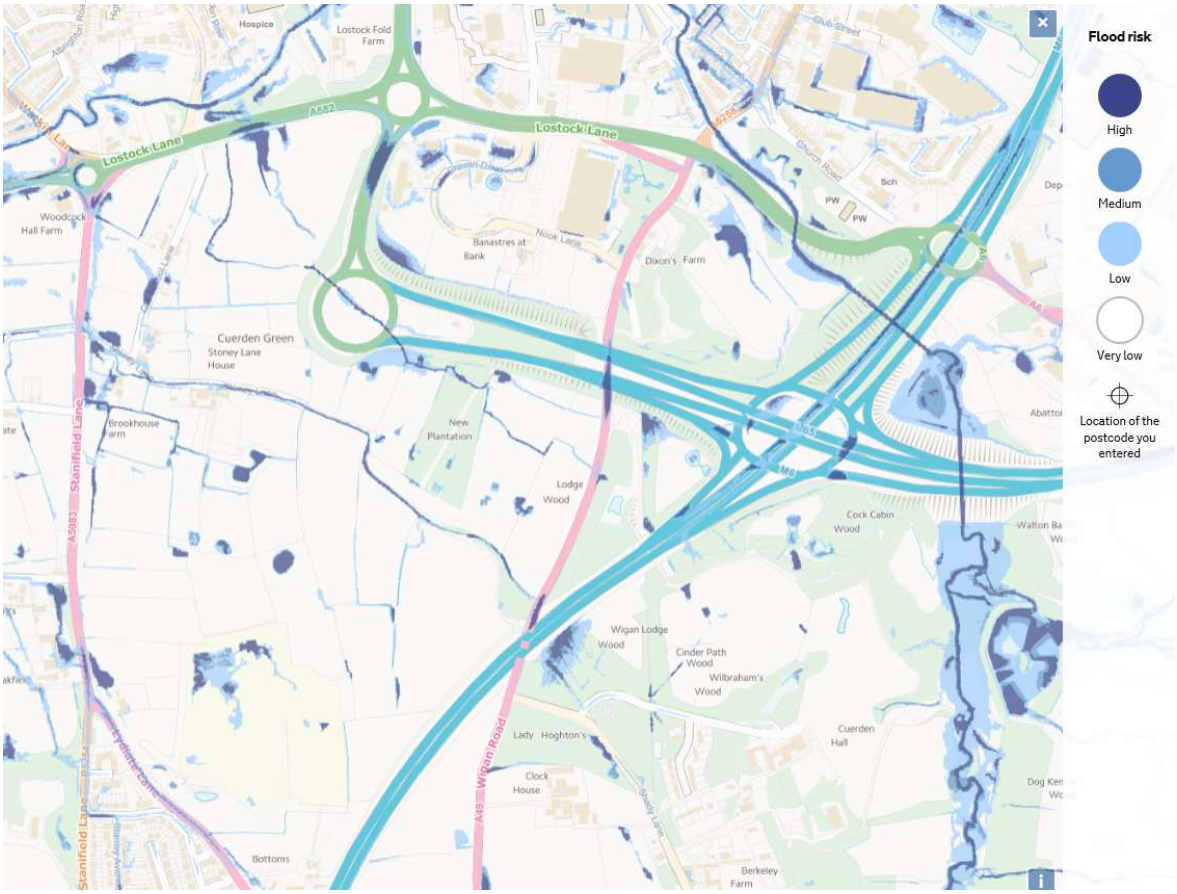
2.2. As such, the risk to the Site from Tidal and Fluvial flooding is considered to be low.

Pluvial

2.3. Pluvial flooding occurs when natural and engineered drainage systems have insufficient capacity to deal with the volume of rainfall. Pluvial flooding can sometimes occur in urban areas during an extreme, high intensity, short duration summer rainfall event which overwhelms the local surface water drainage systems, or in rural areas during medium intensity, long duration events where saturated ground conditions prevent infiltration into the subsoil. This flood water would then be conveyed via overland flow routes dictated by the local topography.

2.4. The Environment Agency's Flooding from Surface Water map is presented in Figure 3 which indicates that the majority of the Site is at 'Very Low' risk of surface water flooding.

Figure 3: Environment Agency Surface Water Flood Maps



2.5. The mapping in Figure 3 suggests that only a small proportion of the Site is at 'High' risk of flooding from surface water. The 'High' risk areas are generally limited to the drainage ditches within the existing site. These ditches allow water to follow the natural falls of the site from east to west towards the culverts at Lostock Lane. It is at these Culverts where the main obstruction to surface water flows is located causing ponding to occur behind these structures and creating areas of surface water flooding.

2.6. The ditch alongside Stoney Lane, which in part flows through the development site can be seen in Figure 3. To the west of the site boundary there is an increased risk of surface water flooding adjacent to Stoney Lane, School Lane and Stanfield Road junctions. Lancashire County Council as Lead Local Flood Authority (LLFA) are aware of reported flooding incidents in this locality. The proposed approach to Surface Water Management will not exacerbate this risk further.

2.7. Figure 4 presents surface water flood risk for the Site. It is clear this flood risk is predominantly limited to the extents of the existing ditch network on the Site.

Figure 4: Environment Agency Surface Water Flood Risk Results

2.8. Whilst the risk of flooding from surface water is generally 'Very Low' across the Site, the areas of flood risk 4 highlight the importance of the ditches within the Site in conveying surface water. It is known that development proposals are likely to require significant changes to the alignment and size of these ditches as well as wholesale changes to the makeup of the Site as more hard standing areas are built over the existing agricultural land.

2.9. As a result, it is important to ensure that appropriate management of surface water is employed within the Site and that the alignment and conveyance of the proposed ditch layout is given consideration at an early stage of the detailed design.

Groundwater

2.10. Groundwater flooding occurs when groundwater levels increase sufficiently for the water table to intersect the ground surface. Groundwater flooding can occur in a variety of geological settings including valleys, in areas underlain by chalk, and in river valleys with thick deposits of alluvium and river gravels.

2.11. Information available from the British Geological Society suggests that the majority of the Site sits above Sidmouth Mudstone Formation overlain by Devensian, Till. Boreholes taken within the area suggest that the strata are dominated by clayey soils suggesting that drainage is likely to be poor.

2.12. The underlying geology is unlikely to provide confined aquifers and may therefore allow the groundwater table to rise above the ground surface. However, it is expected that any flood risk associated with groundwater could be mitigated against by ensuring appropriate threshold levels

for buildings above the adjacent ground. A threshold level of 200mm is likely to be adequate. It will also be important to ensure that hardstanding areas slope away from buildings.

Artificial Sources of Flooding

2.13. There are no artificial water sources (canals, reservoirs, etc.) within close vicinity of the site that could potentially be the source of flood risk to the site. Flood risk from artificial sources is therefore considered low.

Summary

2.14. The Site is considered to be at a low risk of flooding from tidal, fluvial and artificial sources. Based on the coarse resolution British Geological Society's online mapping, the underlying geology may potentially be conducive to the groundwater table rising up to the ground surface during prolonged wet weather. However, any associated risk can be easily mitigated by ensuring appropriate threshold levels for buildings above the adjacent ground. A threshold level of 200mm is likely to be adequate. It will also be important to ensure that hardstanding areas slope away from buildings.

2.15. The majority of the Site is currently at 'Very Low' risk of pluvial flooding. However, there do appear to be some areas of 'High' risk due to the current ditch network. This ditch network is to be re-aligned as part of the proposed scheme and so the impacts of these changes have been assessed. Section 4 discusses the surface water management plan for the Site in relation to the drainage ditches.

3. Historical Flooding

3.1. Discussions have been held with LCC as LLFA in relation to known flooding events.

3.2. As mentioned in 2.6 (above) there have been reported incidents of flooding at locations adjacent to Stoney Lane, School Lane and Stanfield Road junctions. These are beyond the site boundary and the development proposals do not exacerbate the current risk of flooding to these locations. Given the site wide approach to surface water drainage (outlined below) there will be a reduced area drained to the existing Stoney Lane ditch. As such this may reduce the risk of flooding downstream of the site.

3.3. There have also been historic reports of surface water flooding at the Stanifield Lane / Lostock Lane roundabout. Initial accounts suggested these events related to the river Lostock overtopping its banks. Flood water was reported as extending into a small part of the field to the southeast of Stanifield Lane / Lostock Lane roundabout. This overtopping did not extend into the development boundary.

3.4. On further consideration of the accounts, record information and other reported events of flooding at the time. In particular, the lack of flooding to the Albrighton Estate located to the north of the river. The consensus view is the likely cause of flooding, was the rainfall event(s) exceeded the capacity of the local sewer system.

3.5. Lancashire County Council in their role as Lead Local Flood Authority have provided confirmation that maintenance was carried out on the existing ditch and culvert located adjacent to Stoney Lane approximately two and a half years ago. Since then, there have been no reports of flooding at either Stoney or at Stanifield Lane / Lostock Lane roundabout.

4. Surface Water Management

4.1. The intention of the following conceptual strategy for the provision of surface water drainage is to outline a framework for subsequent phases of development to adopt in order to mimic as closely as possible the undeveloped scenario.

4.2. Guidance for the disposal of surface water from a development Site indicate infiltration systems are to be considered as the primary solution. If this is not practical, discharge to a watercourse is to be considered as the next available alternative. Only if these options are unavailable, and other sustainable drainage methods not possible, should the use of the public sewerage system be considered.

4.3. During preliminary site investigation activities infiltration testing was carried out at locations across the site to develop an understanding of the likely viability for infiltration-based drainage systems.

4.1. The test locations and results can be found in Appendix B of the Geo-environmental Assessment (Ref: WIE11556-102-R-1.1.5-MB). It has been found consistently across the site that infiltration techniques will not be viable.

Existing Catchments

4.2. The site is largely divided into agricultural fields of varying sizes. Field boundaries are generally lined with trees and hedges. An area of woodland is located just south of the M65.

4.3. A series of open ditches along field boundaries drain the site towards the North / Northwest site boundaries.

4.4. An existing watercourse enters the site from the east via a culvert under Wigan Road. This onsite watercourse becomes culverted again as it approaches the existing M65 roundabout. The culvert re-emerges the site adjacent the north-west side of the roundabout. This ditch then flows in a north / north westerly direction to existing culverts under Lostock Lane. A second watercourse also enters the site as a culvert from Wigan Road. This culvert flows in a westerly direction and becomes an open watercourse adjacent to the south side of Stoney Lane. This watercourse becomes culverted again as it passes under Stoney Lane and joins an existing carrier drain system running in a northerly direction along Stanifield Lane, ultimately discharging to the River Lostock.

4.5. The M65 roundabout landscaped area is set lower than the circulatory carriageway. The area forms part of the off-site highway drainage system and provides a significant volume of attenuation.

4.6. Drainage surveys have been undertaken in December 2021 and January 2022 to confirm drainage connectivity to the River Lostock from the site. Further information of the drainage surveys undertaken can be found in Appendix B.

4.7. The second ditch emanating from Wigan Road runs initially beyond the southern boundary of the site, before turning into the site and along Stoney Lane as far as Brookhouse Farm. Here the ditch then deviates onto and across this third-party land to an assumed outfall across Stanifield Lane (consistent with mapping data).

4.8. Beyond the North-West corner of the site in the adjacent field, there is a further ditch. Consultations with LCC confirmed a piped connection from this ditch into the existing drainage system at Lostock Lane / Stanifield Lane Roundabout. The system discharges into the River Lostock to the north of the roundabout. This information is verified via the December 2021 survey information, provided is Appendix B.

4.9. Historical maps and United Utilities sewer plans indicate additional drainage ditches and outfalls crossing Stanifield Lane on the West boundary of the site. Similar drainage ditches on the agricultural land to the west of Stanifield Lane appear to drain to the Lostock River.

4.10. In during December 2021 and January 2022 a drainage survey was carried out on the existing drainage infrastructure that this development intends to connect to at several locations. The survey provided evidence of where this infrastructure ultimately discharges to. All of the existing surface water drainage infrastructure ultimately discharges to the River Lostock. All details of this survey including defects have been forwarded to LCC LLFA/Highways Department as per their request to inform future maintenance and remediation works. The documentation for this survey work is provided in Appendix B, with the key elements also shown on the Drainage Constraints plans provided in Appendix F.

4.11. A topographical survey plan of the existing site is attached at Appendix A. This survey was carried out in December 2021.

4.12. The greenfield run-off rate has been assessed as 6.4 l/s/ha for the development area, see Appendix C for a copy of the assessment.

Proposed Catchments Discharge Restrictions & Attenuation Estimates

4.13. The existing site catchment drains the site to the North and West boundaries via a system of field ditches towards Lostock Road and Stanifield Road.

4.14. It is intended that the proposed development run off will replicate the existing Greenfield run off rate. The adoption of greenfield discharge rates within the design of the site wide infrastructure will mimic the undeveloped scenario. Paragraphs 4.16 to 4.18 provides an overview of the drainage strategy for the 3 distinct parts of the overall development. There are three potential future phases for the scheme which are briefly outlined in paragraphs 4.19 to 4.21 below. The proposed adoptable highway systems that shall serve the development, and how they are to be drained is set out in paragraph 4.22.

4.15. The residential component of the site located immediately east of Stanifield Lane will drain via the existing piped network that flows in a northerly direction adjacent to Stanifield Lane and ultimately outfalls into the River Lostock. These surface water flows shall be attenuated to greenfield runoff rate via an attenuation pond. Foul flows generated shall be conveyed to an adoptable foul pumping station located on site.

4.16. The employment area of the development known as Zone D is located directly east of Stanifield Lane. Flows from this area shall be attenuated on site via a combination of above and below ground attenuation. Attenuated flows will discharge into an existing drainage pipe location alongside Stanifield Lane, ultimately discharging to the River Lostock.

4.17. The remaining development consists of various non-residential units located across three Zones (A to C). Each unit shall have its own attenuation measures to limit surface water runoff to the equivalent greenfield runoff rate for that unit. These attenuated flows shall then discharge into the on-site ditch which becomes culverted under Lostock Lane and discharges to the River Lostock.

4.18. There is a potential future phase parcel located in between Zone D and Zones B to C. Flows from this Zone would flow at an attenuated rate into the ditch system located on the west side of Zone C.

4.19. There is another future phase parcel located to the west of Zone C. This shall drain via the existing piped network that flows in a northerly direction adjacent to Stanifield Lane and ultimately outfalls into the River Lostock. These surface water flows shall be attenuated to onsite to greenfield runoff

rate. on site. Flows from the pumping station shall be conveyed to the United Utilities public sewer network; point of connection is at the junction between Cuerden Way and Lostock Lane.

4.20. The third and final potential future phase is located directly south of Zone D. There is a drain that runs along Stanfield Lane. However due to an obstruction located in the drain that was discovered during the CCTV survey works that were carried out in 2021 and 2022, it is not confirmed whether or not this drain extends further south along Stanifield Lane to a point adjacent to this parcel. Figure 4 in Section 2.0 of this report suggests there are several natural ditches / tributaries in this area, which would be the preferred method of conveying surface water flows from this area. Should this future phase be taken forward, some further investigation work shall be required to determine the most viable method of conveying surface water from the development.

4.21. The proposed adoptable road from the junction with Wigan Road to a point approximately to the south of the M56 roundabout shall drain unattenuated to the existing attenuation pond within the roundabout, via an existing culvert. This area equates to approximately 1 hectare and Lancashire of impermeable surfacing and Lancashire County Council have confirmed their attenuation pond can accommodate unattenuated flows from the area. Refer to correspondence between Waterman and LCC provided in Appendix I

4.22. A plan showing the proposed site catchment areas (i.e., as modified by the development) is provided in Appendix D.

4.23. Appendix E contains a summary of the anticipated volume of attenuation that is required for each part of the proposed development, supporting Micro Drainage Source Control attenuation volume estimates are provided for each plot.

4.24. Given that the application seeks Outline Planning Permission with all matters reserved (except access), it should be noted that these calculations are intended as a guide and that detailed drainage proposals will be developed and submitted for approval at the Reserved Matters stage. Any detailed proposals for individual Development Zones or Plots should demonstrate how they align with and contribute towards the wider drainage strategy for the Site.

4.25. Indicative surface water drainage proposals are provided on the Drainage Constraints plans in Appendix F. As a minimum each development plot will contain a system that attenuates and controls surface water discharge to greenfield rates. Each system will contain an appropriate for of pollution control measures compliant with PPG3.

4.26. Waterman Infrastructure and Environment are also providing drainage drawings for the proposed highway access junctions serving the development. This package of work shall be issued to LCC as a separate package of information.

Surface Water Management

4.27. The site approach is based on controlling surface water at source and limiting discharge to existing greenfield rates, with the exception of the eastern portion of the on-site highway that shall be offered for adoption to Lancashire County Council: As stated in paragraph 4.22 above, Lancashire County Council have agreed to take the catchment unattenuated into their existing attenuation pond.

4.28. Each plot will contain a system that attenuates and controls surface water discharge to greenfield rates the plot-by-plot review of greenfield discharge/discharger restrictions and outline attenuation volumes are provided within Appendix E.

4.29. It is envisaged that development plot drainage will incorporate geocellular tank system with discharge controlled by a suitable flow control device. Where viable, above ground attenuation shall be utilised.

4.30. With the exception of the adoptable highway catchment described in above paragraph 4.22, the remaining adoptable highway catchment shall be served by above ground attenuation features surface features, such as attenuation ponds with discharge controlled to greenfield rates. These features shall then discharge into the diverted on-site ditch system.

4.31. Opportunities for rainwater harvesting will be considered as part of the future detailed design for this scheme on a plot-by-plot basis. The use of geocellular tanks may provide the opportunity for rainwater harvesting. With surface water used for landscape irrigation purposes or toilet flushing.

4.32. Although infiltration techniques are not viable (due to underlying ground conditions) the use of porous parking bays may also be considered this technique will increase the time of entry into the drainage system and may provide further opportunities for rainwater harvesting.

4.33. Where appropriate the attenuation of rainfall from events in excess of 1 in 30-year return period, by the controlled flooding of external car parks, landscaped area and service areas is considered.

4.34. There is an existing ditch linking Wigan Road to the M65 roundabout. This ditch will need to be diverted through the development. Due to the changes in site level against the existing invert level of the ditch retaining structures will be required at specific points along the diversion route to support the highway and areas along the route.

4.35. Where required the proposed drainage infrastructure shall incorporate PPG3 compliant pollution control measures.

4.36. Opportunities for rainwater harvesting and increasing the time of entry for rainfall into the drainage system (such as porous parking spaces) will be considered during the detailed design of each plot.

4.37. There are proposals, as part off-site highway works to provide additional carriageway capacity within the M65. Additional impermeable area will be provided and will increase flow into the M65 roundabout. These proposals do not form part of this application and are being dealt with by Lancashire County Council.

4.38. Mott Macdonald have completed and Outline Drainage Strategy for these works (reference: 357876/04/A dated 28.02.17) and Lancashire County Council have confirmed that the general principles of this report are still accurate. As the final design emerges with further input from stakeholders on and off site, any proposals to vary the finer detail of that strategy will be subject to Lead Local Flood Authority approval post planning

Adoption & Maintenance

4.39. The drainage strategy has been developed to demonstrate conceptually that drainage for the proposed development site is achievable, including delivering the site in a multi-phased approach.

4.40. A Management Company will be instructed to oversee the maintenance of the site, it's landscaping and infrastructure.

The main techniques that are proposed within the strategy are summarised below, an initial review of potential maintenance requirements are also provided.

Swale Maintenance		
Regular	Litter and debris removal	Monthly
	Amenity grass cutting at 35-50mm	As required
	Grass cut to swales, access and overflows 75-100mm not to exceed 150mm	Monthly or as required
	Wetland or meadow vegetation cut at 50mm and remove to wildlife or compost piles	Monthly or as required
	Inspect and clear inlets outlets and overflows	Monthly
Occasional	Remove leaf accumulation	As required
	Cut back overhanging branches to allow dense vegetation growth	As required
Remedial	Repair erosion, level uneven surfaces or damage by re-turfing or seeding	As required
	Remove silt and spread locally outside design profile and reinstate surface	As required
	Repair inlets, outlets or check dam structures to design detail	As required

Detention areas – dry basins		
Regular	Litter and debris removal	Monthly
	Amenity grass cutting at 35-50mm	As required
	Grass cutting to access, overflows and main basin where required at 75-100mm not to exceed 150mm	As required
	Meadow grass, where appropriate cut at 50mm and remove to wildlife or compost piles	Annually
	Manage any wetland planting in micro pools by cutting and remove to wildlife or compost piles	As required
	Inspect and clear inlets outlets and overflows	Monthly
Occasional	Remove leaf accumulation	As required
	Cut back overhanging branches to allow dense vegetation growth	As required
	Remove sediments from forebay, inlets and pre-treatment structures	As required
Remedial	Rep Repair inlets, outlets or check dam structures to design detail	As required

Permeable Pavement Parking Spaces) Maintenance

Regular	Surface brushing for appearance and to reduce silt accumulation	Monthly
	Brushing and suction sweep or jet wash and suction sweep particularly for block pavement in autumn after leaf fall	Annually
	Mow grass edges to pavement at 35-50mm and remove weed and leaves	As required
	Check outlets and control structures	Monthly depending on detail
Occasional	Jetting and suction where silt has accumulated in joints or voids. Replace grit and vibrate surface to lock for permeable block paving	As required
	Cut back overhanging branches to allow dense vegetation growth	As required
Remedial	Where sinkage or surface damage occurs uplift blocks, remove grit bedding layer, geotextile if present and reinstate to design profile	As required

Wetland/Pond Areas		
Regular	Litter and debris removal	Monthly
	Amenity grass cutting at 35-50mm	As required
	Grass cut to wetland/pond, access and overflows 75-100mm not to exceed 150mm	Monthly or as required
	Wetland or rough grass cut at 50mm and remove to wildlife or compost piles	Annually or as required
	Cut pond vegetation if required and not more than 30% 100mm above pond base and remove to wildlife or compost piles	Annually or as required
	Inspect and clear inlets, outlets, overflows and control structures	Monthly
	Remove sediment from forebay structures if present and site	Annually
Occasional	Review silt accumulation remove, and site apply or take off site if necessary subject to agreement	As required
	Removal of tree or shrub growth within 5m of pond/wetland edge	As required
Remedial	Repair inlets, outlets or check dam structures to design detail	As required

Attenuation Tanks: Geocellular Boxes & Oversized Pipes		
Regular	Check inlets, outlets, control structures and overflows	Monthly or annually as per manufacturers recommendations
Occasional	Clearance of silt	As required
Remedial	Reinstate	As required

5. Foul Water Drainage

5.1. Previous discussions with United Utilities have identified a point of connection into their system at the junction of Cuerden Way / Lostock Lane. As these original discussions took place in 2016, United Utilities have been re contacted to provide an up-to-date response. An up to date response is provided in Appendix J, along with the precious correspondence. The latest response confirms the proposed connection point into the public sewer at Cuerden Way / Lostock Lane is acceptable. The proposed foul flows provided to United Utilities include all the potential future phases.

5.2. Based on the current masterplan layout three pumping stations are currently proposed. One shall serve Zones A to C and is located on the northern end of the main spine road through Zones A to C. A second pumping station shall serve Zone D. The third pumping station shall serve the residential zone.

5.3. Should any of the potential future phases become part of the development, the foul drainage strategy shall be reviewed to ensure all phases are accounted whilst minimising as much as is feasible, the number of pumping stations.

5.4. The indicative foul drainage layout is provided on the Drainage Constraints drawings in Appendix I.

5.5. Correspondence with United Utilities can be found in Appendix J.

6. Conclusions

6.1. The Site is located within Flood Zone 1 and is therefore considered by the Environment Agency to be at a low risk of tidal and fluvial flooding.

6.2. Pluvial or Surface Water Flood Risk is generally considered to be 'Very Low' within the Site. However, a number of drainage ditches are known to exist within the Site that allow drainage of the fields from east to west towards the culverts beneath Lostock Lane and into the river Lostock itself. As the proposed development will see the ditches re-aligned together with wide scale development across the Site, it is important to ensure that proposed drainage layout is capable of draining the Site efficiently without causing flooding of any of the proposed units.

6.3. Following discussions with the LLFA is the consensus view that historical flooding to a small part of the northwestern area of the site is due to rainfall event exceeding the capacity of the existing drainage system.

6.4. It is anticipated that post determination and in advance of any future reserved matters application that the drainage within Stanifield Lane/Lostock Lane roundabout is subject to review in conjunction with LCC as LLFA/Highways Authority.

6.5. The underlying geology suggests that there is potential for groundwater flooding to occur however, it is expected that any flood risk associated with groundwater could be mitigated against by ensuring appropriate threshold levels for buildings above the adjacent ground. A threshold level of 200mm is considered adequate whilst ensuring that hardstanding areas slope away from buildings.

6.6. The flood risk from artificial sources has also been assessed and found to be low.

6.7. It is important to note that the surface water management/drainage provision included in this Flood Risk Assessment demonstrates technical feasibility and further detailed drainage design works will be undertaken in parallel with the future reserved matters application. It is simply a demonstration of a suitable and technically feasible design for the proposed development, based on the information available at present.

6.8. Site constraints such as ground conditions, invert levels of the drainage ditch, underground infrastructure clashes, and development requirements have yet to be fully explored and may affect the final design of the on-site drainage system. This would be investigated as part of the detailed design which when confirmed and would be submitted to the Local Planning Authority for approval.

6.9. This report demonstrates that the proposed Development would be at a low risk of flooding. It also confirms that surface water run-off from the development could be drained sustainably, ensuring that flood risk is not increased elsewhere. It is anticipated that the information provided within this report would satisfy the requirements of the NPPF.

UK and Ireland Office Locations