

Bergan-Brooklyn Apartments

- 17.5.57 There are 66 windows within this residential property serving 36 rooms.
- 17.5.58 In regards to VSC, 37 (56%) out of the 66 windows will meet the BRE guidelines and therefore the effect on these windows is considered to be negligible.
- 17.5.59 Of the remaining windows, five will experience alterations between 20-30% which are considered minor adverse in significance and 12 windows will experience between 30-40% alterations. Therefore 12 windows will experience over 40% alterations in VSC level, however three of these windows will still have a proposed level of 16% which can be considered commensurate with the surrounding context of a city centre location. One of these 12 windows will experience over 70% alterations however the existing VSC level is 9.5% which is considerably lower than the level recommended by the BRE guidelines (27%) whereby any alteration could result in a disproportionate percentage change.
- 17.5.60 Also, the room uses are unknown for this property and there is a possibility that several of these rooms bedrooms which by reference to the BRE are considered less sensitive in terms of daylight compared to living rooms. There is also possibility that these rooms are bathrooms or circulation space which are not considered relevant within this assessment.
- 17.5.61 In regards to NSL, 29 (81%) out of the 36 rooms assessed will meet the BRE guidelines and thus experience a negligible effect.
- 17.5.62 For the remaining seven rooms, four will experience alterations between 20-30% which are considered minor adverse in significance and two rooms will experience between 30-40% alterations. This leaves one room which will experience over 40% alterations. The room will experience 46% alterations which is only slightly over the 40% mark. For the affected rooms the rooms uses are unknown therefore there is a chance they could be bedrooms which according to the BRE guidelines are considered less sensitive than living rooms. There is also possibility that these rooms are bathrooms or circulation space which are not considered relevant within this assessment.
- 17.5.63 Overall the effect on Bergan-Brooklyn Apartments is considered to be **minor to moderate adverse** in significance.

769, 771 and 771a High Road

- 17.5.64 There are nine windows within this terrace of mixed use properties serving nine rooms.
- 17.5.65 In regards to VSC, four (44%) out of the nine windows will meet the BRE guidelines and therefore the effect on these windows is considered to be negligible.
- 17.5.66 The remaining five windows will all experience alterations between 20-30% which is considered of minor significance. All five rooms will also retain VSC levels of 21.5 and above which may be considered commensurate with the urban context of the site.
- 17.5.67 In regards to NSL, four (44%) out of the nine rooms assessed will meet the BRE guidelines and thus experience a negligible effect.

17.5.68 For the remaining five rooms, all will experience between 20-30% alterations which is considered of minor significance. However, the uses for the remaining rooms within these properties are unknown and there is a possibility that these rooms are bedrooms which by reference to the BRE are considered less sensitive in terms of daylight compared to living rooms. There is also possibility that the windows serve bathrooms or circulation space which are not considered relevant within this assessment.

17.5.69 Overall the effect on 769, 771 and 771a High Road is considered to be **minor adverse** in significance.

794 High Road

17.5.70 There are 19 windows within this residential property serving 11 rooms.

17.5.71 In regards to VSC, 12 (63%) out of the 19 windows will meet the BRE guidelines and therefore the effect on these windows is considered to be negligible.

17.5.72 Out of the remaining seven windows, six will experience alterations between 20-30% which is considered minor adverse in significance, leaving one window that will experience alterations between 30-40%. However, the window will still receive a proposed VSC of 17% which may be considered acceptable within the urban context of the site. It must also be noted that the room uses for this property are unknown and there is a possibility that several of the windows serve bathrooms or circulation space which are not considered relevant in this assessment. The windows could also serve bedrooms which are considered less sensitive to daylight than living rooms as stated in the BRE guidelines.

17.5.73 In regards to NSL, all of the 11 rooms (100%) assessed will meet the BRE guidelines and thus experience a negligible effect.

17.5.74 Overall the effect on 794 High Road is considered to be **minor adverse** in significance.

790 High Road

17.5.75 There are 12 windows within this residential property serving 12 rooms.

17.5.76 In regards to VSC, none of the windows will meet the BRE guidelines. One window will experience between 30-40% alterations and the remaining 11 windows experiencing over 40% alterations. However, 11 out of the 12 windows have proposed VSC levels above 16% and therefore may be considered commensurate within the surrounding context of an urban location. Also, the room uses for this property are unknown and there is a possibility that several of these windows serve bedrooms which are all considered less sensitive to daylight conditions than living rooms according to the BRE guidelines. There is also possibility that the windows serve bathrooms or circulation space which are not considered relevant within this assessment.

17.5.77 Similarly in regards to NSL, none of the 12 rooms assessed will meet the BRE guidelines. Five of the windows will experience 20-30% alterations which is considered of minor significance, four will experience alterations between 30-40% and the final three rooms will all experience over 40% alterations. However, the room uses for this property are unknown and there is a chance several of these rooms are bedrooms which according to the BRE guidelines are considered less sensitive than living rooms. There is also possibility that the rooms are bathrooms or circulation space which are not considered relevant within this assessment.

17.5.78 All of the rooms that will not meet the BRE guidelines will however, retain NSL levels between 50.23-74.71% which may be considered commensurate with the dense urban environment.

17.5.79 Overall the effect on 790 High Road is considered to be **moderate to major adverse** in significance.

45, 49 and 51 Northumberland Park

17.5.80 There are 16 windows within these terraced residential properties serving 13 rooms.

17.5.81 In regards to VSC, 12 (75%) out of the 16 windows will meet the BRE guidelines and therefore the effect on these windows is considered to be negligible.

17.5.82 The four remaining windows will all experience alterations over 40%, however the existing levels of VSC for these windows are all below 2% which is very considered low (compared to the recommended 27%) and any alteration could result in a disproportionate percentage change, which is supported by the small absolute alterations which are all below 1%. Such changes are unlikely to be noticeable to the occupant and are technical transgressions.

17.5.83 In regards to NSL, all of the 13 rooms (100%) assessed will meet the BRE guidelines and thus experience a negligible effect.

17.5.84 Given that the absolute changes are so small and unlikely to be noticeable the effect on 45, 49 and 51 Northumberland Park is considered to be **negligible**.

10 Worcester Avenue

17.5.85 There are five windows within this terraced residential property serving four rooms.

17.5.86 In regards to VSC, four (80%) out of the five windows will meet the BRE guidelines and therefore the effect on these windows is considered to be negligible.

17.5.87 The one window that does not meet the BRE guidelines will experience alterations between 20-30% which is considered of minor significance. Also, the use for this room is unknown and there is a possibility that the window serves a bathroom or circulation space which are not considered relevant to this assessment or a bedroom which are considered less sensitive to daylight conditions than living areas according to the BRE guidelines.

17.5.88 In regards to NSL, all four rooms (100%) assessed will meet the BRE guidelines and thus experience a negligible effect.

17.5.89 Overall the effect on 10 Worcester Avenue is considered to be **minor adverse** in significance.

17 – 41 Worcester Avenue

17.5.90 There are 226 windows within these terraced residential properties serving 53 rooms. These residential houses form a terrace on the opposite side of Worcester Avenue. They are situated to the northeast of the site.

17.5.91 In regards to VSC, 62 (27%) out of the 226 windows will meet the BRE guidelines and therefore the effect

on these windows is considered to be negligible.

- 17.5.92 Of the remaining 164 windows, 23 will experience between 20-30% alterations which is considered of minor significance and 19 windows will experience between (30-40%) alterations. Therefore 122 windows will experience over 40% alterations in VSC levels. However, 52 of these windows have proposed VSC levels over 15% which may be considered acceptable within the context of the urban environment.
- 17.5.93 166 windows serve either entrance hallways, bedrooms or garages. The 45 windows serving entrance hallways and 12 serving garages are not considered relevant in this assessment as the BRE guidance states that circulation spaces and garages need not be considered. The 109 windows serving bedrooms are considered less sensitive to daylight conditions than living rooms according to the BRE guidelines.
- 17.5.94 There are 60 windows serving a total of 12 living rooms which the BRE guidance states has the highest expectation for daylight. Each living room is served by 5 windows of equal size. The BRE guidelines recommend that where equal size windows serve a room the average VSC can be taken. The average retained VSC value for each living room ranges from 12-26%, which may be considered acceptable within the context of the urban environment.
- 17.5.95 The extant planning permissions previously granted for the Project Site saw the living rooms reduced to retain between 16-27% VSC for nos. 31 to 41 Worcester Avenue. The latest proposals therefore do not lead to a material deviation outside of this range.
- 17.5.96 In regards to NSL, 19 (36%) of the 53 rooms assessed will meet the BRE guidelines and thus experience a negligible effect.
- 17.5.97 For the remaining rooms, two of the rooms will experience between 20-30% alterations and 1 will experience 30-40%. Therefore 31 rooms will experience over 40% alterations.
- 17.5.98 It must be noted that all of the rooms within 17-21 (odd) Worcester Avenue meet the BRE criteria for NSL levels. The living rooms at nos. 23 and 25 (odd) Worcester Avenue also meet the BRE criteria for NSL levels. The living room at 27 Worcester Avenue experiences a 24% reduction in NSL, which is marginally short of the BRE criteria. The overall effect to these rooms is considered minor.
- 17.5.99 Of the remaining 6 living rooms, located at 31 to 41 Worcester Avenue, these rooms experience reductions in NSL levels ranging from 46-64%.
- 17.5.100 Where there is an extant planning permission on a site, Appendix F2 of the BRE Guide states that a local authority may allow the vertical sky component (VSC) for the permitted scheme to be used as an alternative benchmark. The extant planning permissions previously granted for the Project Site saw the living rooms reduced to retain between 16-27% VSC for nos. 31 to 41 Worcester Avenue and the latest proposals do not lead to a material deviation outside of this range. Overall the effect on 17-41 Worcester Avenue is considered to be **major adverse** in significance.

Northumberland Park Community School

- 17.5.101 There are 20 windows within this school serving five rooms.
- 17.5.102 In regards to VSC, 17 (85%) out of the 20 windows will meet the BRE guidelines and therefore the effect

on these windows is considered to be negligible.

17.5.103 All three of the remaining windows will experience alterations between 20-30% which is considered minor adverse in significance. The three windows will also retain proposed VSC levels of 18.5% and above which may be considered acceptable given the urban environment that the site is located within.

17.5.104 In regards to NSL, three (60%) of the five rooms assessed will meet the BRE guidelines and thus experience a negligible effect.

17.5.105 The two remaining rooms will both experience between 30-40% alterations. These effects are likely the result of the proximity of the school to the Site and the current, relatively open, view across the Site. In addition, it is a possibility that the affected rooms have ancillary uses to the school such as offices rather than classrooms and therefore may not be considered as sensitive in terms of daylight.

17.5.106 Overall the effect on Northumberland Park Community School is considered to be **minor adverse** in significance.

St Paul's and All Hallows School

17.5.107 There are 37 windows within this school serving 23 rooms.

17.5.108 In regards to VSC, 16 (43%) out of the 37 windows will meet the BRE guidelines and therefore the effect on these windows is considered to be negligible.

17.5.109 Of the remaining windows, one will experience alterations between 20-30% which is considered minor adverse in significance. Eight windows will experience alterations between 30-40% although all of these affected windows will retain VSC levels between 16-24% which may be considered commensurate within the dense urban environment. 12 windows will experience over 40% alterations, however, four of these windows will retain proposed VSC levels between 16-16.5% which may be considered acceptable given the urban environment context of the site. In addition, the room uses for this property are unknown and there is a possibility that several of these windows serve ancillary rooms or circulation space rather than principle rooms such as classrooms.

17.5.110 In regards to NSL, 19 (83%) of the 23 rooms assessed will meet the BRE guidelines and thus experience a negligible effect.

17.5.111 The four remaining rooms will all experience between 30-40% alterations. These effects are likely the result of the proximity of the school to the Site and the current, relatively open, view across the Site. In addition, it is a possibility that the affected rooms have ancillary uses to the school such as offices rather than classrooms and therefore may not be considered as sensitive in terms of daylight.

17.5.112 It must also be noted that seven of the rooms within the school will experience a gain in NSL levels.

17.5.113 Overall the effect on St Paul's and All Hallows Infant School is considered to be **moderate adverse** in significance.

48 - 56 Park Lane

17.5.114 There are 22 windows within these mixed use terraced properties serving 22 residential rooms.

17.5.115 In regards to VSC, six (27%) out of the 22 windows will meet the BRE guidelines and therefore the effect on these windows is considered to be negligible.

17.5.116 Of the remaining windows, 13 will experience alterations between 20-30% which are considered minor adverse in significance and three windows will experience alterations between 30-40%. However, all of the rooms which do not meet the BRE guidelines will retain levels of 16% and above which may be considered commensurate with the urban context of the site.

17.5.117 In regards to NSL, 20 (95%) of the 21 rooms assessed will meet the BRE guidelines and thus experience a negligible effect.

17.5.118 The one remaining room will experience alterations between 20-30% which is considered of minor significance. Also, the use of this room is unknown and there is a possibility that it may be used as a bedroom which are considered less sensitive to daylight conditions than living rooms. There is also possibility that this room is used as a bathroom or circulation space which are not considered relevant within this assessment.

17.5.119 Overall the effect on 48 - 56 Park Lane is considered to be **minor adverse** in significance.

38 - 44 Park Lane

17.5.120 There are 35 windows within these residential terraced properties serving 16 rooms.

17.5.121 In regards to VSC, none of the 35 windows will meet the BRE guidelines and all will experience alterations over 40%. However, this is due to the low existing level of VSC (all 18% or below) whereby any alteration may result in a disproportionate percentage change. Also, the room uses for this property are unknown and there is a likelihood that several of these windows serve bedrooms which according to the BRE guidelines are considered less sensitive than living rooms. There is also possibility that the windows serve bathrooms or circulation space which are not considered relevant within this assessment.

17.5.122 In regards to NSL, all of the 16 rooms (100%) assessed will meet the BRE guidelines and thus experience a negligible effect.

17.5.123 Overall the effect on 38 - 44 Park Lane is considered to be **moderate adverse** in significance.

28 - 36 Park Lane

17.5.124 There are 57 windows within these residential terraced properties serving 19 rooms.

17.5.125 In regards to VSC, six (11%) out of the 57 windows will meet the BRE guidelines and therefore the effect on these windows is considered to be negligible.

17.5.126 Of the remaining windows, two will experience alterations between 20-30% which are considered minor adverse in significance and 11 will experience alterations between 30-40%. Therefore 38 windows will experience alterations over 40%. However, this is due to the low existing level of VSC (all below 16%) whereby any alteration may result in a disproportionate percentage change. Also, the room uses for this

property are unknown and there is a likelihood that several of these windows serve bedrooms which according to the BRE guidelines are considered less sensitive than living rooms. The windows could also serve bathrooms or circulation space which are not considered relevant to this assessment. The close proximity of these properties to the site is also plays a role in these results.

17.5.127 In regards to NSL, 17 of the 19 rooms (89%) assessed will meet the BRE guidelines and thus experience a negligible effect.

17.5.128 The remaining two rooms will both experience over 40% alterations. However, the room uses are unknown and there is a possibility that these two rooms are bedrooms which, as stated in the BRE guidelines are considered to be less sensitive to daylight conditions than living rooms. There is also possibility that the rooms are used as bathrooms or circulation space which are not considered relevant within this assessment.

17.5.129 It must also be noted that all of the rooms that will meet the BRE guidelines will experience a gain in NSL level which could be due to the relocating of the football stadium within the site.

17.5.130 Overall the effect on 28-36 Park Lane is considered to be **minor to moderate adverse** in significance.

1 -2 Lancaster Close

17.5.131 There are 17 windows within these residential terraced properties serving 14 rooms.

17.5.132 In regards to VSC, 13 (11%) out of the 17 windows will meet the BRE guidelines and therefore the effect on these windows is considered to be negligible.

17.5.133 Of the four remaining windows, three will experience alterations between 20-30% which is considered of minor significance and one window will experience between 30-40% alterations. However, this window will experience 30.8% alterations which is only fractionally higher than the upper limit to the 20-30% alterations range which is considered minor. Also, the uses for these rooms are not known and there is a possibility that the windows serve rooms less sensitive to daylight conditions compared to living areas, such as bedrooms,. The windows could also serve bathrooms and circulation space which are not considered relevant to this assessment.

17.5.134 In addition, one of the affected windows will retain a VSC level of 21% which may be considered commensurate with the dense urban environment.

17.5.135 In regards to NSL, all of the 17 rooms (100%) assessed will meet the BRE guidelines and thus experience a negligible effect.

17.5.136 Overall the effect on 1 – 2 Lancaster Close is considered to be **minor adverse** in significance.

Concord House

17.5.137 There are 103 windows within this residential property serving 70 rooms. Concord House is a four storey block of duplex apartments situated to the southwest of the site across Park Lane. The facing windows serve hallways and galley style kitchens at entrance level (ground and second) and bedrooms above (first and third). The main living rooms appear to be located on the opposite side of the building, unaffected by

the Project.

- 17.5.138 The entrances to these flats, located on ground and second floors, are served by walkways, which are set back from the façade. The fact that the windows at these levels are recessed means that they have severely restricted levels of daylight in their current condition and cannot receive skylight from an upward direction. Instead they are entirely dependent upon skylight received horizontally from across the site of the Project. This places an excessive burden upon the site of the proposal and means that the overlooking windows are unusually sensitive to changes in skylight levels.
- 17.5.139 The detailed results, attached within Appendix 17.2, show that in the baseline situation the majority of windows at ground and second floors receive levels of VSC between 0 – 4%, where the BRE guidance suggests a VSC of 27%. With levels as low as these, any change to the massing on the Project Site, however slight, will lead to significant changes in daylight levels. In situations such as these the BRE guidance suggests that different target criteria may be required.
- 17.5.140 It is therefore more appropriate to consider the impact that the proposed development has upon the bedroom windows, which are not recessed within the façade.
- 17.5.141 The VSC results for the whole building show that seven (7%) out of the 103 windows will meet the BRE guidelines and therefore the effect on these windows is considered to be negligible.
- 17.5.142 The remaining 96 windows will all experience over 40% alterations.. 41 of the windows, located on ground and second floor, have existing levels of VSC below 4% which is considerably lower than the 27% recommended by the BRE guidelines. Therefore any alteration may result in a disproportionate percentage change and trigger a transgression.
- 17.5.143 The remaining windows, located on first and third floors, serve bedrooms. The BRE guidance considers bedrooms less sensitive to daylight conditions than living rooms. These rooms have retained levels of VSC between 12-24%, which may be considered acceptable within the context of the site.
- 17.5.144 The extant planning permissions previously granted for the Project Site saw the bedroom windows on first and third floors reduced to retain between 15-22% VSC. The latest proposals therefore do not lead to a material deviation outside of this range.
- 17.5.145 In regards to NSL, 22 out of the 70 rooms (31%) assessed will meet the BRE guidelines and thus experience a negligible effect.
- 17.5.146 Of the remaining rooms, seven will experience between 20-30% alterations, three will experience 30-40% alterations and 38 will experience over 40% alterations. Six of the rooms that will experience over 40% alterations will experience over 90% alterations and one will experience 100% alterations.
- 17.5.147 It must also be noted that of the rooms that meet the BRE guidelines, one will experience 0% alterations and one will gain in NSL level.
- 17.5.148 Overall the effect on Concord House is considered to be **moderate to major adverse** in significance.

2/2a Park Lane

- 17.5.149 There are five windows within these mixed use properties serving four residential rooms.
- 17.5.150 In regards to VSC, two (40%) out of the five windows will meet the BRE guidelines and therefore the effect on these windows is considered to be negligible.
- 17.5.151 Of the remaining windows, two will experience between 20-30% alterations which is considered minor adverse in significance. One window will experience alterations of 30.4% which is only fractionally above the upper limit of the 20-30% alterations which is considered minor.
- 17.5.152 All three of the affected windows will retain VSC levels between 24-25.5% which may be considered commensurate with the dense urban environment.
- 17.5.153 In addition, the uses for the rooms in this property are unknown and there is a possibility that the windows could serve bedrooms which are all considered to be less sensitive to daylight levels. The windows could also serve bathrooms or circulation space which are not considered relevant to this assessment.
- 17.5.154 In regards to NSL, three out of the four rooms (75%) assessed will meet the BRE guidelines and thus experience a negligible effect.
- 17.5.155 The remaining room will experience between 30-40 % alterations. However, since the room uses are unknown there is a chance that this room is used as a bedroom which are considered less sensitive to daylight conditions than living areas as stated within the BRE guidelines. The room will also retain a proposed NSL level of 53.05% which may be considered commensurate with the dense urban context of the site.
- 17.5.156 Overall, based on the retained levels of daylight, the effect on 2/2a Park Lane is considered to be **minor adverse** in significance.
- 2 Vicarage Road*
- 17.5.157 There are two windows within this residential property serving two rooms.
- 17.5.158 In regards to VSC, neither of the two windows will meet the BRE guidelines and will both experience alterations between 20-30%, however, this is considered minor adverse in significance. The will still receive proposed levels on 22% and 24% which may considered commensurate with the dense urban environment.
- 17.5.159 In regards to NSL, one of the two rooms (50%) assessed will meet the BRE guidelines and thus experience a negligible effect.
- 17.5.160 The remaining room will experience 30-40% alterations, however the room will experience a retained NSL level of 62.42 which may be considered commensurate with the dense urban environment.
- 17.5.161 Overall the effect on 2/2a Park Lane is considered to be **minor adverse** in significance.

28 Bromley Road

- 17.5.162 There are four windows within this residential property serving two rooms.

17.5.163 In regards to VSC, two (50%) out of the four windows will meet the BRE guidelines and therefore the effect on these windows is considered to be negligible.

17.5.164 Both of the windows that will not meet the BRE guidelines will experience 30-40% alterations, however they will retain proposed VSC levels of 18% and 19% which may be considered acceptable given the urban context of the site. The room uses are also unknown for this property and there is a possibility these windows serve rooms that are less sensitive to daylight conditions, for example, a bedroom. There is also possibility that the windows serve bathrooms or circulation space which are not considered relevant within this assessment.

17.5.165 In regards to NSL, both of the rooms assessed will meet the BRE guidelines and thus experience a negligible effect.

17.5.166 Overall the effect on 28 Bromley Road is considered to be **minor adverse** in significance.

29 Bromley Road

17.5.167 There are five windows within this residential property serving two rooms.

17.5.168 In regards to VSC, two (40%) out of the five windows will meet the BRE guidelines and therefore the effect on these windows is considered to be negligible.

17.5.169 All three remaining windows will experience 30-40% alterations, however, two will retain proposed VSC levels of 17.5% and 18% which may be considered acceptable given the urban context of the site. The third window has a low existing level of VSC whereby any change will result in a disproportionate percentage change and trigger a transgression. In addition, the room uses are unknown for this property and there is a possibility these windows serve rooms that are less sensitive to daylight conditions, for example, bathrooms or bedrooms.

17.5.170 In regards to NSL, both of the rooms assessed will meet the BRE guidelines and thus experience a negligible effect.

17.5.171 Overall the effect on 29 Bromley Road is considered to be **minor adverse** in significance.

38 Bromley Road

17.5.172 There are two windows within this residential property serving two rooms.

17.5.173 In regards to VSC, neither of the two windows which have been assessed will meet the BRE guidelines

17.5.174 These two windows will experience 20-30% alterations which is considered minor adverse in significance. Also, both will retain proposed VSC levels of 25.5% and 26% which may be considered acceptable given the urban context of the site.

17.5.175 In regards to NSL, both of the rooms assessed will meet the BRE guidelines and thus experience a negligible effect.

17.5.176 Overall the effect on 38 Bromley Road is considered to be **minor adverse** in significance.

Coombes House

- 17.5.177 There are 50 windows within this residential property serving 32 rooms.
- 17.5.178 In regards to VSC, 46 (92%) out of the five windows will meet the BRE guidelines and therefore the effect on these windows is considered to be negligible.
- 17.5.179 All four windows that will not meet the BRE guidelines will experience 20-30% alterations which is considered minor adverse in significance. In addition, all four windows will retain proposed VSC levels above 15% which may be considered acceptable given the urban context of the site.
- 17.5.180 In regards to NSL, 31 of the 32 rooms assessed will meet the BRE guidelines and thus experience a negligible effect.
- 17.5.181 The one room that will not meet BRE guidelines will experience an alteration of 22% which is considered of minor significance compared to the level of 20% set out in the BRE guidelines. It must also be noted that five of the rooms assessed will not experience any alteration in NSL level.
- 17.5.182 Overall the effect on Coombes House is considered to be **minor adverse** in significance.

Sunlight effects to Surrounding Properties

- 17.5.183 Full detailed results of the sunlight assessment can be found in *ES Volume 3 Appendix 17.2*.
- 17.5.184 Out of the total 674 windows assessed 469 (70%) meet the BRE criteria for both annual and winter APSH.
- 17.5.185 All of the windows within those properties highlighted green in Table 17.7 in *Appendix 17.2* would meet the BRE guidelines for annual and winter APSH or experience an **insignificant** effect.
- 17.5.186 The remaining properties are discussed in more detail below.

729 High Road

- 17.5.187 10 (91%) out of the 11 windows assessed will meet the BRE guidelines for annual and winter APSH.
- 17.5.188 The one window that will not meet BRE guidelines for both will experience alterations in excess of 40%. However, this window will still retain an APSH level of 24% which is only fractionally below the recommended BRE guideline of 25%.
- 17.5.189 The effect of the Project on 729 High Road is considered of **minor adverse** significance.

Library – Kathleen Ferrier Court

- 17.5.190 20 (80%) out of the 25 windows assessed will meet the BRE guidelines for annual and winter APSH.
- 17.5.191 Four windows will not meet the BRE guidelines for annual APSH, with one that will experience between 20-30% alterations and three that will experience over 40% alterations. However, all four will still retain annual APSH levels above 17% which may be considered commensurate with the urban context of the

site. All four windows will meet the BRE criteria for winter APSH.

17.5.192 One window will not meet the BRE guidelines for both annual and winter experiencing alterations in excess of 40% for both. The proposed APSH level for winter is 4% which is only fractionally below the recommended 5% and could be considered commensurate for within an urban location. For the annual APSH, the existing level is 25% which is the recommended level for annual APSH stated in the BRE guidelines therefore any alterations will result in the annual APSH going below this recommended level.

17.5.193 It must also be noted that these windows are all on the ground floor which is understood to be the library and therefore commercial and not considered as sensitive to sunlight conditions as residential areas.

17.5.194 The effect of the Project on Library – Kathleen Ferrier Court is considered of **minor adverse** significance.

794 High Road

17.5.195 One window within this property was relevant for this assessment and it will not meet the BRE guidelines in either winter or annual APSH.

17.5.196 The window will experience alterations in excess of 40% for winter APSH, however the existing level of winter APSH is 2% which is already below the recommended BRE guidelines (5%) and any alteration will result in a disproportionate percentage change and trigger a transgression. The use for this room is also unknown and there is a possibility that the window could serve a bedroom, bathroom or circulation space which are not considered to be sensitive to sunlight conditions as stated within the BRE guidelines. For annual APSH the window will experience alterations between 30-40% and will not meet the BRE guidelines (25%), however the proposed APSH level will be retained at 23% which is only marginally lower than the recommended level and may be considered commensurate with the urban location of the site.

17.5.197 Since only one window is affected in isolation, the effect of the Project on 794 High Road is considered of **minor adverse** significance.

10 Worcester Avenue

17.5.198 One window was assessed for this property and it will not meet the BRE guidelines in either winter or annual APSH levels.

17.5.199 The window will experience alterations in excess of 40% for winter APSH, however the proposed level of winter APSH is 3% which could be considered commensurate with the urban context of the site. The use for this room is also unknown and there is a possibility that the window could serve a bedroom, bathroom or circulation space which are considered to be less sensitive to sunlight conditions as stated within the BRE guidelines. In addition, the annual APSH levels for this window will exceed the level recommended in the BRE Guidelines.

17.5.200 The effect of the Project on 10 Worcester Avenue is considered of **minor adverse** significance.

17-41 Worcester Avenue

- 17.5.201 Forty-four (20%) of the 226 windows assessed for these residential terraced properties will meet the BRE guidelines for annual and winter APSH.
- 17.5.202 Sixty of these windows serve entrance halls and garages and can therefore be set aside under BRE guidelines. A further 106 windows serve bedrooms, which the BRE guidelines advises are less sensitive for sunlight amenity than living rooms.
- 17.5.203 The remaining 60 windows serve 12 living rooms. Each living room is served by 5 windows of equal size. Where this arrangement occurs, the BRE guidelines advise that it is possible to consider the average APSH for the room.
- 17.5.204 The living rooms at nos. 17 and 19 Worcester Avenue will meet the BRE guidelines for annual and winter APSH. The remaining 10 rooms retain between 1-5% Winter APSH and 10-27% annual APSH, which could be considered commensurate for the urban location,
- 17.5.205 The extant planning permission reported reductions in annual sunlight between 20% to 50%. The latest proposals have led to a marginal increase in the upper end of this range.
- 17.5.206 The effect of the Project on 17-41 Worcester Avenue is considered of **moderate adverse** significance.

Northumberland Park Community School

- 17.5.207 Thirteen (87%) out of the 15 windows assessed for this school will meet the BRE guidelines for annual and winter APSH.
- 17.5.208 Two windows will not meet the BRE criteria for winter APSH with one window that will experience 30-40% alterations and one that will experience in excess of 40% alterations. However, both of the windows will retain proposed winter APSH levels of 4% which may be considered commensurate with the urban context of the site. It must also be noted that school rooms are not considered as sensitive to sunlight compared to living areas within residential properties.
- 17.5.209 The effect of the Project on Northumberland Park Community School is considered of **minor adverse** significance.

St Paul's and All Hallows Infant School

- 17.5.210 Twenty-one (66%) out of the 32 windows assessed for this school will meet the BRE guidelines for annual and winter APSH.
- 17.5.211 One window will not meet the BRE criteria for winter APSH experiencing alterations in excess of 40%, however the existing APSH level was 2% therefore lower than the BRE recommended level.
- 17.5.212 Eleven windows will not meet the BRE criteria for annual APSH with one window experiencing 20-30% which is considered of minor significance, five windows will experience between 30-40% alterations and five windows experience in excess of 40% alterations. One of the windows has an existing APSH level of 22% which is below the BRE guidelines recommendation. Eight of these windows will still retain proposed APSH levels above 18% which may be considered commensurate with the urban environment the site is located within. In addition, three of these windows that will not meet the annual BRE criteria will

experience gains in winter APSH. It must also be noted that schools are not considered as sensitive to sunlight conditions as living areas within residential properties.

17.5.213 The effect of the Project on St Paul's and All Hallows Infant School is considered of **minor adverse** significance.

Sun Hours on the Ground

17.5.214 Full details of the sun hours on ground assessment can be found in Appendix 17.3 (ES Volume 3) and are summarised below.

17.5.215 In regards to all of the external areas (area numbers 3 to 6) all of the areas will receive at least two hours of direct sunlight on March 21st to at least 50% of the total amenity space. Therefore the impact to the surrounding areas of amenity is considered to be **negligible**. For these areas the levels of exposure indicate that the sunlight will be considerably more than the guidelines at over 6 hours of direct sunlight on March 2st.

17.5.216 In addition, there are two areas of amenity space proposed within the Project Site, labelled areas 1 and 2 within our assessment. Both will receive at least 2 hours of direct sunlight to over 50% of the amenity space on March 21st and therefore will be fully compliant.

Transient Overshadowing

17.5.217 Full details of the transient overshadowing assessment can be found in Appendix 17.3 Annex 3 and are summarised below.

17.5.218 In regards to overshadowing, areas of amenity space are considered to be the most sensitive and the discussion below focuses on several key amenity areas identified in proximity to the Site.

March 21st

17.5.219 On March 21st, shadow would be cast to the west of the Project Site at 08:00 GMT and transient overshadowing would fall on a small portion of the school grounds and playing fields of St Francis De Sales RC Junior School. Later in the day from 16:00 GMT to 17:00 GMT, marginal additional transient overshadowing would be cast to the east of the site on the grounds of Northumberland Park Community School, Northumberland Park Sports Centre and St Paul's and All Hallows Infant and Junior Schools. However, this overshadowing will be brief and will pass quickly.

17.5.220 In addition, additional overshadowing will occur on a couple of the private gardens to the rear of the residential properties on Worcester Avenue directly to the northeast of the site. This will occur between 9:00GMT and 14:00 GMT on only a few gardens at a time.

17.5.221 Whilst the BRE Guidelines do not provide any criteria for transient overshadowing, using professional judgement, the potential effect of the completed Project on transient overshadowing on 21st March would be considered to be of **minor significance**.

June 21st

- 17.5.222 In the summer period shadows are shorter in length due to the higher position of the sun. On June 21st, transient overshadowing would occur on the school grounds and playing fields of St Francis De Sales RC Junior School between 06:00 BST and 08:00 BST, however this would move quickly and the majority of the playground would be out of the shadow by 09:00 BST. Later in the day at 17:00GMT transient overshadowing would occur to the west of the site on the grounds of St Paul's and All Hallows Infant and Junior Schools. However the school playgrounds would not likely be in use at this time of day.
- 17.5.223 During the summer period, marginal additional transient overshadowing would be cast on Northumberland Park Sports Centre and Northumberland Park Community School between 18:00 BST and 20:00 BST.
- 17.5.224 Whilst the BRE Guidelines do not provide any criteria for transient overshadowing, using professional judgement, the potential effect of the completed Project on transient overshadowing on 21st June would be considered to be of **minor significance**.

December 21st

- 17.5.225 On December 21st, the sun's altitude is particularly low, never reaching more than 15.6°. Therefore, relatively low obstructions create long shadows. The sun is only above 10° between around 9.50 and 14.10 GMT, so it is only during these periods that the BRE Guidelines suggest detailed consideration should be focused.
- 17.5.226 The analysis illustrates that the completed Development would cast longer shadows over the area to the north of the Site due to the lower angle of the sun. However, the only amenity space that would experience additional transient overshadowing would be the residential gardens to the north and this would occur between 11:00 GMT and 14:00 GMT. Additional overshadowing would also occur to the east of the site on the grounds of Northumberland Park Community School and Northumberland Park Sports Centre between 13:00 GMT and 14:00 GMT. However, the area of additional overshadowing on the playing pitches of Northumberland Park Sports centre would be relatively small and therefore not significant.
- 17.5.227 In addition, additional overshadowing will occur on a couple of the private gardens to the rear of the residential properties on Worcester Avenue directly to the northeast of the site. This will occur between 11:00GMT and 15:00 GMT.
- 17.5.228 In summary, using professional judgement, the changes to the existing baseline condition on December 21st as a result of the Project are considered to be **minor to moderate adverse** significance.
- 17.5.229 Overall, the effect of the Project in terms of the overshadowing of amenity areas at all times of the year is therefore considered to be minor to moderate adverse.

Light Pollution

- 17.5.230 A qualitative light pollution assessment has been undertaken based on the various lighting designs around the site. The assessment is broken down into each of these specific light fittings.

Street Lighting

17.5.231 Street lighting is proposed on High Road, Park Lane and Worcester Avenue.

17.5.232 The supplier has still not been chosen however, it is understood that the street lighting scheme will consist mainly of two types of 12m lighting columns: EXL15 and EXL16. The EXL15 columns will provide light to the road and footpath and the EXL16 columns will provide light to the road only.

17.5.233 There are 15 columns proposed to be installed on the 'our' side of the road closest to the site and 16 columns to be installed on the neighbours' side of the road. It is assumed that the lighting will be in compliance with BS 5489 Set of standards for road lighting, particularly BS 5489-1:2013 Code of practice for the design of road lighting – Lighting of roads and public amenity areas: "... schemes close to the edge of residential areas should also receive special attention. In these cases the light distribution should be controlled to minimize light spill on adjoining areas, by selection of appropriate installed intensity class from BS EN 13201-2:2003, Table A.1."

17.5.234 All of the proposed street lighting columns will have flat front covers that will be tilted at 16° to be BS compliant resulting in minimal glare and light spillage.

17.5.235 EXL18 fixtures are proposed to be installed to light the VIP entrance arch, however this is low brightness LED tape and therefore glare and light spillage will be minimal.

Five-a-side Football Pitch

- 17.5.236 It is proposed that the Five-a-side Football Pitch located within the site will be lit using four EXL 13 4m columns with eight 41.6W 4700lm LED spot lights. These will be carefully positioned to aim the light downwards as required to prevent glare. The pitch will not be lit using special sports lighting projectors and therefore should produce less light glare.
- 17.5.237 The proposed lighting columns are relatively short and will be tilted downwards and the Upward Light Ratio (ULR) is likely to be zero.

Stairs

- 17.5.238 There are several sets of stairs located in the southern part of the site. It is proposed that these stairs will be lit using EXL 08 50W 3400lm LED spot light fixtures that will be wall mounted. These will be powerful spotlights however, by aiming the lights downwards onto the stairs glare will be prevented. The light spillage is expected to be contained within the solid handrails although some outward spill will be expected but it is unlikely to affect residential occupants so as to cause a nuisance.
- 17.5.239 A number of sets of stairs surrounding the stadium site will be proposed to be lit using EXL02 fittings positioned on 6m columns with 16 no. 9.3W 640lm spots. The lighting columns will be located at the centre of the stairs and aimed downwards. Little to no light spillage is expected for these fixtures.
- 17.5.240 One handrail within the site will be lit using EXL 09 fixtures which will be LED tape integrated into the handrail that will face downwards. The spillage from these lights will be contained by the solid handrails or walls and no direct glare will be experienced.

Ramps

- 17.5.241 The ramps within the site will be lit using EXL 07 and EXL 10 fixture that will be wall mounted LED strips. The EXL 07 fittings will be used to illuminate pedestrian ramps and EXL 10 will provide illumination to the vehicle ramp entrance. These lights will be of low wattage and will not be directly visible therefore no glare will be produced and if any light spillage occurs it will be minimal.
- 17.5.242 The ramp on the north podium to the north west of the stadium will be lit using seven EXL 06 3,200lm LEDs on 5m columns. The front face of these lighting fixtures is horizontal so that the light faces downwards on to the ramp. Therefore the lights will not cause any glare to neighbours and light spillage will be minimal.

Trees

- 17.5.243 A number of trees surrounding the stadium within the site will be lit EXL 01 13W 487lm in ground uplighters. These fixtures will be at street level and will provide uplighting to the tree canopies. These fixtures will have an adjustable light distribution and have a walk-over and drive-over pressure load of up to 2000kg.
- 17.5.244 The light fixtures will have very high ULR and therefore sky glow which is expected while the trees are immature as well as in winter when leaves are shed from the trees. There is potential for these lights to cause glare to passers-by depending on the location and shielding of the lights, however, no glare from

these particular lights will be experienced by neighbours.

Podium

17.5.245 It is proposed that lighting columns EXL 03 which are 10m in height and EXL 11 which are 20m in height both with 21/40 no. 9.3W 640lm spot lights will be used to provide general illumination to podium levels. These spots will be aimed downwards therefore little to no glare or light spillage is expected.

17.5.246 To provide illumination to the façade of the northern side of the stadium EXL 04 104W LED floodlights will be used. These will be mounted to the underside of the façade mesh and directed towards the podium. Since these fixtures are very powerful aiming is critical to reduce the potential for glare.

Entrance

17.5.247 The southern podium entrance is proposed to be illuminated by EXL 12 12W 1590lm Gecko projector LED fittings. These will be mounted to the façade of the southern side of the stadium. As with the illumination of the northern side of the stadium aiming is critical with regards to the potential for glare. This is possible as these fittings are adjustable by 130° tilt and rotatable by 360°.

Stadium Floodlighting

17.5.248 The stadium incorporates sports lighting including the use of internal floodlights.

17.5.249 The location and orientation of the floodlighting would likely be contained below the roofline and within the stadium and therefore is unlikely to result in light spill into surrounding residential receptors as the lighting is situated below the roofline and directed to the pitch. Some brightening of the sky portion above the stadium is typical of sports installations when the floodlighting is in use, however, the resulting brightness is likely to be in line with other stadia of a similar nature.

Solar Glare

17.5.250 Full details of the solar glare assessment are provided within *ES Volume 3 Appendix 17.4*.

17.5.251 The assessments have been undertaken from those signalised road junctions and pedestrian crossings nearby which are considered sensitive in terms of solar glare.

17.5.252 The following viewpoints will not experience any solar glare within 30° at any time of day throughout the year and are therefore considered to have a **negligible** effect with regards to solar glare:

- High Road (North) 3
- High Road (South) 2
- Park Lane (West) 1
- Park Lane (West) 2

17.5.253 The remaining viewpoints are discussed in further detail below.

Brereton Road (East)

- 17.5.254 A small isolated incidence of solar reflection will occur between 8:00 and 9:00GMT on the Stadium façade between 18°-30° of a driver's line of sight. These reflections will be visible between late September and late March.
- 17.5.255 In addition, throughout the year, small sections of solar reflection will occur on the façade of the Stadium and The Tottenham Experience in the afternoon/early evening between 14:00 to 18:00 GMT and will occur between 7°- 30° of a driver's line of sight.
- 17.5.256 These reflections will only appear for a very short time and the vast majority of the solar reflections can be mitigated by the driver's use of their sun visor. There are also no key signalling points that would be obscured by the reflections off the façades.
- 17.5.257 Therefore the effect of the Project at this junction is considered to be **minor adverse**.

Bromley Road (North)

- 17.5.258 There are two very small instances of solar reflection that will occur on the façade of the Stadium. One reflection will occur at around 8° of the driver's line of sight between 9:00 and 10:00 GMT from late April to late May and late August to late September.
- 17.5.259 The second reflection will occur at around 25° from the driver's line of sight between 13:00 and 14:00 GMT from late March to late April and late August to late September.
- 17.5.260 These instances of solar reflection will only appear for a very short time and the reflections can be mitigated by the driver's use of their sun visor. There are also no key signalling points at this junction and the driver will be looking to their left or right rather than straight on to the Stadium. Therefore the instances of reflection will be unlikely to cause a nuisance to a driver.
- 17.5.261 Therefore the effect of the Project at this junction is considered to be **negligible**.

Church Road (East)

- 17.5.262 There are two small instances of solar reflection that will occur on the lower façade of the hotel between 20-30° of the driver's line of sight between 8:00 and 10:00 GMT from late October to late February.
- 17.5.263 Another small instance of solar reflection will occur between 18:00 and 19:00 GMT between late April to late May and from late July to late August.
- 17.5.264 These instances of solar reflection will only appear for a very short time and the majority of the reflections can be mitigated by the driver's use of their sun visor. There are traffic lights at this junction, however, they will not be obscured by the solar reflections as they will occur in the driver's periphery and the overhang of the hotel façade above could also block the sunlight and reduce the solar reflection.
- 17.5.265 Therefore the effect of the Project at this junction is considered to be **negligible to minor adverse**.

High Road (North) 2

- 17.5.266 A small instance of solar reflection will occur between 14:00 and 15:00 GMT at 27° of the driver's line of sight from late February to late March and from late September to late October.
- 17.5.267 This instance of solar reflections will only appear for a very short time in the periphery of the driver's vision and the reflection can be mitigated by the driver's use of their sun visor.
- 17.5.268 Therefore the effect of the Project at this junction is considered to be **negligible**.

High Road (South) 3

- 17.5.269 A small instance of solar reflection will occur between 12:00 and 13:00 GMT at 20° of the driver's line of sight from late November to late January.
- 17.5.270 This instance of solar reflection will only appear for a very short time and the reflection can be mitigated by the driver's use of their sun visor. There is a pelican crossing at this junction however it will not be obscured by the instance of solar reflection and therefore the effect is not likely to cause a nuisance to a driver.
- 17.5.271 Therefore the effect of the Project at this junction is considered to be **negligible**.

Whitehall Street (East)

- 17.5.272 Instances of solar reflection will occur on the Stadium façade in the evening between 16:00 and 20:00 from late February to late October within 10-30° of the driver's line of sight.
- 17.5.273 There are no key signalling points at this junction and the driver will be looking to their left or right, therefore the reflections are not likely to cause a nuisance to a driver. In addition, the instances of reflection will be very short at different points across the façade at different times of the day and during different times of the year. The reflections can be mitigated by the driver's use of a sun visor.
- 17.5.274 The risk associated with glare is considered in the context of the London climate and the likelihood that the sun will be shining for any reflections to occur. Within London in the evening the probability of the sun shining is reduced to 10% and therefore the likelihood that the reflections at these viewpoints will occur, is low.
- 17.5.275 Therefore the effect of the Project at this junction is considered to be **minor to moderate adverse**.

Internal Daylight Amenity

- 17.5.276 An assessment of the potential for daylight within the proposed residential units has been undertaken and the results can be found in Appendix 17.5 and are summarised below. The study of daylight potential is carried out with reference to BRE's Vertical Sky Component (VSC) assessment. This is the most appropriate test to be run at Outline Stage where details such as aperture sizes and interior layouts are not the subject of the planning submission.
- 17.5.277 The illustrations on page 7 show the proposed massing assessed and results for the VSC test can be

found on pages 8-12 of the report in Appendix 17.5.

17.5.278 It is clear from the images provided that the vast majority of the facades of the towers will achieve levels of VSC of 27% and above (depicted in yellow). BRE considers that this level of VSC will allow for interior levels of daylight which are in line with best practice.

17.5.279 A few portions of the facades, in particular the lower floors of the southern facade of Tower A, the eastern facade of Tower C, the northern facade of Towers B and C and the western facade of Tower A, will receive levels of VSC between 5 and 15%. This is typical of urban environments, however, a very good result considering the size and nature of this development.

17.5.280 According to BRE's guide, larger windows and careful interior layout design should be adopted in order to ensure adequate levels of interior daylight.

17.5.281 GIA has worked alongside Allies and Morrison architects on preliminary layouts and aperture sizes in order to ensure the highest interior daylight levels possible. These will be tested and submitted as part of a detailed or reserved matters application in due course.

17.5.282 It is considered that the proposed illustrative massing will provide very good daylight potential overall which in turn has the potential to deliver accommodation which sees good levels of daylight indoors.

17.6 Additional Mitigation, Compensation and Enhancement Measures

Demolition and Construction

17.6.1 The potential effect of portable lighting would be mitigated by positioning the portable units so as not to spill light into the nearby residential properties.

17.6.2 The potential daylight and sunlight effects would steadily increase in magnitude as the Project is built-out. Any mitigation required in relation to the completed Development is discussed below.

Completed Development

Daylight and sunlight

- 17.6.3 The results of the assessments indicate some significant adverse effects in regards to daylight and sunlight when compared with the BRE guideline criteria. However, the results of the assessment need to be considered in the context of the Site's urban location and the aspirations of both the Mayor and LBH to regenerate the surrounding Tottenham area. This is further supported by the historic consent for the site, establishing a precedent for redevelopment in this location. It would be impossible to achieve the levels of regeneration and growth on the agenda for the area without some change to the context and levels in terms of daylight and sunlight.
- 17.6.4 In addition, they should also be viewed in the context of the uncertainty regarding the uses of many of the rooms, which is likely to have led to an over-estimated assessment of the number of affected windows. It must also be noted that the existing levels of daylight and sunlight are relatively high for such an urban location; it would be unreasonable to expect high levels of daylight and sunlight to be maintained given the demand for development.
- 17.6.5 Nevertheless, given that the planning application for the Project is submitted in part outline and part detailed, and that consequently the architectural design of the Project is fixed for the purposes of the planning applications, there are no practicable opportunities for mitigating the likely significant effects identified.

Sun Hours on the Ground

- 17.6.6 The sun hours on the ground assessment on the surrounding areas of amenity show that all areas will experience at least 50% receiving at least two hours of direct sunlight on March 21st. Therefore the impact on the surrounding amenity space is negligible and no further mitigation is required.

Transient Overshadowing

- 17.6.7 The results of the assessment indicate that the Project would result in additional levels of overshadowing on the surrounding area, however these would be minor to moderate adverse in significance. Given the scale of these effects on the surrounding areas of amenity space, no mitigation measures for transient overshadowing are considered necessary.

Light Pollution

- 17.6.8 The results of the qualitative light pollution assessment indicate that there will likely be no significant light pollution effects and therefore no further mitigation is considered necessary.

17.6.9 Solar Glare

17.6.10 The Project will not result in significant adverse effects in regards to solar glare at nearby junctions and pedestrian crossings. The assessments undertaken assume a worst case scenario whereby the sun will shine all of the time which is not the case within the UK or London. Many of the reflections identified will occur for a short period of time, will not directly affect the view of traffic signals and may be mitigated through the use of a car sun visor.

17.6.11 Given the effect significance and the probability of these reflections occurring, no further mitigation is considered necessary.

17.7 Assessment Summary and Residual Environmental Impacts and Effects

17.7.1 A summary of residual impacts is set out in Table 17.5 below.

Demolition and Construction

17.7.2 Assuming the careful location and aiming of portable lighting, the likely residual effects of light spill during the demolition and construction phases of the Project would be **negligible**.

17.7.3 The potential daylight and sunlight effects would steadily increase in magnitude as the Project is built-out. There would be no practical mitigation for the gradual reduction in light as the Project proceeds towards its final massing. Therefore, the likely residual effects of the construction phase of the Project would be the same as the potential effects.

Operation

17.7.4 For the reasons outlined above, mitigation for the reduction in daylight and sunlight is impracticable. Therefore, the likely residual effects of the completed Project would remain the same as the potential effects. 76 properties will experience a **negligible** effect whereas the remaining 71 properties will experience adverse effects ranging from **minor adverse** with instances of **moderate to major adverse**.

17.7.5 In regards to daylight, the only likely significant moderate to major and major adverse effects that are predicted to occur to 731-741 High Road, 790 High Road, 17-41 Worcester Avenue and Concord House. With regards to the properties on High Road, this is principally a result of the current open and undeveloped nature of the existing site and thus high existing levels of daylight. Given the aspirations of the Mayor and LBH to regenerate the site and the surrounding Tottenham area it would be unreasonable to expect such levels of daylight to be maintained. In regards to sunlight, the likely residual effects would remain as **negligible** for 60 properties whereas the remaining 24 properties will experience adverse impacts ranging from **minor to moderate adverse**. The moderate adverse effect is predicted for the residential terraced properties 11 and 15-41 Worcester Avenue as a result of the close proximity of the properties to the site. As with daylight, the high levels of existing sunlight cannot be expected to be maintained given the aspirations to regenerate the site and surrounding area.

17.7.6 As the room uses for these properties are unknown there is a possibility that many of the windows/rooms expected to experience significant adverse impacts could serve/be bedrooms which are considered less sensitive to daylight conditions and sunlight than living rooms. There is also a possibility that a number of the windows/rooms assessed could also serve/be bathrooms, circulation space, ancillary rooms or

commercial which are not considered relevant for assessment for daylight and sunlight as per the BRE.

- 17.7.7 This is further supported by the historic consent for the site, establishing a precedent for redevelopment in this location. It would be impossible to achieve the levels of regeneration and growth on the agenda for the area without some change to the context and levels in terms of daylight. In addition, they should also be viewed in the context of the uncertainty regarding the uses of many of the rooms, which is likely to have led to an over-estimated assessment of the number of affected windows. It must also be noted that the existing levels of daylight and sunlight are relatively high for such an urban location; it would be unreasonable to expect high levels of daylight and sunlight to be maintained given the demand for development.
- 17.7.8 In addition, given that these properties are within a dense, urban environment, the current levels of daylight cannot be expected to be maintained. This low level of expectation with regard to daylight levels being maintained must be reemphasised regarding the aspirations to regenerate the area and the demand for new development in Tottenham.
- 17.7.9 In order to deliver a sports facility of this magnitude and the associated regeneration benefits to the wider area, there would invariably be a degree of adverse impact in regards to daylight and sunlight and as such a fully BRE compliant scheme would be considered a non-viable option.
- 17.7.10 In regards to overshadowing, all of the areas assessed will meet the BRE guidelines for the Sun Hours assessment and the effects will be minor to moderate adverse in significance. As with daylight, some parts of the site are currently open (e.g. the carpark) whereby there is little massing on the site. Given the aspirations for the site and surrounding area, such levels of overshadowing are not unusual and could be considered commensurate with a dense urban environment.
- 17.7.11 In regards to light pollution, no likely significant effects will occur based on the qualitative review.
- 17.7.12 In terms of the solar glare the majority of viewpoints assessed will experience a negligible to minor adverse effect. The instances of reflection identified will be brief and small in nature and are unlikely to result in any significant nuisance glare to a driver at these junctions/crossings assessed.

Table 17.5 Daylight, Sunlight and Overshadowing Residual Effects

Environmental Effect	Potential Effect	Additional Mitigation	Residual Effect
Demolition and Construction Effects			
Daylight, sunlight, sun hours on ground, overshadowing, light pollution and solar glare	As per completed development. In terms of light pollution minor adverse effects may occur due to portable lighting units in proximity to residential receptors.	None required. Positioning of portable lighting units away from residential receptors.	As per completed development. Negligible.
Operational Effects			
Daylight	Negligible to 76 properties with 17 instances of minor adverse, two instances of minor to moderate adverse, three instances of moderate adverse, two instances of moderate to major adverse and two instances of major adverse.	The scheme is fixed and therefore no further mitigation is available.	Negligible to minor adverse with instances of moderate and major adverse effects.
Sunlight	Negligible to 60 properties with six instances of minor adverse and one instances of moderate adverse effects.	The scheme is fixed and therefore no further mitigation is available.	Negligible to minor adverse with instances of moderate adverse effects.
Sun Hours on Ground	Negligible to surrounding amenity areas. Proposed amenity areas will meet the BRE guidelines.	None required.	Negligible.
Transient Overshadowing	Minor adverse for March and June 21 st and minor to moderate adverse for December 21 st .	None required given the nature of the effects.	Minor adverse with one instance of minor to moderate adverse.
Light Pollution	No significant light pollution effects likely.	None required.	No significant light pollution effects likely.
Solar Glare	Negligible for seven viewpoints with one instance of negligible to minor adverse, one instance of minor adverse and one instance of minor to moderate adverse.	None required due to the brief and isolated nature of the effects.	Negligible with instances of minor to moderate adverse.
Internal Daylight to proposed residential	The proposed illustrative massing will provide	N/A	The proposed illustrative massing will provide

towers	very good daylight potential overall which in turn has the potential to deliver accommodation which sees good levels of daylight.		very good daylight potential overall which in turn has the potential to deliver accommodation which sees good levels of daylight.
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18. Electronic Interference

18.1 Introduction

- 18.1.1 This chapter of the Environmental Statement (ES) reports the findings of an assessment of the likely significant effects relating to electronic interference as a result of the Project in the London Borough of Haringey (LBH). The chapter summarises the relevant requirements placed upon new developments under national legislation and adopted planning policy at the national, regional and local levels.
- 18.1.2 It reports the findings of an assessment of the likely significant effects on digital terrestrial and satellite television reception (hereafter referred to as 'TV reception') as a result of the Project. Consideration has also been given to the potential effects on radio reception, mobile telephone signals, wireless networks and emergency service communications.
- 18.1.3 As well as presenting the planning policy context for the assessment, the chapter presents the methodologies used and the assumptions made in the assessment of potential effects. Areas of likely effect have been quantified and mitigation measures proposed where appropriate.
- 18.1.4 This assessment and ES chapter has been produced by Tom Paxton, a specialist electronic interference consultant.

18.2 Assessment Criteria and Methodology

Previous Assessment

- 18.2.1 The previous assessment, carried out in 2008 and updated in 2010, which supported the consented scheme, took place when analogue as well as digital terrestrial TV was being transmitted. Satellite and cable TV takeup was not as great as it is today. The assessment generated shadow areas within which terrestrial and satellite TV reception would have the potential to be adversely affected. Although these shadows remain relatively unchanged for this current assessment, the numbers of viewers potentially adversely affected will be less because of the migration from terrestrial TV reception to satellite and cable TV in the intervening years. The previous assessment identified a total of 167 aerial installations at risk of degraded TV reception. This was made up of 151 using Crystal Palace transmitter signals, 5 using Alexandra Palace transmitter signals and 11 using satellite TV signals.

Scoping Opinion

- 18.2.2 Although a formal Scoping Opinion was not sought the Scope of the EIA was based on the technical scope for the original 2010 ES and the Southern Addendum. A draft Scoping Report was sent to the Council on the 19th June 2015, for their informal comments and discussion. No informal comments were received in relation to this assessment.

Legislative Context

- 18.2.3 There is no legislation in place that is relevant to electronic interference as a result of new construction.

Planning Policy and Guidance

National Planning Policy

- 18.2.4 The National Planning Policy Framework (NPPF) (2012) (Ref. 18.1) states in paragraph 44 that "Local planning authorities...should ensure that: ...they have considered the possibility of the construction of new buildings or other structures interfering with broadcast and telecommunications services."
- 18.2.5 The National Planning Practice Guidance (NPPG) (2014) (Ref. 18-2) was launched on the 6th March 2014 and provides a web-based resource in support of the NPPF. Following its launch, a number of previously published planning guidance documents have been cancelled and are detailed within the Written Ministerial Statement titled 'Making the planning system work more efficiently and effectively', also dated 6th March 2014. There is no guidance relevant to TV reception or electronic interference.

Local Planning Policy

- 18.2.6 The Greater London Authority's (GLA) London Plan - The Spatial Development Strategy for London Consolidated with Alterations Since 2011(2015) (Ref. 18.3) is the statutory strategic planning framework for London. Policy 7.7 states that "tall buildings should not affect their surroundings adversely in terms of ...telecommunication interference."
- 18.2.7 The London Borough of Haringey's Local Plan, Strategic Policies 2013-2026 (2013) (Ref. 18.4) has no policies relevant to TV reception or electronic interference. There are no relevant policies in the saved UDP policies, Supplementary Planning Documents or the Supplementary Planning Guidance.

Guidance/ Best Practice

- 18.2.8 There are no international, national or regional standards or guidance available with regards to the assessment of electronic interference.

Baseline Data Collection

- 18.2.9 Baseline data was collected by inspecting the Ofcom database for transmitter details and conducting a site visit of the surrounding area on foot to assess TV viewing patterns.

Assessment Methodology

- 18.2.10 The introduction of new structures of significant height and bulk into an environment can cause disruption to the reception of electromagnetic waves. Although this effect relates to both radio and TV signals, TV reception is potentially affected more. This is because a TV receiving installation (roof-mounted aerial) is static whereas a radio can be moved about to optimise reception.
- 18.2.11 Radios can receive signals that have been reflected off buildings perfectly adequately. This is how they are able to operate at ground level in urban environments. There is therefore considered to be no significant risk to radio reception (both analogue and digital) and as such only TV reception will be further considered in this chapter. Similarly, the reception of mobile telephone signals, wireless networks and emergency service communications should not be compromised unless their transmitting aerials are sited

on top of adjacent buildings at heights less than those of the Proposed Development. Transmitters in urban areas have significant overlaps of coverage and their high frequencies allow them to penetrate buildings as long as they are not too close to them as would be the case if the Proposed Development were adjacent to the transmitter. Should that be the case, the affected transmitting aerials may have to be relocated. A search of Ofcom transmitter databases and a visual inspection of adjacent buildings showed no such transmitting aerials at risk. Therefore these services will not be considered further in this assessment.

- 18.2.12 Terrestrial television signals are transmitted in digital format (Freeview). The only relevant interference mechanism affecting digital terrestrial TV signals is attenuation due to buildings physically blocking (and absorbing) the signals. This same mechanism affects satellite TV signals as well. If the wanted signals are too weak then the pictures very quickly deteriorate into random 'blocks' and then disappear altogether.
- 18.2.13 In order to define any areas where TV reception will be at risk, the details of the physical form or mass of the Project were placed in their locations on a 1:10000 scale map and, by calculation, illuminated by the TV transmitters that serve the area. The shadows subsequently cast, i.e. those areas where the signal will be blocked by the Project, were marked on a map. Calculations were carried out using International Radio Consultative Committee/International Telecommunication Union (CCIR/ITU) criteria, specifically the Appendix A3.1 parameters (Ref. 18.5). Predicted TV signal strengths for the areas were then calculated.
- 18.2.14 Within these theoretical areas of potential interference to TV reception a physical survey of terrestrial aerials and satellite dishes was carried out. The type and positions of the aerials gave an indication of the strength and quality of the available signal.

Construction Methodology

- 18.2.15 In general, effects during construction will be similar to, or less marked than, those when the buildings have been completed (see 'Operational Methodology' below). The size of the impact depends on how much of the proposed structures have been built at the time.

Operational Methodology

- 18.2.16 The areas where TV reception has the potential to be affected are in the radio frequency 'shadows' that the Project will cast. These are shown in Figure 18.1. The blue outlined area identifies the Project Site.
- 18.2.17 The shadow from the Crystal Palace transmitter will lie in lines to the north from the project site for approximately 0.90km. The shadow from the Alexandra Palace transmitter will lie in lines to the east from the project site for approximately 0.85km. The shadow from the Edmonton transmitter will lie in lines to the south from the site for approximately 1.20km. Beyond these distances the loss in TV signal is not considered to be significant. These are shown in Figure 18.1 as uncoloured black outlines.
- 18.2.18 Domestic satellite dishes point to the south-east. The effective satellite shadow that this Project would cast to the north-west would be for up to 100m. This is shown in Figure 18.1 as a green-coloured black outline.
- 18.2.19 The potential for the Project to cause interference to terrestrial and satellite TV reception has been assessed by a combination of desk-based calculations (as discussed above) and an on-site inspection of domestic aerial installations. The assessment has been carried out based on the:

- Location of the Project Site;
- Details regarding the design of the Project ;
- Location of the Project with respect to key transmitters; and
- Principles of radiowave propagation.

Assessment Criteria

18.2.20 To determine the significance of the effects to terrestrial and satellite TV reception, professional judgement has been used to define the following criteria which have been applied throughout this assessment:

- Adverse - The Project is likely to cause a noticeable permanent deterioration in reception; or
- Beneficial - The Project is likely to result in a noticeable permanent improvement in reception; or
- Negligible - The Project is likely to result in no noticeable effect on reception.
- Where adverse or beneficial effects have been identified, the magnitude is described as:
- Negligible - The Project is likely to affect reception for up to 20 dwellings (insignificant);
- Minor - The Project is likely to affect reception for more than 20 and up to 100 dwellings (insignificant);
- Moderate - The Project is likely to affect reception for more than 100 and up to 500 dwellings (significant); or
- Major - The Project is likely to affect reception for more than 500 dwellings (significant).

18.2.21 Within these theoretical predicted shadow areas of potential interference to TV reception, a physical survey of domestic TV aerials has been undertaken (conducted on September 2nd, 2014). The type and positioning of the aerials has provided an indication of the strength and quality of the available signals. The presence of cable and satellite usage was also noted, so as to ascertain whether or not particular households are depending solely on terrestrial signals.

18.2.22 The sensitivity of the receptors will vary with their use of TV services but experience shows that many high-use receptors will have high sensitivity.

Geographical Scope

18.2.23 The maximum length of predicted TV shadow cast by the Project has been calculated to be 1.2km. Therefore the geographical scope is **local**.

Assumptions and Limitations

18.2.24 Reception by portable TV sets within dwellings cannot be considered as it is not possible to make robust assumptions about the following factors: location within the dwellings; the signal attenuation due to the walls; the signal gain (if any) of the set-top aerials; and the existing quality of the reception.

18.2.25 All mitigation measures described are expected to provide TV reception of at least the same quality as that enjoyed by any affected households prior to the completion and occupation of the Project (i.e. in the baseline scenario).

18.3 Baseline Conditions

18.3.1 Freeview terrestrial television signals within the vicinity of the site are provided by a combination of three transmitters. The Crystal Palace transmitter is located about 20.1 km to the south of the site. The

Alexandra Palace transmitter is located about 4.5km to the west of the site and the Edmonton transmitter is about 2.4km to the north of the site. There is generally poor terrestrial signal quality in the area because of the screening effect of the existing football stadium, resulting in many using either satellite or cable signals.

- 18.3.2 A survey of housing in the vicinity of the site was carried out on September 2nd 2014. Most dwellings are two storey terraces or blocks of flats ranging from 5 to 20 storeys. The majority of dwellings have satellite dishes and those that have terrestrial aerials are almost exclusively using Crystal Palace signals. Cable TV is available throughout the shadow areas.

18.4 Inherent Design Mitigation

- 18.4.1 There is no inherent design mitigation to address electronic interference.

18.5 Potential Environmental Impacts and Effects

- 18.5.1 The Project is predicted to block the reception of both terrestrial and satellite TV signals at some local locations.

Construction

- 18.5.2 The likely impact on TV reception during the construction phase will steadily increase in magnitude as the structure of the new buildings are built and then clad. The magnitude of impacts during construction will therefore be less than the likely impacts of the completed development, as construction will increase the extent of the massing of the Project over time. Therefore, the effects of the completed development provide a worst-case scenario.

Occupation

- 18.5.3 Areas where TV reception has the potential to be adversely affected are in the shadows calculated to be cast by the Project, as illustrated in Figure 18.1.
- 18.5.4 The Crystal Palace shadow, to the north, contains 105 Crystal Palace aerial installations. Of these, 66 also have satellite dishes, leaving 39 ($105-66=39$) that depend solely on Crystal Palace signals and are therefore at risk of losing TV reception. It is possible that these are using cable TV signals, potentially reducing this number.
- 18.5.5 The Alexandra Palace shadow, to the east, contains one Alexandra Palace aerial installation that is at risk of losing TV reception. Although it does not have satellite reception as well, it may be availing itself of cable TV.
- 18.5.6 The Edmonton shadow, to the south, contains no Edmonton aerial installations. Therefore there are no Edmonton viewers at risk of losing TV reception as a result of the Proposed Development.
- 18.5.7 The satellite TV shadow, coloured green, contains 11 satellite dishes calculated to be at risk of losing TV reception.
- 18.5.8 This makes a total of 51 aerial installations ($39+1+11=51$) predicted to be adversely affected by the Project.

18.6 Additional Mitigation, Compensation and Enhancement Measures

Construction

- 18.6.1 As the Project increases in mass it will begin to adversely affect some of those TV aerial installations identified in this Chapter, until the maximum adverse effect is reached upon completion of the Project. TV aerial installations adversely affected can be mitigated using methods described under 'Operation'.

Operation

- 18.6.2 For the 40 terrestrial aerial installations (39 Crystal Palace and 1 Alexandra Palace) at risk of adverse effects mitigation measures would include upgrading those aerials by increasing their height and gain or by providing a non-subscription satellite service such as that provided by the BBC and ITV ('Freesat') or by 'Sky' for a one-off cost.
- 18.6.3 For the 11 satellite dishes at risk of adverse effects mitigation measures would include increasing the height of the dishes by putting them on 2m poles or by resiting them to other parts of their properties where good reception could be achieved.
- 18.6.4 The developer will make contact details known for those identified as at risk of losing their TV services. Suitable mitigation will be provided in a timely manner at no cost to the affected parties.

18.7 Assessment Summary and Residual Environmental Impacts and Effects

- 18.7.1 A summary of residual impacts is set out in Table 18.1 at the end of this chapter.

Construction

- 18.7.2 Prior to mitigation the construction process is predicted to adversely affect between zero and 51 aerial installations. Following suitable mitigation there are predicted to be no residual effects.

Operation

- 18.7.3 Prior to mitigation the completed development is predicted to adversely affect 51 aerial installations (the same 51 as the construction phase will, as the massing increases, eventually affect).

Cumulative Effects of the Proposed Development with Other Development Schemes

- 18.7.4 Effects on terrestrial TV reception are generally of a cumulative and interactive nature. At reception sites, cumulative TV interference effects can be experienced which are caused by a large number of obstructions and interactions. The sources of these effects can be spread over a wide geographic area.
- 18.7.5 Key schemes considered are those located within the predicted shadow areas as well as those that might block the incoming terrestrial TV signals to the Project. By applying the same assessment methodology used for the Project, no schemes have been found to have the potential to create a cumulative effect.

References

Ref 18.1 Department for Communities and Local Government (DCLG), (2012); 'The National Policy Framework'.

Ref. 18.2 DCLG, (2014); 'The National Planning Practice Guidance'.

Ref. 18.3 Greater London Authority (GLA), (2015); 'The London Plan – Spatial Development Strategy for London. Consolidated with Alterations Since 2011'.

Ref. 18.4 London Borough of Haringey (LBH) (2013); 'Haringey's Local Plan, Strategic Policies 2013-2026'.

Ref. 18.5 European Broadcasting Union, (1988); 'Tech. 3254-E Planning Parameters and Methods for Terrestrial Television Broadcasting in the VHF/UHF Bands'.

Table 18.1: Electronic Interference Residual Effects

Environmental Effect	Sensitivity of Receptor	Nature of Impact	Impact Magnitude	Significance	Additional Mitigation	Residual impact Magnitude	Residual Significance of Effect
Construction Effects							
Blocking terrestrial TV signals to up to 40 receptors, as the massing increases	High	Negative	Minor	Insignificant	Improve existing terrestrial aerials or provide a non-subscription satellite TV service	None	None
Blocking satellite TV signals to up to 11 receptors, as the massing increases	High	Negative	Negligible	Insignificant	Raise dishes up and/or relocate them out of the shadow area	None	None
Operational Effects							
Blocking terrestrial TV signals to 40 receptors (same 40 as for Construction Effects)	High	Negative	Minor	Insignificant	Improve existing terrestrial aerials or provide a non-subscription satellite TV service	None	None
Blocking satellite TV signals to 11 receptors (same 11 as for Construction Effects)	High	Negative	Negligible	Insignificant	Raise dishes up and/or relocate them out of the shadow area	None	None

19. Summary of Residual Effects

19.1.1 This section summarises all residual effects which are set out in the tables below for each topic. This section also considered potential cumulative impacts resulting from combined effects.

Table 19.1: Summary of Residual Effects

Topic	Environmental Effect	Sensitivity of Receptor	Nature of Impact	Impact Magnitude	Significance	Additional Mitigation	Residual Impact Magnitude	Residual Significance of Effect
Construction Effects								
Chapter 6: Air Quality	Construction Dust Impacts	High	Negative	n/a	n/a	A package of mitigation measures	n/a	Neutral
	Construction Traffic Impact – No Local Construction Compound	High	Negative	Very Low	Minor	None	Very Low	Minor
	Construction Traffic Impact – Local Construction Compound	High	Negative	Very Low	Minor	None	Very Low	Minor
Chapter 7: Archaeology	Potential buried archaeological deposits	Low	Negative	Major	Slight/Moderate	None	Slight/moderate	Slight/moderate
	Potential buried archaeological deposits	Low	Negative	Major	Slight/Moderate	WB in west of Area A	Minor	Neutral/slight
	Potential buried archaeological deposits	Low	Negative	Major	Slight/Moderate	WB in west of area B	Minor	Neutral/slight
	Potential buried archaeological deposits	Low	Negative	Moderate/Major	Slight/Moderate	None	Slight/moderate	Slight/moderate
	Potential buried archaeological deposits	Low	Negative	Major	Slight/Moderate	WB in west of area D	Minor	Neutral/slight
	Potential buried archaeological deposits	Low	Negative	Major	Slight/Moderate	None	Slight/moderate	Slight/moderate

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	Potential buried archaeological deposits	Medium	Negative	Negligible	Neutral	None if no instructive works take place	Neutral	Neutral
Chapter 8: Cultural Heritage	<i>Please see Table 19.2 below: Cultural Heritage has been assessed against a different Significance Criteria</i>							
Chapter 9: Ecology	<i>No Construction Effect Predicated</i>							
Chapter 10: Surface Water Drainage and Flood Risk	Suspended Sediment into Moselle Brook and shallow aquifer	Low	Positive	High	Moderate	Controlled surface water releases; Clean site; Settlement tanks;	Very Low	Minor-neutral
	Oil and hydrocarbons into Moselle Brook and shallow aquifer.	Low	Positive	High	Moderate	Store hydrocarbons in bunded tank in designated area; Valves protected against vandalism; Drip trays for plant; Oil separators prior to discharge; Emergency Spillage action plan in place.	Very Low	Minor-neutral
	Concrete and cement products in to Moselle Brook and shallow aquifer	Low	Positive	High	Moderate	Pre-mix and delivered from off-site source; Designated impermeable areas; Water for washing down will be tankered to licensed waste operator; Use of precast concrete units.	Very Low	Minor-neutral
	Contaminated Land affecting Moselle Brook and shallow aquifer.	Low	Positive	High	Moderate	Regular monitoring; If discovered, stop work, treat contaminated soil; or remove off site to licensed Waste operator.	Very Low	Minor-neutral
	Physical Disturbance to chalk aquifer	High	Positive	High	Moderate	Monitoring to ensure confining impermeable clay layer, approx. 10m thick, to the chalk aquifer remains intact.	Very Low	Minor
Chapter 11: Ground	Preferential pathways to surface water drainage system and shallow aquifer	Low	Positive	High	Moderate	Decommissioning of Boreholes to satisfaction of EA; Dewatering of excavations to approved repository; All existing utilities will be identified and marked prior to work commencing; any damage to the drainage network will be immediately repaired.	Very Low	Minor-neutral
	Flood Risk to surrounding area	High	Positive	High	Moderate	The discharge rates into Moselle Brook and Thames Water Sewers will be regulated to an agreed rate ensuring no increase in flood risk.	Very Low	Minor
Chapter 11: Ground	Direct contact with contaminants in the	High	Negative	Medium	Moderate	Appropriate use of personal protective equipment (PPE) and safe working procedures. Construction	Very Low	Minor

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Conditions and Hydrogeology	Made Ground and potential contaminated soil during site development	High	Negative	Medium	Moderate	workers should remain vigilant of ground conditions at all times and should report any suspect areas of potential contamination.	Very Low	Minor
	Health impacts from inhalation and ingestion of contaminated dust particles Impacts to adjacent flora from exposure to phytotoxic contaminated dust particles	High	Negative	Medium	Moderate	During both demolition and construction phases of work, dust suppression measures will be employed by the contractor when necessary to prevent the potential generation of contaminated dust particles and migration off site.	Very Low	Minor
	Gas migration/accumulation	High	Negative	Medium	Moderate	Site investigation data suggests there is potential for exposure to low levels of CO2 in any confined spaces in the northern development area. There is limited potential for accumulation to hazardous concentrations due to consistently low flow rates and the nature/extent of Made Ground. Historical site investigation data (Soiltechnics) suggests there is potential for exposure to moderate levels of CO2 and CH4 in the stadium development area. Further investigation in this area will be carried out prior to development. Appropriate use of PPE and safe working procedures in any below ground/confined space work.	Very Low	Minor
	Degradation of Minor Aquifer and River Mousell via increased leaching and mobilisation of contaminants	Medium	Negative	Medium	Moderate	Excavation associated with basement carpark, infrastructure and pile caps so stockpiling of soil is likely. Where excavation of grossly contaminated soils (if encountered) is required (as part of remedial measures) stockpiling of this material will be avoided if possible. Stockpiles will be covered when not in use and placed on impermeable sheeting/hardstanding. Pollution control measures will be implemented by the contractor where required and spillage	Low	Minor

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	Degradation of Minor Aquifer via creation of temporary preferential pathway or driving of solid contaminants into the underlying aquifer during piling.	Medium	Negative	Medium	Moderate	containment will be present on site at all times. Development of a foundation works risk assessment and the adoption of appropriate piling methods/design to mitigate risk. The impact to the Chalk Major Aquifer from piling has not been assessed. This is because piles will not breach the Lambeth Group, the nature and extent of expected contamination, and the depth of the Major Aquifer. There is therefore no requirement for a Foundations Work Risk Assessment as outlined in NGWCLC Report NC/99/73.	Low	Minor
	Degradation of Minor Aquifer and River Mousell via fuel and chemical spills.	Medium	Negative	Medium	Moderate	Control measures will be implemented by the contractor on re-fuelling activities, storage of fuels and chemicals and vehicle movements and parking. Spill response measures will be implemented by the contractor and spillage containment will be present onsite at all times.	Very Low	Minor
Chapter 12: Townscape and Visual	<i>Please see Table 19.3 below: Townscape and Visual Residual Effects</i>							
Chapter 13: Noise and Vibration	Construction noise (worst-case assessment)							
	Worcester Avenue (dwellings)	High	Negative	Negligible to moderate	Neutral to moderate	Implementation of a CEMP Application of the principle of Best Practicable Means	Negligible to moderate	Neutral to moderate
	Worcester Avenue (schools)	High	Negative	Moderate to major	Moderate to major	Implementation of a CEMP Application of the principle of Best Practicable Means	Moderate to major	Moderate to major
	Park Lane	High	Negative	Negligible to major	Neutral to major	Implementation of a CEMP Application of the principle of Best Practicable Means	Negligible to major	Neutral to major
	High Road	High	Negative	Negligible to major	Neutral to major	Implementation of a CEMP Application of the principle of Best Practicable Means	Negligible to major	Neutral to major
	Construction noise (average-case assessment)							
	Worcester Avenue (dwellings)	High	Negative	Negligible to moderate	Neutral to moderate	Implementation of a CEMP Application of the principle of Best Practicable Means	Negligible to moderate	Neutral to moderate
	Worcester Avenue (schools)	High	Negative	Moderate to major	Moderate to major	Implementation of a CEMP Application of the principle of Best Practicable Means	Moderate to major	Moderate to major

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						Means			
	Park Lane	High	Negative	Negligible to major	Neutral major	Implementation of a CEMP Application of the principle of Best Practicable Means	Negligible to major		Neutral major
	High Road	High	Negative	Negligible to major	Neutral major	Implementation of a CEMP Application of the principle of Best Practicable Means	Negligible to major		Neutral major
	Construction vibration								
	Worcester Avenue (dwellings)	High	Negative	Negligible to moderate	Neutral moderate	Implementation of a CEMP Application of the principle of Best Practicable Means	Negligible to moderate		Neutral moderate
	Worcester Avenue (schools)	High	Negative	Moderate to major	Moderate to major	Implementation of a CEMP	Moderate to major		Moderate to major
	Park Lane	High	Negative	Negligible to major	Neutral major	Application of the principle of Best Practicable Means	Negligible to major		Neutral major
	High Road	High	Negative	Negligible to major	Neutral major	Implementation of a CEMP	Negligible to major		Neutral major
Chapter 14: Socio Economics	Employment generation	Medium	Beneficial	Low	Minor (local) Negligible (regional)	None required	Low		Minor (local) Neutral (regional)
Chapter 15: Transport	Excavation activity, site preparation, piling and foundations - HGV Impact on highway network	Low	Negative	Low	Minor	Routeing and scheduling of construction HGVs and delivery times	Very Low		Minor - Neutral
	Construction of stadium – HGV Impact on highway network	Low	Negative	Medium	Minor	Routeing and scheduling of HGVs and delivery times Use of construction compound near White Hart Lane Stations	Very Low		Minor - Neutral
	Construction of southern area uses – HGV Impact on highway network	Low	Negative	Very Low	Neutral	Routeing and scheduling of construction HGVs and delivery times	Very Low		Minor - Neutral
Chapter 16: Microclimate	Wind effect on construction site	Medium	Negligible	Neutral	Neutral	None	Negligible		Neutral
Chapter 17: Daylight, Sunlight and Overshadowing	Please see Table 19.4 below: Daylight, Sunlight and Overshadowing Residual Impact Summary								
Operational Effects									

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Chapter 6: Air Quality	Operation Traffic Impact in 2018 – Nitrogen Dioxide	High	Negative	Very Low	Minor	None		Very Low	Minor
	Operation Traffic Impact in 2018 – PM	High	Negative	Negligible	Neutral	None		Negligible	Neutral
	Combined Energy Plant and Operational traffic Impact in 2021 – Nitrogen Dioxide	High	Negative	Low	Moderate	None		Low	Moderate
	Combined Energy Plant and Operational traffic Impact in 2021 – PM	High	Negative	Low	Moderate	Onsite generators with lower emission limits		Very Low	Minor
Chapter 7: Archaeology	No Operational Effects Predicated								
Chapter 8: Cultural Heritage	Please see Table 19.2 below: Cultural Heritage has been assessed against a different Significance Criteria								
Chapter 9: Ecology	No Operational Effects Predicated								
Chapter 10: Surface Water Drainage and Flood Risk	Leaks, spillage, application of fertilisers and pesticides – risk of contaminating surface water	Low	Positive	High	Moderate	Emergency spill response; Vehicle speed limits; Management plan for use of fertilisers etc.		Very Low	Minor-neutral
	Contamination for insitu materials.	Low	Positive	High	Moderate	Building above damp-proof course hence isolated from underground strata and groundwater; New drainage will be constructed to meet Building Regulations Part H.		Very Low	Minor-neutral
	Flood risk to surrounding area	High	Positive	High	Moderate	The Project does not increase the impermeable area; The discharge from the Project will be attenuated by storage tanks and discharged at agreed rates; Design is for the 1:100 year plus climate change event to be stored in the underground storage tanks and oversized pipe in excess of the agreed discharge rate. The drainage system will be regularly maintained and		Very Low	Minor
	Flood risk to the Project Site	Low	Positive	High	Moderate			Very Low	Minor-neutral

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	receptors assessed.			assessed but potentially major	assessed but potentially major	stage to ensure all relevant noise sources meet the noise limits in Table 13. 19.		
Chapter 14: Socio Economics	Gross Direct Employment	Medium	Beneficial	Medium/High	Major (local) Moderate (Wider Impact Area)	None required	Medium/High	Major (local) Moderate (Wider Impact Area)
	Visitors & Spending	Medium	Beneficial	Medium/High	Major (local) Moderate (Wider Impact Area)	None required	Medium/High	Major (local) Moderate (Wider Impact Area)
	Provision of new homes	Medium	Beneficial	Medium/High	Major (local and Wider Impact Area) Minor (regional)	None required	Medium/High	Major (local) Moderate (Wider Impact Area)
	Healthcare requirements (including delivery of Community Medical Centre)	Medium	Beneficial	Low	Minor (local)	None required	Low	Minor (local)
	Education	Low	Neutral	Low	Neutral	None required	Low	Negligible
	Open Space and Public Realm including provision of plaza and improvements to public realm	Medium	Beneficial	Medium	Major (local)	None required	Medium	Major (local)
Chapter 15: Transport	Play space provision	Low	Beneficial	Low	Minor (local)	None required	Low	Minor (local)
	Sport and recreation	Medium	Beneficial	Medium	Moderate (local)	None required	Medium	Moderate (local)
	Crime and Safety	High	Beneficial	Medium	Major (local)	None required	Medium	Major (local)
	Cumulative additional trips on the highway network. Local roads around the project site eg Park Lane (non-event day)	Low	Negative	Low	Minor	Local traffic flows much lower. Local traffic congestion reduced by northern development highway improvements. New CPZ implemented by LBH. Major scheme to remove Tottenham Hale Gyratory.	Low	Minor

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	Cumulative additional trips on rest of the highway network (non-event day)	Very Low	Negligible	Negligible	Neutral	Local traffic flows much lower. Local traffic congestion reduced by northern development highway improvements. New CPZ implemented by LBH. Major scheme to remove Tottenham Hale Gyratory.	Negligible	Neutral
	Additional passengers on rail services, Underground services and bus services (non-event day)	Low	Negligible	Negligible	Neutral	Once completed service enhancements and station upgrades will improve the passenger experience. Improvements at Seven Sisters interchange. New bus station at Tottenham Hale. New Victoria Line timetable with increased frequency. New Tottenham Hale railway station, new Overground rolling stock. Upgrades to pedestrian environment along the High Road.	Medium positive	Minor positive
	Pedestrians along the High Road. Additional pedestrians on non-event days	Medium	Negative	Low	Minor	Reconfiguration of footways along the High Road	Very Low	Minor
	Event Day Road Closures	Low	Negative	Medium	Minor	Time that Road closures are in operation on event days will be reduced.	Negligible	Neutral
	Additional queues at rail stations and Underground stations event days. Impact on background users.	Medium	Negative	Medium	Moderate	Better pedestrian routes to public transport facilities Station Management Plans in operation Enhanced transport services and station improvements eg Seven Sisters Interchange. Event day CPZ has been extended. New Victoria Line timetable with increased frequency. New Tottenham Hale railway station, new Overground rolling stock, new shuttle bus services. Upgrades to pedestrian environment along the High Road.	Low	Minor
Chapter 16: Microclimate	Operational Effects – Opening Day Scenario							
	Exceedance of safety criteria	High	Negative	High	Major	landscaping, screens/signs & hoarding	Negligible	Neutral
	Wind effect on thoroughfares	High	Negative	Medium	Moderate	landscaping, screens/signs & hoarding	Low	Moderate
	Wind effect on entrances	High	Negative	Medium	Moderate	side screens	Negligible	Neutral
	Wind effect on recreational spaces	High	Negligible	Neutral	Neutral	None	Negligible	Neutral
	Wind effect on	High	Negative	Medium	Moderate	hoarding	Negligible	Neutral

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Table 19.2: Cultural Heritage Residual Effects

Heritage Asset	Description of Potential Impact/Description of View Location	Residual Impact
Warrington House, Grade-II listed building	Restoration and re-use of Warrington House as part of the proposed Tottenham Experience Museum	Major Beneficial
Northern Terrace, Grade-II and Grade-II* listed buildings	Construction of the proposed development within the wider setting of the listed terrace	Minor Beneficial
North Tottenham Conservation Area	Demolition and replacement of three locally listed buildings in the conservation area with new buildings forming the proposed Tottenham Experience	Moderate Beneficial
	Restoration and re-use of Warrington House and construction of the proposed Tottenham Experience building in the conservation area	Moderate Beneficial
	Construction of new stadium in, and within the setting of, the conservation area	Moderate Beneficial
	Construction of hotel within the setting of the conservation area	Minor Beneficial
	Construction of four residential towers within the setting of the conservation area	Negligible
North Tottenham Conservation Area, Views Assessment:	Construction of Extreme Sports Centre within the setting of the conservation area	Negligible
	<i>Impact of proposed development on views within the conservation area (view locations described below):</i>	
	View 15	West side of the High Road at the junction with Lordship Lane
	View 16	West side of the High Road opposite the junction with Northumberland Park
	View 23	West side of the High Road, at junction with Cedar Road
	View 26	White Hart Lane
	View 27	West side of the High Road, at the junction with White Hart Lane
	View 31	South side of Church Road, looking northeast
	View 32	West side of the High Road, at the junction with Ruskin Road
	View 33	West side of the High Road opposite, and just north of junction with Bromley Road
		Minor Beneficial
		Minor Beneficial
		Minor Beneficial
		Minor Beneficial
		Minor Beneficial
		Minor Beneficial
		Moderate Beneficial

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View 34	West side of the High Road, just north of junction with Hampden lane	Minor Beneficial
Alexandra Palace and Park Conservation Area: View 1	Impact of proposed development on wider setting of conservation area.	Major Beneficial
Tottenham Cemetery Conservation Area: View 10	Impact of proposed development on wider setting of conservation area.	Negligible
Bruce Castle Conservation Area:	Impact of proposed development on wider setting of conservation area (view locations described below):	
View 11	Bruce Castle Conservation Area, north-western edge of Bruce Castle Park	Moderate Adverse
View 12	Bruce Castle Conservation Area, southern end of Bruce Castle Park	Negligible
View 35	Bruce Castle Conservation Area, Bruce Grove adjoining Edmansons Close	Negligible
Tottenham Green Conservation Area: View 13	Impact of proposed development on wider setting of conservation area	Minor Beneficial
Scotland Green Conservation Area: View 36	Impact of proposed development on wider setting of conservation area	Minor Adverse
Bruce Grove Conservation Area: View 37	Impact of proposed development on wider setting of conservation area	Minor Adverse

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Table 19.3: Townscape and Visual Residual Effects

Location	Sensitivity			Magnitude (Construction)				Significance of Effect (Construction)	Magnitude (Year 1 - Winter)				Significance of Effect (Year 1 - Winter)	Magnitude				Significance of Effect (Year 15 - Summer)
	Value	Susceptibility	Overall Sensitivity	Size / Scale of Change	Geographical Influence	Duration and Reversibility	Overall Magnitude		Size / Scale of Change	Geographical Influence	Duration and Reversibility	Overall Magnitude						
Effects on Townscape Site Features																		
Landform	Low	Medium	Low	Negligible	Medium	High	Low Adverse	Minor Adverse	Negligible	Medium	High	Low Adverse	Minor Adverse	Negligible	Medium	High	Low Adverse	Minor Adverse
Vegetation	Medium	Medium	Medium	Low	Medium	High	Low Adverse	Minor Adverse	Low	Medium	High	Low Beneficial	Minor Beneficial	Medium	Medium	High	Medium Beneficial	Moderate Beneficial
Built Form	Medium	High	Medium	Very High	Very High	High	Very High Adverse	Major Adverse	Very High	Very High	High	High Beneficial	Major Beneficial	Very High	Very High	High	Major Beneficial	Major Beneficial
Free Standing Built Structures	Medium	Medium	Medium	Low	Low	High	Low Adverse	Minor Adverse	Low	Low	High	Low Beneficial	Minor Beneficial	Low	Low	High	Low Beneficial	Minor Beneficial
Land Use	Medium	High	Medium	Medium	High	High	Medium Adverse	Moderate Adverse	Medium	High	High	Medium Beneficial	Moderate Beneficial	Medium	High	High	Medium Beneficial	Moderate Beneficial
Public Access	Medium	High	Medium	Medium	High	High	Medium Beneficial	Moderate Adverse	Medium	High	High	Medium Beneficial	Moderate Beneficial	Medium	High	High	Medium Beneficial	Moderate Beneficial
1: THFC Stadium	Low	Low	Very Low	Very High	Very High	Low	Very High Neutral	Moderate Neutral	Very High	Very High	High	Very High Beneficial	Moderate Beneficial	Very High	Very High	High	Very High Beneficial	Moderate Beneficial
2: Tottenham High Road	High	High	High	High	High	Low	High Adverse	Major Adverse	High	High	High	High Beneficial	Major Beneficial	High	High	High	Major Beneficial	High Beneficial
3: North Tottenham Low Level Industrial Estates	Low	Low	Very Low	Medium	Low	Low	Medium Adverse	Minor Adverse	Medium	Low	High	Medium Beneficial	Minor Beneficial	Medium	Low	High	Medium Beneficial	Minor Beneficial
4: East Tottenham Large Scale Residential	Medium	Low	Low	High	High	Low	High Adverse	Moderate Adverse	High	High	High	High Beneficial	Moderate Beneficial	High	High	High	High Beneficial	Moderate Beneficial

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5: East Tottenham Linear Residential	Medium	Medium	Medium	Medium	Low	Low	Low	Medium Adverse	Moderate Adverse	Medium	Low	High	Medium Beneficial	Medium	Low	High	Medium Beneficial	Moderate Beneficial
6: East Tottenham Mixed Linear Residential	Medium	Medium	Medium	Medium	Medium	Medium	Low	Medium Adverse	Moderate Adverse	Medium	Medium	High	Medium Neutral	Medium	Medium	High	Medium Neutral	Moderate Neutral
7: Northumberland Park Discordant Residential	Low	Medium	Low	Medium	Medium	Medium	Low	Medium Adverse	Minor Adverse	Medium	Medium	High	Medium Beneficial	Medium	Medium	High	Medium Beneficial	Minor Beneficial
8: Bruce Castle Mixed Open Space	High	Very High	High	Medium	Low	Low	Low	Medium Adverse	Moderate Adverse	Medium	Low	High	Medium Adverse	Medium	Low	High	Medium Adverse	Moderate Adverse
9: Lee Valley Large Scale Industrial	Low	Low	Very Low	Very Low	Low	Low	Low	Very Low Adverse	Negligible Adverse	Very Low	Low	High	Very Low Beneficial	Very Low	Low	High	Very Low Beneficial	Negligible Beneficial
10: West Tottenham Large Scale Mixed Development	Low	Medium	Low	Very Low	Very Low	Low	Low	Very Low Adverse	Negligible Adverse	Very Low	Very Low	High	Very Low Beneficial	Very Low	Very Low	High	Very Low Beneficial	Negligible Beneficial
1: Alexandra Palace	High	High	High	Medium	Low	Low	Low	Medium Adverse	Moderate Adverse	Medium	Low	High	Medium Beneficial	Medium	Low	High	Medium Beneficial	Moderate Beneficial
2: Parliament Hill	High	High	High	Very Low	Very Low	Low	Low	No Change	No Change	Very Low	Very Low	High	Very Low Neutral	No	No Change	High	No Change	No Change
3: Royal Observatory, Greenwich Park	High	High	High	No Change	No Change	Low	Low	No Change	No Change	No	No Change	High	No Change	No	No Change	High	No Change	No Change
4: Intersection of Lordship Lane and High Road, Wood Green	Medium	High	High	No Change	No Change	Low	Low	No Change	No Change	No	No Change	High	No Change	No	No Change	High	No Change	No Change
5: Western edge of Lordship Recreation Ground	Medium	High	High	Low	Low	Low	Low	Low Adverse	Moderate Adverse	Low	Low	High	Low Neutral	Low	Low	High	Low Neutral	Moderate Neutral

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6. Forest Lane Bridge Crossing of River Lea	Low	Medium	Low	Low	Low	Low	Low	Low	Low	Minor Adverse	Low	Low	High	Low	Minor Neutral	No Change	No Change
7. Public Footpath, Tottenham Marshes	Medium	High	High	Medium	Low	Medium Adverse	Medium Adverse	Medium	High	Moderate Adverse	Medium Neutral	High	High	Medium Neutral	Moderate Neutral	Moderate Neutral	Moderate Neutral
8. Eastern End of Park Lane	Low	Medium	Low	High	Low	Moderate Adverse	High Adverse	High	High	Moderate Adverse	High Neutral	High	High	High	Moderate Neutral	High Neutral	Moderate Neutral
9. Northern End of Fore Street, Upper Edmonton	Low	Medium	Low	Low	Low	Minor Adverse	Low Adverse	Low	High	Low Neutral	Low Neutral	Low	High	Low	Minor Neutral	Low Neutral	Minor Neutral
10. War Memorial, Tottenham Cemetery	Medium	High	High	Low	Very Low	Minor Adverse	Very Low Adverse	Low	High	Very Low Adverse	Very Low Adverse	Very Low	High	Very Low	Minor Adverse	Very Low Adverse	Minor Adverse
11. Bruce Castle Park, close to the boundary with Church Lane	Medium	High	High	Medium to High	Medium	Moderate Adverse	Medium Adverse	Low	High	Moderate Adverse	Medium Adverse	Medium to High	High	Medium	Moderate Adverse	Medium Adverse	Moderate Adverse
12. North-east of Bruce Castle with in Bruce Castle Park	Medium	High	High	Very Low	Low	Minor Adverse	Very Low Adverse	Low	High	Very Low Adverse	Very Low Adverse	Very Low	High	Low	Minor Adverse	Very Low Adverse	Minor Adverse
13. High Cross at the Junction of High Road with Monument Way	Medium	Medium	Medium	Low	Low	Minor Adverse	Low Adverse	Low	High	Low Beneficial	Low Beneficial	Low	High	Low	Minor Beneficial	Low Beneficial	Minor Beneficial
14. Hartington Park	Medium	High	High	Low to Medium	Low	Moderate Adverse	Low Adverse	Low	High	Low Neutral	Low Neutral	Low to Medium	High	Low	Moderate Neutral	Low Neutral	Moderate Neutral
15. Crossroads of High Road and Lansdowne Road	Medium	Medium	Medium	Low	Low	Moderate Adverse	Medium Adverse	Low	High	Low Beneficial	Low Beneficial	Low	High	Low	Minor Beneficial	Low Beneficial	Minor Beneficial

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16. Junction with High Road and Northumberland Park	Medium	Medium	Medium	High	High	Medium	High	Moderate Adverse	High Adverse	Low	High Adverse	Moderate Adverse	High	High	Medium	High	High Neutral	Moderate Neutral	High Neutral	High	Medium	High	High Neutral	Moderate Neutral
17. Northumberland Park at the junction with Worcester Avenue	Medium	High	High	High	High	High	High	Major Adverse	High Adverse	Low	High Adverse	Major Adverse	High	High	High	High Neutral	Major Neutral	Major Neutral	High Neutral	High	High	High	High Neutral	Major Neutral
18 Trulock Road, Tottenham	Low	Medium	Low	High	High	High	High	Moderate Adverse	High Adverse	Low	High Adverse	Moderate Adverse	High	High	High	High Beneficial	Moderate Beneficial	Moderate Beneficial	High Beneficial	High	High	High	High Beneficial	Moderate Beneficial
19 Almond Road near to Lea Valley School	Low	Medium	Low	High	High	High	High	Moderate Adverse	High Adverse	Low	High Adverse	Moderate Adverse	High	High	High	High Beneficial	Moderate Beneficial	Moderate Beneficial	High Beneficial	High	High	High	High Beneficial	Moderate Beneficial
20. Park Lane at the junction with St Paul's Road	Low	Medium	Low	High	High	High	High	Moderate Adverse	High Adverse	Low	High Adverse	Moderate Adverse	High	High	High	High Neutral	Moderate Neutral	Moderate Neutral	High Neutral	High	High	High	High Neutral	Moderate Neutral
21. Corner of Vicarage Road and Park Lane, Tottenham	Medium	High	High	Very High	Very High	Very High	Very High	Substantial Adverse	Very High Adverse	Low	Very High Adverse	Substantial Adverse	Very High	Very High	Very High	Very High Beneficial	Substantial Beneficial	Substantial Beneficial	Very High Beneficial	High	Very High	Very High	Very High Beneficial	Substantial Beneficial
22. Bromley Road	Medium	High	High	Very High	Very High	Very High	Very High	Substantial Adverse	Very High Adverse	Low	Very High Adverse	Substantial Adverse	Very High	Very High	Very High	Very High Neutral	Substantial Neutral	Substantial Neutral	Very High Neutral	High	Very High	Very High	Very High Neutral	Substantial Neutral
23. Tottenham High Road at the Junction with Cedar Road	Medium	Medium	Medium	High	High	High	High	Moderate Adverse	High Adverse	Low	High Adverse	Moderate Adverse	High	High	High	High Neutral	Moderate Neutral	Moderate Neutral	High Neutral	High	High	High	High Neutral	Moderate Neutral
24. Breton Road	Medium	High	High	High	High	High	High	Major Adverse	High Adverse	Low	High Adverse	Major Adverse	High	High	High	High Neutral	Major Neutral	Major Neutral	High Neutral	High	High	High	High Neutral	Major Neutral

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Table 19.4: Daylight, Sunlight and Overshadowing Residual Effects

Environmental Effect	Potential Effect	Additional Mitigation	Residual Effect
Demolition and Construction Effects			
Daylight, sunlight, sun hours on ground, overshadowing, light pollution and solar glare	As per completed development In terms of light pollution minor adverse effects may occur due to portable lighting units in proximity to residential receptors.	None required Positioning of portable lighting units away from residential receptors.	As per completed development. Negligible
Operational Effects			
Daylight	Negligible to 76 properties with 17 instances of minor adverse, two instances of minor to moderate adverse, three instances of moderate adverse, two instances of moderate to major adverse and two	The scheme is fixed and therefore no further mitigation is available.	Negligible to minor adverse with instances of moderate and major adverse effects.

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	instances of major adverse.	The scheme is fixed and therefore no further mitigation is available.	Negligible to minor adverse with instances of moderate adverse effects.
Sunlight	Negligible to 60 properties with six instances of minor adverse and one instance of moderate adverse effects.		Negligible
Sun Hours on Ground	Negligible to surrounding amenity areas. Proposed amenity areas will meet the BRE guidelines.	None required	
Transient Overshadowing	Minor adverse for March and June 21 st and minor to moderate adverse for December 21 st .	None required given the nature of the effects.	Minor adverse with one instance of minor to moderate adverse.
Light Pollution	No significant light pollution effects likely.	None required	No significant light pollution effects likely.
Solar Glare	Negligible for seven viewpoints with one instance of negligible to minor adverse, one instance of minor adverse and one instance of minor to moderate adverse.	None required due to the brief and isolated nature of the effects.	Negligible with instances of minor to moderate adverse.
Internal Daylight to proposed residential towers	The proposed illustrative massing will provide very good daylight potential overall which in turn has the potential to deliver accommodation which sees good levels of daylight.	N/A	The proposed illustrative massing will provide very good daylight potential overall which in turn has the potential to deliver accommodation which sees good levels of daylight.

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Combined Residual Effects

19.1.2 Table 19.5 below sets out the combined residual effects from multiple disciplines. These potential combined effects have not been quantitatively measured and are based on professional judgement.

Table 19.5: Combined Residual Effects

Topics	Environmental Effect	Sensitivity of Receptor	Nature of Impact	Impact Magnitude	Significance	Additional Mitigation	Residual Impact Magnitude	Residual Significance of Effect
Cumulative Construction Effects								
Chapter 10: Surface Water Drainage and Flood Risk	There are a number of potential cumulative environmental effects during construction that could affect the Moselle Brook.	High	Negative	Medium	Moderate	A number of appropriate mitigation measures have been set out to mitigate any potential significant adverse impacts on the Moselle Brook. The mitigation set out for both of these topics does not conflict, and the potential impacts do not give rise to any significant adverse effects.	Very Low	Minor
Chapter 11: Ground Conditions and Hydrogeology								
Chapter 10: Surface Water Drainage and Flood Risk	There are a number of potential cumulative environmental effects during construction that could affect the aquifer.	High	Negative	Medium	Moderate	A number of appropriate mitigation measures have been set out to mitigate any potential significant adverse impacts on the Aquifer. The mitigation set out for both of these topics does not conflict, and the potential impacts do not give rise to any significant adverse effects.	Low	Minor
Chapter 11: Ground Conditions and Hydrogeology								
Chapter 6: Air Quality	Construction traffic along High Road may result in potential cumulative	High	Negative	Negligible to High	Neutral to Major	Details of measures to protect the environment during the construction of the Project will be set out in a Construction Environmental Management Plan (CEMP). Such measures will address hours of	Negligible to High	Neutral to Major
Chapter 13: Noise and								

EIA Environmental Statement

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Vibration Chapter 12: Townscape and Visual	environmental effects during construction that could affect air quality, noise/vibration and traffic.	Low to High	Negative	Negligible to High	Neutral to Major	working, noise, vibration, dust, light spill, wheel washing and control of run-off. It is anticipated that the implementation of the CEMP will be a condition on the planning permission and it will be regularly monitored. Therefore, no additional mitigation is proposed.	Negligible to High	Neutral to Major
Chapter 15: Transport	Additionally, the existing townscape of High Road will be temporarily effected during construction.							
Chapter 6: Air Quality	Construction traffic along Park Lane may result in potential cumulative environmental effects during construction that could affect air quality, noise/vibration and traffic.				Neutral to Major	Details of measures to protect the environment during the construction of the Project will be set out in a Construction Environmental Management Plan (CEMP). Such measures will address hours of working, noise, vibration, dust, light spill, wheel washing and control of run-off. It is anticipated that the implementation of the CEMP will be a condition on the planning permission and it will be regularly monitored.		
Chapter 13: Noise and Vibration								
Chapter 12: Townscape and Visual								
Chapter 15: Transport	Additionally, the existing townscape of High Road will be temporarily effected during construction.					Therefore, no additional mitigation is proposed.		
Cumulative Operational Effects								
Chapter 8: Cultural	The existing townscape of	Medium	Negative	Negligible to High	Neutral to Moderate	No additional mitigation.	Negligible to High	Neutral to Moderate

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Heritage	Bruce Castle Park may be temporarily effected during construction.	Medium to High	Negative	Low to Medium	Minor to Moderate	No additional mitigation.	Low to Medium	Minor to Moderate
Chapter 12: Townscape and Visual								
Chapter 6: Air Quality	Cumulative additional trips on the highway network. Local roads around Project Site, e.g. Park Lane.							
Chapter 13: Noise and Vibration								
Chapter 15: Transport	The surrounding road network may be impacted by combined effects from traffic, noise and air quality.							

Operational Waste Management Plan

Executive Summary of Site Wide Waste Management Proposals

1.1 Introduction

The management of solid waste is an important element to consider as buildings are designed. Planning for future operational waste management ensures that a building will be able to operate efficiently and sustainably while minimising the impacts on the designed requirements building performance and site users. Good waste management will be essential ensure safe operational practice throughout the development.

The waste management strategy must ensure that the Facilities Management (FM) teams that operate throughout the project masterplan can collect, store, recycle, re-use and dispose of waste quickly and efficiently and in a discreet manner in line with Tottenham Hotspur Football Clubs (THFC) Waste Management Policy, regional and local policy, as well as the waste hierarchy as shown in **Figure 1**.

Figure 1: The Waste Hierarchy



- 01** Minimise the amount of waste produced and avoid producing waste in the first instance
- 02** Re-use items as many times as possible
- 03** Recycle what you can once you have re-used it and it is no longer able to be used or is no longer needed
- 04** Turn waste materials into a new product where possible i.e. the generation of waste from energy
- 05** Dispose of what is unable to be recovered in a responsible way

Three separate Operational Waste Management Strategies (OWMS) have been produced for the THFC development, these are summarised below;

- Stadium also covering the public square, THFC Experience and North East Building;
- Hotel; and
- Residential

A detailed study of the THFC Experience and North East Building has not been undertaken, however the anticipated waste generation from these developments have been accounted for within the stadium strategy and subsequently the planning of management infrastructure and procedures. Detailed studies could not be undertaken due to the recent addition of these to the scheme. The Extreme Sports Centre is outside the scope of the appointed waste consultant.

The key drivers for each project are detailed in full within the respective OWMS.

1.2 Summary of Operational Waste Management Proposals

1.2.1 Stadium

BuroHappold undertaken work to establish an anticipated waste generation rate for the stadium, THFC Experience, UTC and public square. The findings of this set out that a total of 27,808kg per year (equivalent to 1,446 tonnes per year) will be generated through the operation of the stadium.

Section 3 of the OWMS outlines how waste will be managed within the stadium. On top of some wider start of pipe solutions to reduce waste, by better controlling good inward the stadium has been designed to better collect, store and process recyclables and waste To summarise, a central waste store has been located in the basement of the stadium. All waste at higher levels will be stored in intermediate waste rooms during match play, these are located throughout the stands and function areas at all levels. Waste collection in concourse areas, the bowl, hospitality areas and so forth will take place at appropriate times dependant on the function and using an appropriate method. Once the stadium is emptied all waste will be transported via the lifts to the central waste store from which it will be collected by the external contractor.

In line with the waste hierarchy, waste will be segregated into the waste streams outlined in **Figure 2**. The restrictions imposed on fans with bringing food and other items into the ground will provide significant opportunity to maximise recycling rates.

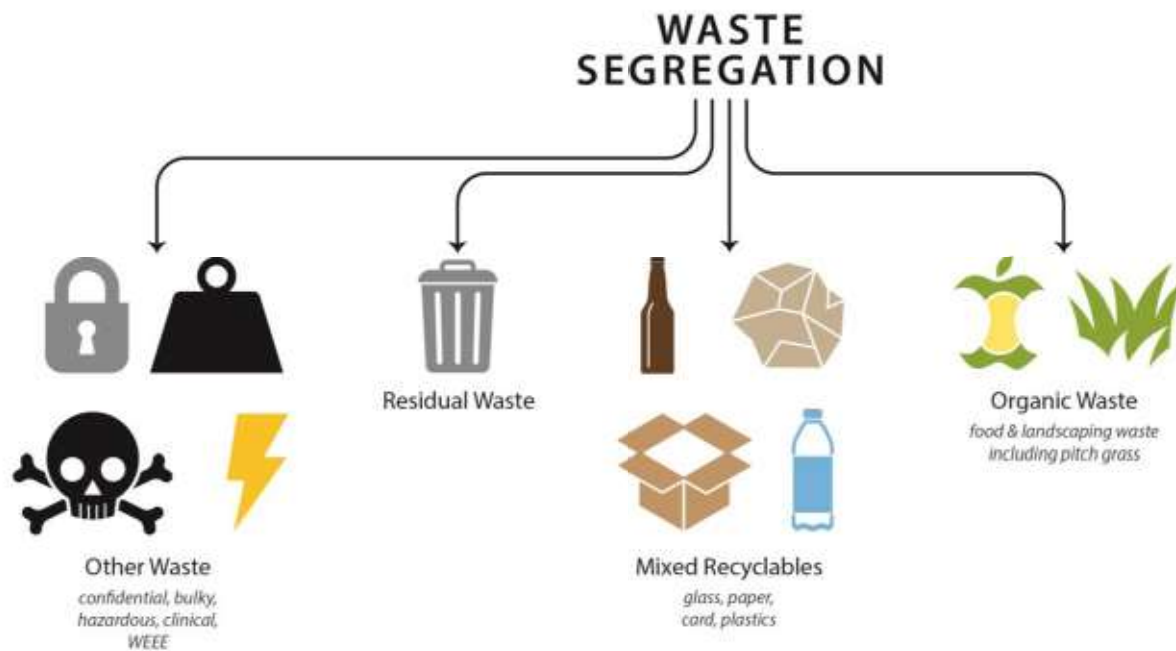


Figure 2: Segregation of Waste and Recyclables with the Stadium

Proposals for the central waste store include the specification of a minimum of three balers, an elevated mini-MRF and potentially a glass crusher. A method of treating food waste on site has also been accommodated.

In the public square a series of three stream litter bins will be provided, it is forecast that these will be serviced once a week with additional collections on match days.

Waste will be collected from the northern end of the waste and recycling area in the loading area within the service yard. Each waste stream will be collected on a specific day or at set times depending on the match and event schedule.

1.2.2 Hotel

Waste generation for the hotel has been estimated at 4,756 kg per week (or 247 tonnes per year). The waste storage area which located in the back of house area on the ground floor has been sized accordingly to enable this to house the necessary amount of bins based on a collection frequency of three times a week. Waste will be segregated into the streams outlined in **Figure 3**.



Figure 3: Segregation of Waste and Recyclables with the Hotel

A dedicated waste and recycling store will be located on the ground floor of the hotel. The FM teams will be responsible for collecting waste from the guest rooms and serviced apartments and this will be directly transferred to the waste and recycling store, via the lifts or the stairs within the building, and segregating their waste before placing it into the appropriate receptacle. The FM team to manually move waste by hand out to the laybys either directly outside the hotel entrance on Park Road or to the waste collection bay further up Park Lane which is being created to service Tower D of the THFC Southern Residential development. Both collection points are within 25m of waste and recycling store.

1.2.3 Residential

Outline waste generation calculations estimate that approximately 83,000 litres per week from the four residential towers. This is equivalent to approximately 16,500 tonnes of waste per week. Each of the residential towers contains a dedicated waste and recycling room and a smaller bulky waste room on the ground floor of the buildings. Residents will be responsible for transferring their waste from their property to the ground floor, via the lifts or stairs within the building and segregating their waste and placing it into the appropriate receptacle. Waste will be segregated into the following streams;



Figure 4: Segregation of Waste and Recyclables in the Southern Residential Development

Twice weekly collection of waste has been agreed by the LBH Council. There is access from the waste rooms to external serving bays on Park Lane and Worcester Avenue where waste collection vehicles will be able to pull up outside the towers and collect the residential waste. A holding area in Tower A has been created so that the FM team can transport Waste from Tower C to this to avoid the need for Council waste collection team to access the internal core of the building.

New Tottenham Hotspur Football Club (THFC) Stadium
Operational Waste Management Strategy

032767

7 September 2015

Revision 01

Revision	Description	Issued by	Date	Checked
00	Operational Waste Management Strategy - draft	Megan Parker Seal	May 2015	James Hobson
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This report has been prepared for the sole benefit, use and information of Tottenham Hotspur Football Club (THFC) for the purposes set out in the report or instructions commissioning it. The liability of Buro Happold Limited in respect of the information contained in the report will not extend to any third party.

author **Megan Parker Seal and
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date **August 2015**

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signature



date **September 2015**

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Glossary

Term	Definition
AD	Anaerobic Digestion
C&I	Commercial & Industrial
DEFRA	The Department of Environment Food and Rural Affairs
EVs	Electric Vehicles
FM	Facilities Management
LBH	London Borough of Haringey
MSW	Municipal Solid Waste
MRF	Material Recovery Facility
NFL	National Football League
NLWP	North London Waste Plan
OWMS	Operational Waste Management Strategy
SWMP	Site Waste Management Plan
THFC	Tottenham Hotspur Football Club
UK	United Kingdom
UTC	University Technical College
Waste Hierarchy	Preferred Environmental Option  Least preferred Environmental Option
WEEE	Waste Electrical and Electronic Equipment
WTN	Waste Transfer Note

1 Introduction

An Operational Waste Management Strategy (OWMS) is required to support the detailed planning application for the new 61,080 seat Tottenham Hotspur Football Club (THFC) Stadium in Tottenham, North London. The stadium development includes a mixed retail and leisure venue known as the THFC experience, a north-east office building, and a large public square (which may contain spectator screens for members of the public to watch events taking place within the stadium).

Tottenham University Technical College (UTC), is located immediately north of the stadium. The UTC is currently operational, although it will take approximately five years to reach full capacity. Currently, UTC waste is being collected by the council via kerbside collection. THFC is a co-sponsor of the UTC and has agreed that once the new stadium is operational, the waste generated within the UTC will be managed by THFC.

All waste generated from these land uses, with the exception of the north-east office building which will manage its own waste, is to be managed by THFC and this OWMS outlines how the stadium team will go about managing this waste. This document will support the planning application for the new THFC stadium which includes the THFC experience and public square and will be submitted to the London Borough of Haringey (LBH)

1.1 Aims and aspirations

The management of solid waste is an important element to consider as buildings are designed. Planning for future operational waste management ensures that a building will be able to operate efficiently and sustainably while minimising the impacts on the designed requirements building performance and site users. Good waste management will be essential, ensuring safe operational practice throughout the development. Specifically, by allowing THFC Facilities Management (FM) to collect, store, recycle, re-use and dispose of waste quickly and efficiently and in a discreet manner in line with THFC Waste Management Policy and the waste hierarchy as shown in **Figure 1**.

Figure 1: The Waste Hierarchy



- 01** Minimise the amount of waste produced and avoid producing waste in the first instance
- 02** Re-use items as many times as possible
- 03** Recycle what you can once you have re-used it and it is no longer able to be used or is no longer needed
- 04** Turn waste materials into a new product where possible i.e. the generation of waste from energy
- 05** Dispose of what is unable to be recovered in a responsible way

Waste management operations will need to be hidden from fans to ensure that they do not interfere with the operations of the stadium or lesser the enjoyment of the fans. Of most importance is the need to develop a waste strategy that works with an effective logistics strategy to allow for rapid venue turnaround times. This is essential, particularly in the stadium which will need to be rapidly cleared of waste during and after football games and events that take place.

In summary, the aims to be achieved during the formulation of the OWMS are to:

- Provide an estimate of anticipated waste generation for the stadium, THFC experience, UTC and public square;
- Provide guidance on waste management to ensure that adequate spatial provision for clean, hygienic and efficient storage and collection of waste is incorporated into the design. This is essential for successful operation and for the aesthetics of development;
- Enable the FM team to manage the different types of waste quickly, sustainably and efficiently and in a discreet manner;
- Ensure that national and local waste management targets as well as any other client aims and aspirations are achieved. These targets, aims and aspirations are detailed in full in **Appendix A**;
- Ensure that waste management practices are efficient, reduce operational costs while aiming to recover economic value from waste whilst championing environmental protection principles;
- Learn from the existing THFC stadium and other London stadiums, to identify the issues that the FM team working within similar venues are facing, how this is affecting the efficiency of waste management operations on a day to day basis. This information will aim to consider any lessons learnt and any improvements to operations that could be made and designed into the new THFC stadium. The detailed findings of the study are presented in **Appendix B**; and
- Look at initiatives to reduce the quantity of waste produced and maximise recycling rates at the development. A summary of the possible initiatives that could be explored are outlined in **Appendix C**.

2 Existing Stadium Waste Generation

Discussions within THFC have been undertaken to understand the main issues that are currently restricting the stadium's FM team's ability to collect, manage and dispose of waste effectively. Existing recycling rates are poor and THFC staff acknowledge that more could be done to manage waste in a more efficient and sustainable way, although there is insufficient waste infrastructure within the existing building to facilitate change.

A review of the ACM Environmental Services¹ waste collection logs for the existing stadium has been undertaken. The number of units (wheeled bins or containers) collected rather than the tonnage is currently recorded. In order to provide data for total volumes of waste, create metrics and to compare these with the new stadium, ACM estimates weights by converting these units to tonnage by using their own assumptions for the waste type that is collected and the disposal container that is used. Therefore, whilst the data reviewed is useful it should be treated as an indication only of the tonnage that the site produces. A summary of existing waste management practices at the existing THFC stadium is provided below:

- Five waste streams are currently collected: clinical waste, dry mixed recyclables (compacted card, paper, cans and plastic), residual waste, glass (uncrushed), confidential waste and grass waste;
- Current recycling practices are poor. 11.4% of waste produced by weight is categorised as recyclables (glass, confidential waste and dry mixed recyclables). 25.7% of the waste generated is grass and 62.9% is residual waste;
- Contamination of recyclable waste is a significant issue for the stadium FM team and
- The amount of waste produced fluctuates significantly based on the number of home games. There is a peak before and after Christmas, relating to the large number of games within a short period of time.

The amount of waste produced at the existing stadium during the period 01/08/2013 to 01/08/2014 is presented in **Table 1**. This has been obtained from the ACM waste collection logs and from the THFC official website. This also allows for the creation of a number of metrics which in turn can be used to predict future waste generation levels within the new stadium.

Table 1: Existing Stadium Waste Generation

Period	No. of games	Recyclables (tonnes)	Grass cuttings (tonnes)	Residual waste (tonnes)	Total (tonnes)	Average waste per game	Average waste per fan per game
August 2013 to August 2014	29	83	188	460	731	18.7	0.546kg

According to the THFC website, 29 games (including pre-season friendlies, Premier League, UEFA and FA and League Cup games) were played during the period 01/08/2013 to 01/08/2014. During this time, fan numbers ranged from 23,101 to 36,102. The average number of fans per game was 34,243 (the stadium is typically 94% full during the season). Based on this data it is estimated that 18.7 tonnes of waste is produced on average per game. It should be noted that this figure excludes grass waste. Assuming that 18.7 tonnes of waste was produced per game when 34,243 fans were in attendance, it is estimated that each fan is producing 0.546kg of waste per game.

¹ Current waste management contractor for THFC

3 Anticipated Waste Generation and Bin Numbers

3.1 Waste Generation

In order to determine spatial requirements for the management of waste in the new stadium, outline waste generation rates have been estimated. This is based on the Populous area schedule, drawings for the stadium and a number of assumptions (laid out via two options) which are outlined below.

Option 1 – Site wide metric: This methodology involves the calculation of waste for the stadium using a site wide metric waste generation rate of 0.546kg per fan per game based on existing THFC waste data. This all-encompassing generation rate includes waste generated within the player and media facilities, offices, kitchens, bar and hospitality areas and the THFC experience). Waste generated from the pitch, UTC, public square, north-east building, National Football League (NFL) games and concerts were then calculated separately to give a total anticipated annual tonnage.

Option 2 – Land use metrics: This methodology involves using a waste generation rate based on data obtained from Wembley Stadium and other specific land use metrics (i.e. kitchens, offices etc.). The figure for fan only waste take into account the amount of waste produced during games and does not consider other stadium operations. Waste generation rates for five events at a similar stadium that took place ranged from 0.21kg and 0.37kg per fan per game, with the average generation rate calculated at 0.25kg per fan per game. Waste generation rates obtained from waste audits or published documents in similar landuses were then used to calculate anticipated waste for the remainder of the stadium facilities including player and media facilities, THFC experience, kitchens, offices, retail etc. as well as the pitch, UTC, public square, north-east building, and anticipated NFL games and concerts.

The amount of waste anticipated using each option was broadly similar. Option 1 anticipated 1,446 tonnes per annum and Option 2 anticipated 1,283 tonnes per annum. It was considered more accurate to use the waste generation rate of 0.546kg per fan per game based on the existing THFC waste data and therefore Option 1 was deemed most appropriate in sizing waste storage needs. This is also the most conservative approach. The waste generation estimates provided in **Table 2** are high level and are based on the following assumptions which are subject to change:

- Average recycling target of 50%;
- A generation rate of 0.546kg per fan per game for the stadium. This accounts for waste generated within the player and media facilities, offices, THFC experience, kitchens, bar and hospitality areas;
- The 61,080 seats within the stadium will all be full. This is a conservative assumption;
- A generation rate of 99.5kg per student per year for the UTC. This accounts for all waste generated within the UTC. It is anticipated that the UTC will accommodate 900 students;
- The amount of grass waste produced will not change as the size of the pitch will be the same in the new stadium;
- The public square will contain ten 90 litre bins which will be serviced (on average) once a day;
- The north-east building offices will accommodate up to 116 employees;
- Two NFL games with a full stadium capacity of 61,080 will be hosted per year in autumn; and
- Six concerts with an average capacity of 55,000 will be hosted per year which will take place between May and July.

Table 2: Estimated New Stadium and Associated Facilities Waste Generation

Land use	Floor area m ²	Capacity	Estimated waste generation (kg/week)	Estimated waste generation (tonnes / year)
Stadium	127,181	61,080	18,599	967
Pitch	-	-	3,615	188
Public square	10,765	-	253	13
UTC	-	900	1,913	100
North-east Building	1,396	-	559	29
NFL games	-	61,080	1,283	67
Concerts	-	55,000	1,585	82
TOTAL WASTE			27,808 kg	1,446 tonnes

Outline waste generation calculations estimate that approximately 28 tonnes of waste will be produced per week with annual waste generation likely to be in the region of 1,446 tonnes.

Consideration has been given to a worse-case scenario in terms of waste generation within the stadium. This would be a football match and an NFL game or other sporting event within one weekend. It has been calculated that up to 49 tonnes of waste could be produced in one weekend.

3.2 Outline Bin Numbers

An estimate of the total number of waste receptacles that will be required within the stadium has been calculated based on an anticipated collection frequency of three times a week for mixed recyclables, residual waste and organics. Other waste streams will be collected at less frequent intervals as and when they are needed. Presentation of bin numbers in this manner should be seen as a worst case scenario in terms of storage and collection. It also better visualises the volume of waste estimated to be produced in a development.

It is estimated that 68 x 1100 litre bins would be required for mixed recyclables² (including glass, plastics, paper and cardboard) and 21 x 1100 litre bins for residual waste. In addition, 40 x 240 litre bins for organic waste (this excludes grass waste) would be needed.

An additional 15 x 240 litre bins for grass waste would be required. These bins have been accommodated within the grounds keeping store within the north-east corner of the stadium.

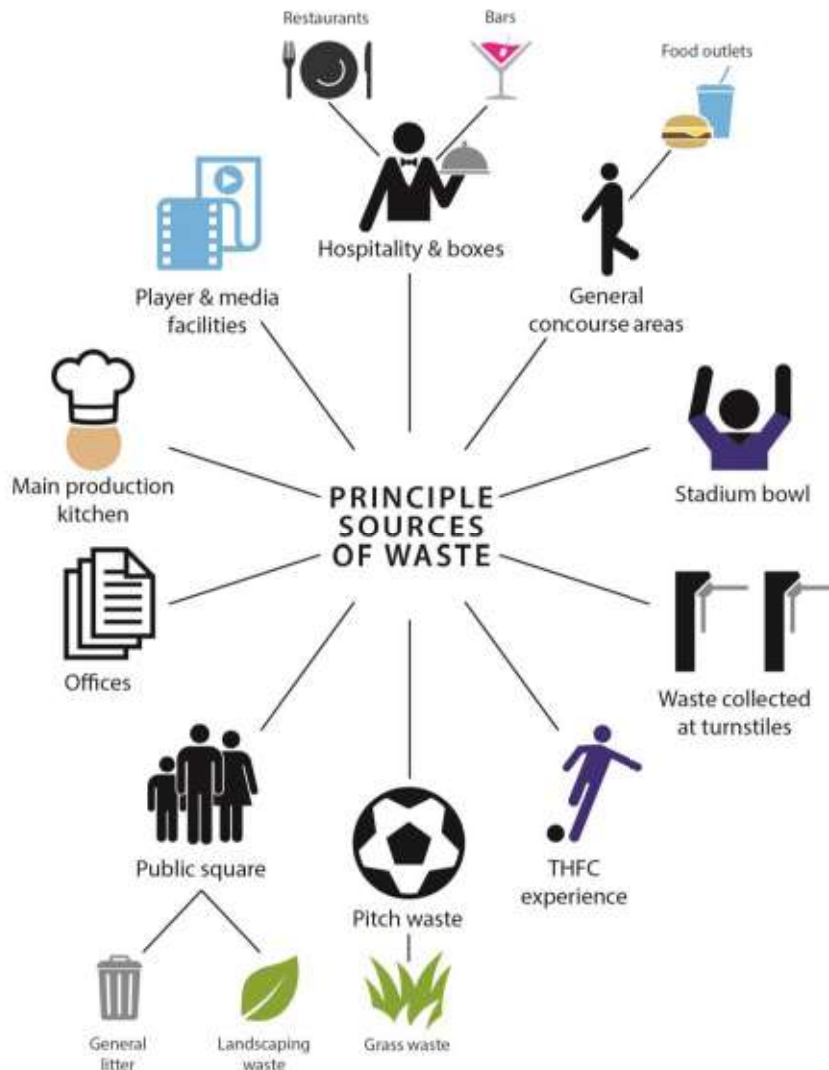
The development of the strategy, in part aims to reduce these bin numbers and facilitate the most efficient form of management that can also deliver the sustainable targets that the stadium has aimed for. Management of Stadium Waste

² Recycling capture rates have not been applied at this high level stage of estimation.

3.3 Waste Sources

The majority of the waste produced within the stadium will be generated sporadically, typically on a fortnightly basis when THFC home games are taking place or when an event such as a NFL game is taking place. This section outlines the main sources of waste and any specific considerations that need to be dealt with in the development of the waste management strategy.

Figure 2: Sources of Waste within the Stadium



3.4 Principle Waste Segregation Strategy

THFC will segregate waste at source (i.e. in the offices, hospitality and food outlets, kitchens, general concourse areas, player and media facilities, public square and within the THFC experience) into the following four main streams: residual waste, mixed recyclables (glass, paper, cardboard and plastics), organic waste (food and landscaping waste) and other waste as outlined in **Figure 3**. The 'other' waste stream is anticipated to include clinical and hazardous wastes, confidential waste, bulky and WEEE wastes which will arise in small quantities.

Figure 3: Segregation of Waste and Recyclables



3.5 Overview of Internal Waste Collection Strategy

Waste generated within the stadium will be managed by the FM team who will be responsible for the safe, hygienic and efficient transfer of waste from around the building to the dedicated waste and recycling area on Level 00, the main service level within the stadium. From here waste will be collected by external waste contractors. Detailed information on the waste and recycling area is provided in **Section 5**.

Intermediate waste storage rooms are located throughout each level of the stadium located to match those areas that will generate significant volumes of waste (Level 1 to 5 and Level 9). Rooms have been provided in general concourse and hospitality areas to enable waste to be held locally until it is less congested and can be moved to Level 00 at a convenient and safe time either during a game or once fans have left the stadium. This will facilitate the efficient management of waste on each level. It will ensure the number of journeys to Level 00 that the FM team has to make is minimised and there is reduced nuisance to fans, without limiting the ability of Level 00 to service the stadium. It is likely this method will also reduce the cost of servicing by reduce demand on FM staff numbers. As well as positioning the waste rooms as close as reasonably practical to the waste sources they have also been located to facilitate vertical movement via designated lifts that will transport waste to Level 00 to help facilitate rapid clearance. The lifts within the stadium which have been selected for the movement of waste are outlined in **Appendix D**.

Doorways to all intermediate waste rooms have a minimum of 1.5m width clearance to facilitate bin movement. All waste rooms will have adequate ventilation and lighting and are sealed to prevent vermin entering. Rubber buffers will be incorporated in all rooms and lifts that will be used to store waste to avoid damaging the walls.

The emergency route into the stadium is located next to the waste and recycling area on Level 00 and it is essential that this is maintained at all times. All waste receptacles and other equipment must remain in designated areas as to not impact the route entrance from the service yard.

3.6 Key Areas - Collection and Storage of Waste

3.6.1 Turnstiles

Fans often attempt to bring banned food and drink items into the stadium, this in turn generates waste at the turnstiles. At the new stadium, the disposal of such items will be encouraged at the point of entry and facilitated for.

Fans will be encouraged to dispose of food purchased outside of the stadium before entering into temporary, wheeled bins. A three-stream (residual waste, recyclables and organic waste) system of honesty bins will be provided for, examples of which are shown in **Figure 4**. This will give the stadium better control over the type of waste that is generated within the general concourse areas and the stadium bowl.

THFC are going to explore the use of detailing the types of waste that cannot be brought into the stadium on tickets and programmes and to encourage fans to use the appropriate bins and to recycle where possible.

Figure 4: Turnstile Bin Examples



The bins will be collected and removed following kick-off from the fan entrances using electric vehicles (EV) which will take waste to the lift on the podium at the north-east of the stadium which has direct access to the waste and recycling area. The bins are likely to be collapsible so that they can be folded away when they are not in use.

Figure 5: Waste Management at the Turnstiles



3.6.2 Stadium Bowl

The restrictions on the type of waste being brought into the stadium should mean that the vast majority of waste generated within the stadium bowl is that generated from what is sold to fans. Specifically, this will relate to food and beverage items sold to fans in concourse areas. As outlined in **Appendix C**, THFC are going to explore options in terms of catering but intend to homogenise waste streams by streamlining packaging used for food and drink served within the food outlets to reduce the number of waste streams and simplify the separation of materials such as cardboard and plastics.

It is recommended that no flyers are handed out during the game and that no free gifts, provided by sponsors are distributed. This would result in a large amount of unwanted items left behind at the end of matches.

No litter bins will be provided in the stadium bowl for security reasons, due to lack of space, poor visibility and limited use by fans. Waste within the stadium bowl will be collected in two ways following the final whistle; firstly a positive pick will be undertaken by FM operatives collecting recyclables with the remaining residual waste blown to the lowest point within the stadium and collected manually. The waste will be transferred to the waste and recycling area using an EV with subsequent bulking and sorting via a mini-Materials Recovery Facility (MRF). While collecting waste by hand is labour intensive, it is one of the most efficient methods for recovering recyclable materials.

Figure 6: Waste Management within the Stadium Bowl



3.6.3 Basement

Limited waste is anticipated within the basement. Waste from the car park, storage and plant rooms will be deposited in small bins and collected locally by FM staff and transferred by hand to the waste and recycling area.

A furniture lift and store with access to Level 00 is provided beneath the north-east stand for the movement and storage of bulky waste. Bulky waste will be stored until a sufficient quantity has accumulated to warrant collection. THFC are keen to explore initiatives to sell or give old furniture which is still in a good condition to local businesses, charity or educational projects for re-use.

3.6.4 Level 00 (Service Level)

Level 00 is the main service level for the stadium and includes the main production kitchen and associated facilities, plant rooms, back of house and corporate circulation, staff, media and player facilities, parking, storage as well as the waste and recycling area with associated loading dock and service yard.

All waste generated will be transported from the upper levels by lift during and following a game via Level 00. There are two service lifts³ within the stadium, one each within the eastern and western stands. These lifts will be used preferentially for the vertical movement of waste. The service lifts have access to Levels B1 up to Level 5 only. Flow route analysis undertaken has revealed that there would be huge pressure on these two service lifts to keep the building functioning and remove all waste from the upper levels independently. Drawings presenting the flow route analysis are provided in **Appendix E**. In the event of a breakdown or fault there would be too much pressure on the lift in either stand resulting in severe congestion on Level 00 (which is already anticipated to be congested on match days).

³ Note, it is understood that Populous are exploring the opportunity to incorporate a dedicated service lift to the two southern cores which is intended to alleviate the pressure on the storage of waste at the concourses as these will be able to be used during the match

Therefore, the use of public and disabled lifts, with access to all levels of the stadium, cannot be avoided. This will be managed by THFC to ensure spectator and visitor experience is not compromised. The lifts that are to be used for the movement of waste within the stadium are shown in **Appendix D**.

Once waste arrives on Level 00, it will be placed temporarily in a designated waste bay at the base of each of the lift cores that are being used for waste movement before being collected by the FM team using an EV and transferred to the waste and recycling area.

Figure 8: Example of Designated Waste Bays



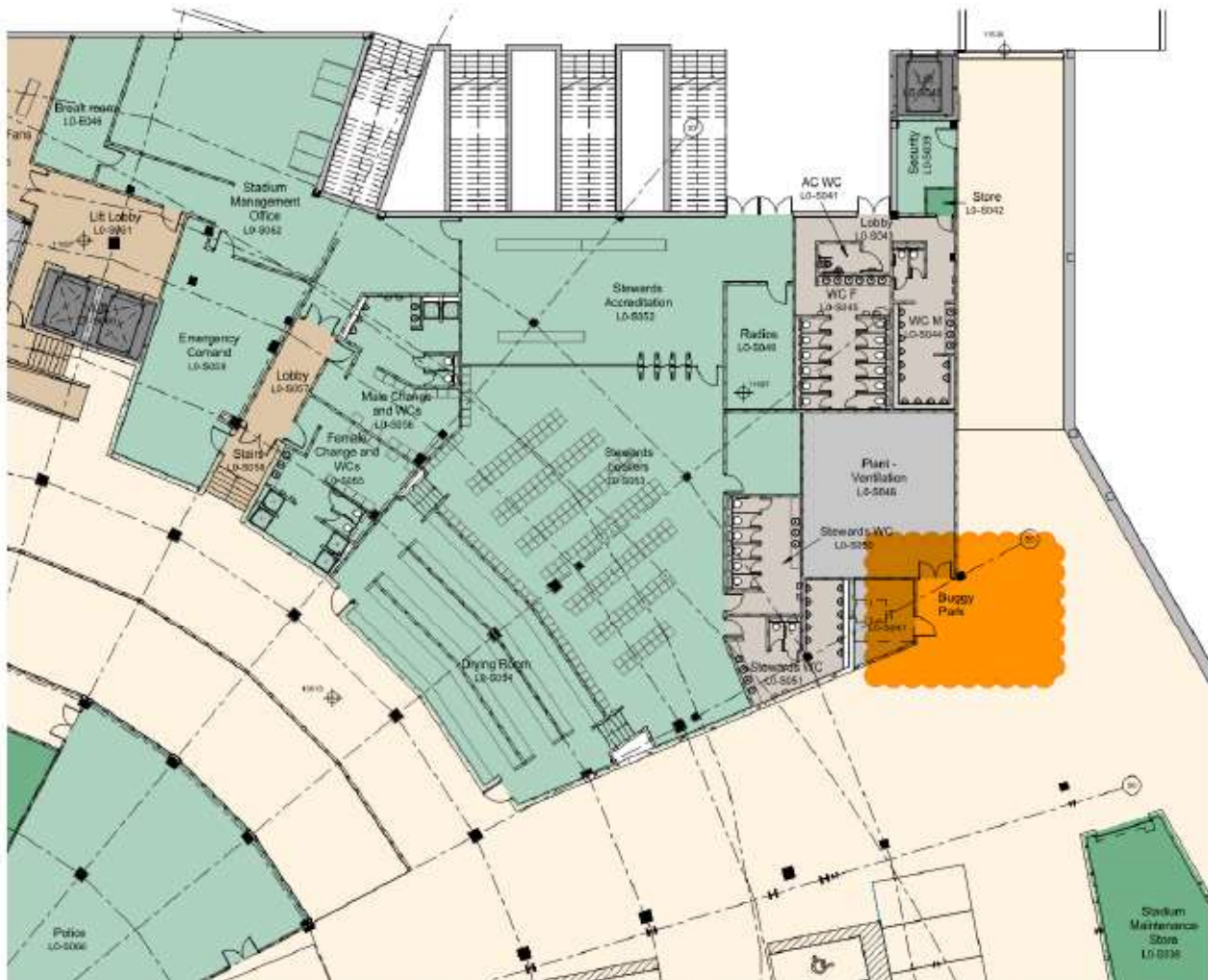
The movement of waste on Level 00 will not be made through staff, media and player facilities within the west stand on match days. This area will be particularly busy and the club do not want waste movement through these public areas for aesthetic reasons. Waste will either need to be transported from the goods lift within the west stand northwards to the waste and recycling area or from the lifts at the south-west of the stadium, through the car park and journey to the waste and recycling area via the east stand.

There are no intermediate waste storage rooms allocated on Level 00. The waste generated within the main production kitchen will be stored locally on match days in designated storage areas, until it is suitable for removal to the waste and recycling area by EV. The production kitchen will be the primary area in which food preparation is undertaken, as such a number of food dewaterers or digesters will be provided to support the effective management of organic waste. The dewaterers and digesters will significantly reduce the weight of organic waste produced whilst also supporting the recycling aspirations for the development.

In other areas, the anticipated quantities of waste are low and litter bins will be located in the media and player facilities and other offices and store rooms as appropriate, with waste collected by the FM team at the end of each day, or more frequently on match days and transported to the waste and recycling area.

Provision for the charging of EVs is provided at the south-east of the stadium on Level 00. The EVs will be used for the transport of both goods and waste. This area is located close to the service road access from Worcester Avenue and will allow EVs access to the podium level.

Figure 9: Designated buggy parks



A stadium maintenance and grounds keeping store is present at the north-east of the stadium, adjacent to the waste and recycling area. This store has capacity for the storage of grass waste for up to fifteen 240 litre bins. The use of easily manoeuvrable small bins that grounds-keeping staff can place cuttings directly into on the pitch side is recommended. The bins will then be transferred to the waste and recycling area approximately three times a week on the day of collection to prevent them becoming odorous. The bins will be cleaned in the waste and recycling area and returned to the grounds keeping store.

3.6.5 General Fans Concourse Areas (Levels 1 to 5)

Intermediate waste storage is allocated within all of the general concourse areas throughout the building on each level of the stadium that is generating waste to ensure waste management operations are discreet. The storage rooms are adequately sized to ensure they can each house 2 x 660 litre bins and 1 x 240 litre bin. Each level of the stadium is self-sufficient for the period of time before, during and after games. Waste collected from the food outlets and litter collected from the concourse will be taken to these rooms.

Each of the food outlets will have space for the temporary storage of waste allocated within them including as a minimum 1 x 240 litre bin for food waste. Waste from the food outlets will be transferred at regular and convenient intervals during and following the game by catering staff to the nearest intermediate waste room for bulking and collection by the FM team.

All of the drinks served within the general concourses will be served in plastic bottles or cups. This will eliminate glass as a waste stream within the general concourses. The mixed recyclables collected within these areas should only comprises plastic bottles and cups, cardboard food packaging and small amounts of paper which is likely to include programmes, leaflets and newspapers.

Within the food court in the South Stand larger intermediate waste rooms have been allocated to reflect the amount of waste that is likely to be generated in this area. This will allow waste to be stored locally as the food court will be congested before and after the match and during the half time interval.

Two-stream litter bins for residual waste and mixed recyclables will be located throughout the concourses, with the acceptance that uptake will be poor and waste will need to be sorted in a MRF. THFC appreciate that typically fans are notoriously bad at recycling and compliance rates are low and significant contamination occurring, particularly from liquids and it is often difficult for fans to locate the bins due to the crowds and to be able to access the bins to dispose of waste. Despite this, THFC consider not having bins as an unhygienic approach and are currently considering the most appropriate bins to use within the concourses and exploring options to encourage and facilitate recycling by fans. Possible options include the use of screens to indicate the location of the nearest bins, taller bins for improved visibility within the concourses, sloped bins to prevent fans crowding round the bins and using them as tables and colour-coded packaging and bags to make it easy to distinguish which bin should be used to dispose of particular items.

Waste will be collected by hand during the first half and second halves and again after the final whistle by the FM team. A large number of relatively narrow shelves will be present throughout the entire concourse areas which will encourage fans to leave their empty cups and packaging on these shelves. It is hoped that this approach will prevent fans disposing of half-drunk liquids within the mixed recyclables bins and causing contamination of cardboard packaging and preventing it from being recycled or compromising its quality. FM staff will empty any containers containing liquid on the shelves into a separate container, with the liquid then poured down the sink within the food outlets. Recyclable packaging (cardboard, plastic cups and food containers) can then be collected via a positive pick.

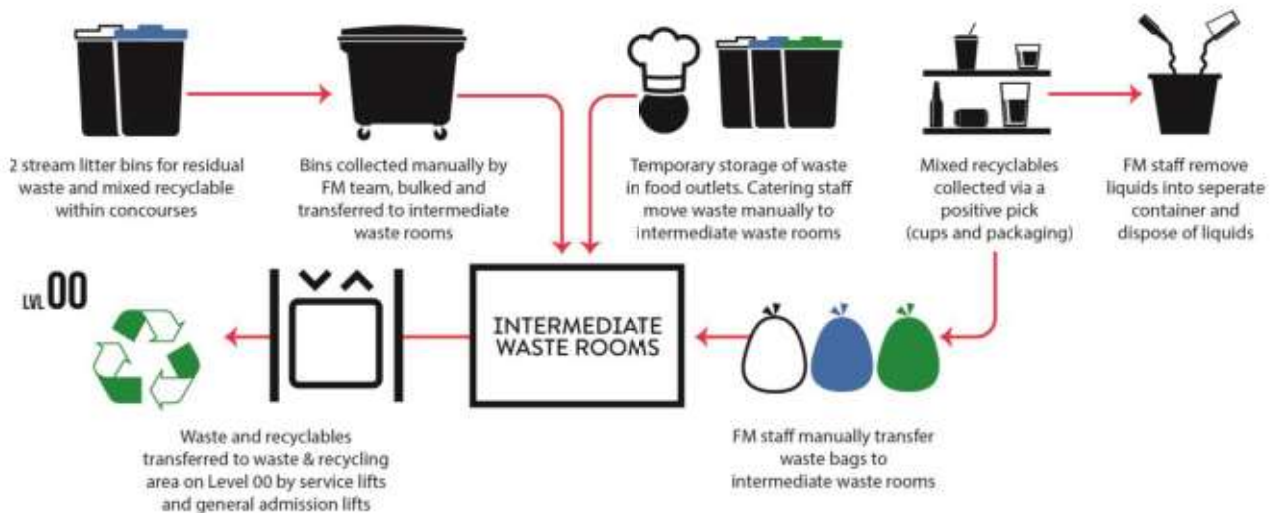
Waste from the intermediate waste rooms will be collected by the FM team along with litter collected from the concourses and transferred to the waste and recycling room using the stadium lifts. The service lifts will be used as a preference, with the remainder of the waste moved by the general admission lifts, outlined in **Appendix D**.

Away Fans

The away fans areas are situated in a segregated area, located on Levels 1 and 2 and capacity will vary between 1,000 and 9,150 fans per game depending on the type of the game and the opposition being played. It is estimated, based on the waste calculations undertaken that up to five tonnes of waste will be produced in these areas per game (based on a 0.546kg generation rate per fan). Adjustable barriers will be installed to ensure the segregation of home and away fans before, during and after games. The away fans areas will be self-sufficient and operate in isolation in terms of waste on match days.

The waste collection strategy within the away fans areas will be the same as the general concourses although all waste generated will have to be stored temporarily in intermediate waste rooms until all fans have departed the stadium. Intermediate waste rooms have been allocated within the centre of the away fans areas to ensure that even if the barriers are adjusted then the intermediate waste room will still be located within the areas. The rooms have been designed for full away fans capacity.

Figure 10: Waste Management within the General Concourses



Concourse Areas at Risk

BuroHappold undertook a further study based upon detailed occupancy numbers provided by Populous (27.07.15). The purpose of this study was to use this data which outlined the maximum occupancy (or waste case) in the various areas of the stadium to test the robustness of the posed strategy. This outlined the worst case scenario for an average game where the greatest pressure is exerted on the waste management infrastructure, the results of this are provided in Appendix F.

In summary only two areas of risk were identified, these were the South Stand at Level 02 and Level 04. Primary issue has arisen due to lack of intermediate storage areas provided, the consequence of which is that the waste generated within the South stand on Level 02 cannot be held within the stand for the entirety of the match. This means that the area will likely become heavily littered and in need of frequent servicing during game play (i.e. after kick off and half time, in addition to when fans have left). A major challenge is the fact that the South stand is located between corporate areas East and West, as such waste cannot be moved to service lifts without moving them through these areas which may detract from fan experience.

Two options to overcome this have been identified within the Design Note (see Appendix F) and Populous have further outlined the team post planning will be looking to provide an additional service lift in the southern cores which can be used during match play to service these areas. As such a suitable solution will be incorporated into the design.

3.6.6 Hospitality Areas (Levels 2 to 4, 6, 7 and 9)

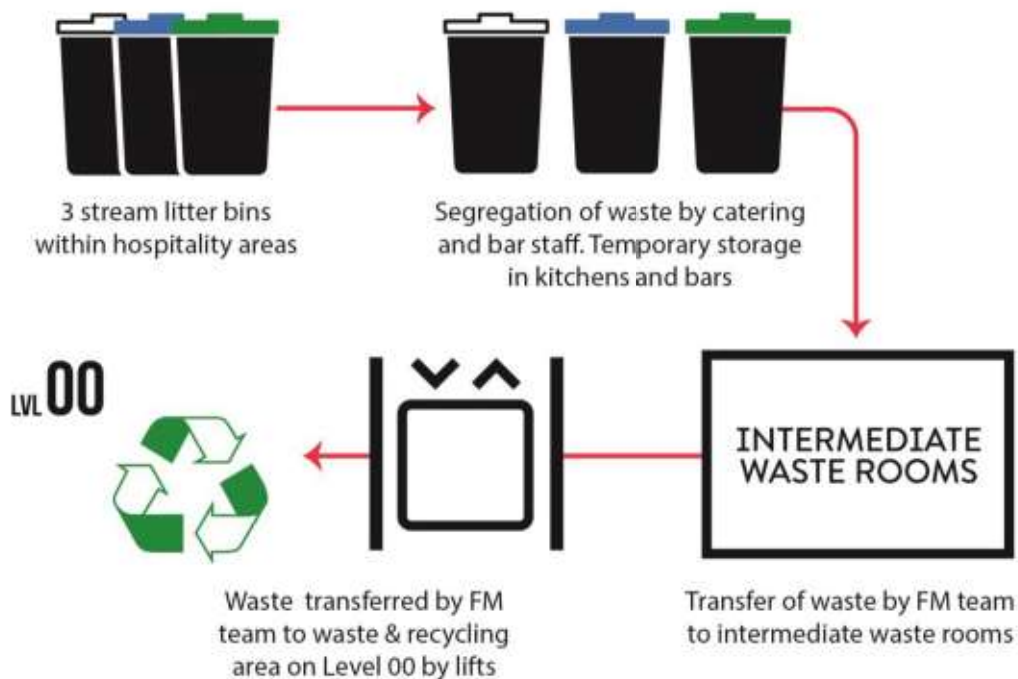
Intermediate waste storage is allocated within the hospitality and corporate areas within the stadium. The storage rooms are sized to ensure they can each house a minimum of 2 x 660 litre bins and 1 x 240 litre bin. Storage space for waste has also been provided locally within the kitchens and bar areas to ensure waste management within these areas is discreet, this is essential within these high-class areas of the stadium. All kitchens will also contain food dewaterers into which food scraps collected from cleared tables will be inputted. Off-cuts from kitchen preparation will also go into the dewaterers however the amount is expected to be minimal as the majority of preparation is to occur in the production kitchen at Level 00.

All of the hospitality lounges and bars as well as each of the corporate boxes will contain three-stream litter bins to encourage the collection and segregation of waste. These areas will be much less crowded than the general concourses so correct waste segregation is more likely to occur.

A large proportion of the segregation that will be carried out within the hospitality areas will be undertaken by the catering staff. In the restaurant areas, tables will be cleared with waste managed within the kitchens. 2 x 660 litre bins and a 1 x 240 litre bin will be provided in all kitchens, with full bins taken to the closest intermediate waste room at a convenient time by the catering staff. 1 x 240 litre bin for glass collected will be provided as appropriate. The FM team will then exchange the full bins within the intermediate waste rooms with empty bins brought up from the waste and recycling area. Within the bars, waste will be sorted as it is collected from tables and lounges within the hospitality areas. Glass will be separated into designated bins where appropriate. It is essential that catering staff are provided with adequate training to ensure that they are aware of the procedure for separating waste, mixed recyclables and food waste as well as glass.

The service lifts and the general admission lifts do not have access to the Sky Lounge on Sky Bridge on Level 9 within the stadium. All of the waste generated on this level will therefore have to be removed via the hospitality lifts in the eastern and western stands to Level 5 and then transferred into the service lifts once all fans have departed. Consequently, all waste generated before, during and after the game will need to be moved from the Sky Bridge and Sky Lounge and bulked on this level within intermediate waste rooms located at the western and eastern ends of the stadium. These rooms have been sized to enable them to accommodate waste for the required timeframes, any excess will be accommodated within the bins provided by the bars.

Figure 11: Waste Management within the Hospitality Areas



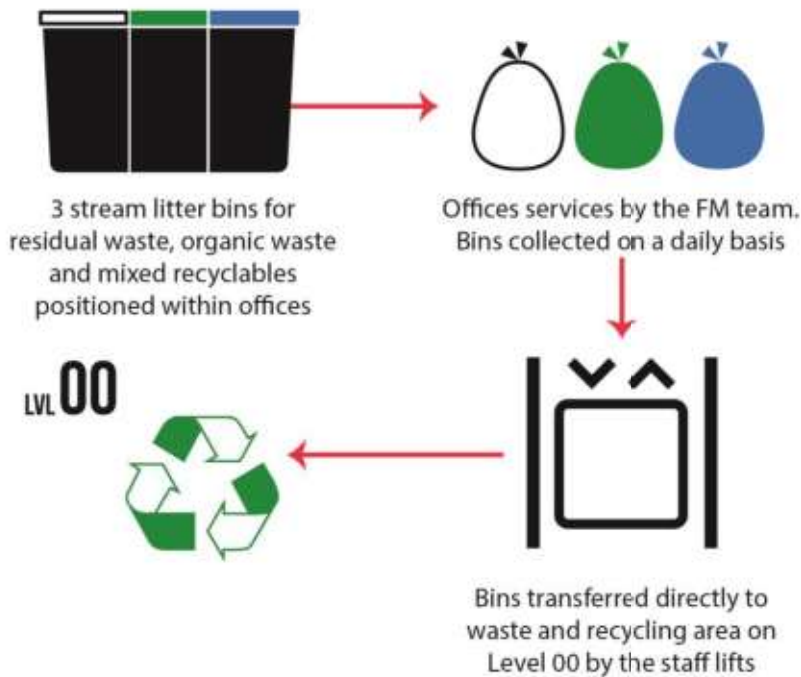
3.6.7 THFC Offices (Level 6 and 7)

The THFC offices are present on Level 6 and Level 7. Waste will be segregated at source by office staff in three-stream bins for mixed recyclables (glass, plastic, paper and cardboard), organic waste and residual waste provided on each floor. The offices will be serviced by the FM team, who will collect the waste from the offices on a daily basis and be taken to Level 00 via the service lift in the west stand before being transferred to the waste and recycling area.

Figure 12: Example of Bins for use in Offices



Figure 13: Waste Management within the THFC offices

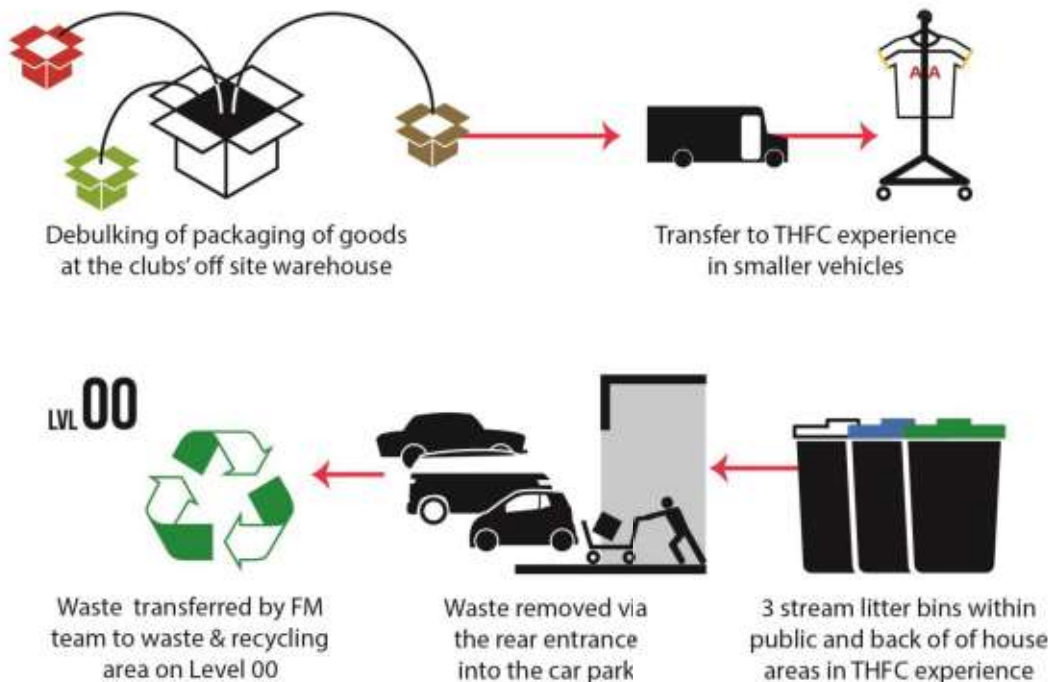


3.6.8 THFC Experience

The waste generated within the THFC will consist mainly of packaging based materials resulting from goods delivered to the retail and merchandising units. As detailed in **Section 4.5.1** a large amount of product will be de-bulked off-site to reduce the amount of packaging generated within the THFC Experience. Small amounts of waste will also be produced by staff and customers.

Waste from the THFC experience will be removed via the car park at the south-west of the stadium on Level 00 and transferred to the waste and recycling area through the east stand to avoid waste being removed from the front of the building through the public realm. This will ensure operations are discreet.

Figure 14: Waste Management within the THFC Experience



3.6.9 Public Square and Stadium Podium

For the purpose of the waste calculations, outlined in **Section 3** it has been assumed that there will be approximately ten three stream litter bins located within the public square which, on average will be serviced once a day. On match days it is likely that the bins will need to be emptied more frequently and a litter pick will also have to be undertaken by FM staff. The FM team will collect the litter bins, with the bagged waste bulked in larger 660 and 240 litre bins. The bins will be collected using an EV which will take all waste either to the lift on the podium at the north-east of the stadium which has direct access to the waste and recycling area or entrance at the south of the stadium which has lift access to Level 00. From here waste will be taken to the waste and recycling area for processing. There are security issues associated with the inclusion of bins within the public realm. The stadium and surrounding area will be very crowded on match day and there will be an increased security risk. Bins that are considered to limit the security risk should be considered.

There are various options which include:

- Plastic hoops with a clear plastic bag (limited expense);
- Letter box litter bins built into the structure which remove waste from the public realm, however means a back of house area is required and the implication of incorporating this into the design; or
- Blast resistant bins which can withstand a minimum of 0.5kg of explosives (expensive).

Figure 15: Examples of bins for use within the public square and on the stadium podium



Figure 16: Waste Management within the Public Square and Stadium Podium



3.6.10 Football Pitch

The THFC pitch will be retractable and will be mown approximately three times per week outside of the winter months. Grounds-keeping staff will transport the designated 1100 litre bins to the pitch side so that as the grass is cut, it can be immediately emptied into the bins. The bins will be temporarily stored within the grounds-keeping storage area at the north-east of the stadium until they are due to be collected from the waste and recycling area by a waste contractor. The bins will be transported to the waste and recycling area on the morning on which they are due to be collected and will be temporarily stored within the waste and recycling area. Once collected, the empty bins will be transported back to the grounds-keeping store.