AAH planning consultants

FLOOD RISK ASSESSMENT AND EVACUATION PLAN

SITE OF THE FORMER THE AULD SOUTH YORKSHIRE INN, TRENT SIDE, KEADBY, DN17 3EF

ERECTION OF A TYRE STORAGE UNIT AND ASSOCIATED EXTERNAL WORKS

Our Ref: ENV/0308/12FRA

APRIL 2013

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APPENDIX A: SITE LOCATION PLAN

APPENDIX B: PROPOSED DEVELOPMENT PLAN

1.0 Introduction

1.1 AAH Planning Consultants have been commissioned to provide a Flood Risk Assessment and Evacuation Plan to accompany the application for planning permission to erect a tyre storage unit, with associated external works.

1.2 The National Planning Policy Framework (NPPF) and its accompanying technical guide (TG) identifies that Flood Risk Assessments should be conducted for new developments proposed on the floodplains of rivers, sites potentially subject to coastal flooding, and for developments of one hectare in size and above. Development located in flood zone 1, with a plan area less than 1 hectare, but located within an identified critical drainage area may also be subjected to flood risk assessment.

1.3 The site is in an area broadly classified by The Environment Agency (EA) as Flood Zone 3a, under the jurisdiction of North Lincolnshire Council Local Planning Authority. Each of the above was consulted prior to assessment, as were the North Lincolnshire Emergency planners.

1.4 The site lies within the Severn Trent Water and sewerage company boundary with sewers in the vicinity of the site controlled by this body. The site also comprises land controlled by the Isle of Axholme and North Nottinghamshire Water Level Management Board whom maintains the network of ordinary watercourses/land drainage ditches in this area.

1.5 Table 2 of NPPF states that A4 class uses such as the public house unit on the site are 'more vulnerable' development to flooding. The proposed development creates a B8 Storage and distribution class use in the form of a tyre storage facility which would also be classified as a 'less vulnerable' development to flooding land use category.

1.6 Because the flood risk vulnerability of the site is reduced, as are the number of people using the facility with the number of staff understood to comprise three full time workers of good health, opposed to a typical pub workforce of two or three staff, with an unknown number of patrons, the principle of development on this site

is considered acceptable in accordance with the National Planning Policy Framework Technical Guidance. This point is acknowledged by the Environment Agency in their correspondent reference AN/2013/116707/01-L01. It should also be noted that the usage of the site would also be reduced with the licensed hours of public houses typically 11:00-23:00 whilst the proposal would operate only during the day.

1.7 The planning application is currently validated and live, however certain criteria in relation to flood risk and evacuation of the site prior to, and under flood conditions remain unsatisfied in line with current local and national planning policy, and good practice guidance. This has lead to a holding objection to the planning application from the Environment Agency until such information is provided.

1.8 Due to the limited requirements of flood risk assessment from a design perspective, with respect for the reduced vulnerability and usage, and the site essentially being a replacement building, referenced site levels within the report are interpolated from the known AOD OS Spot levels on the highway adjacent to the site (3.9m AOD), with flood level data sourced from the North Lincolnshire Strategic Flood Risk Assessment (SFRA).

2.0 Site as Existing

2.1 The proposal site is located within the settlement of Keadby on a corner plot formed by a bend in the A1392 Trent Side Highway which runs along the southern and eastern site boundaries. On the opposite side of the Trentside highway where it flanks the eastern site boundary are a combination of raised flood wall and flood bank defences, behind which lies a small riparian zone, and subsequently the course of the tidal River Trent. Keadby itself is located 5.5km west of Scunthorpe, 1.8km north of the nearest neighbouring settlement of Althorpe, and 6.3km east of Crowle, the nearest settlement within a flood zone 1 dry island, west of the River Trent.

2.2 The existing site is occupied at the main public house building which comprises the pub at ground floor level with a self contained flat and storage space on the first floor. In addition to the public house building are a number of associated outbuildings and areas of impermeable hardstanding used for vehicular and pedestrian access. The entire footprint of the site is for the purposes of this assessment considered as an impermeable catchment. For indicative purposes it is noted that an OS Spot level with a value of 3.9m AOD is located immediately adjacent to the site on the Trent Side highway, this level appears to be roughly equivalent to those levels comprising the proposed footprint for development.

2.3 The public house building at ground floor level comprises the main bar areas, toilets, a kitchen, storage areas, the beer cellar, and a foyer with stairs leading to the first floor where there is a self contained flat with a double bedroom, living room, kitchenette, bathroom and landing area. The approved class order use of the pre developed site is an A4 Drinking Establishments; Pubs and bars which is accordance with table 2 of NPPF is classified as 'more vulnerable' development to flooding.

2.4 It is understood that all surface water arising from buildings and hardstanding on the site formerly discharged to the adjacent Severn Trent Water sewer however this point remains unproven as both were removed last year in anticipation of this development. Both vehicular and pedestrian access to the site are drawn from the A1392 Trent Side highway from the south eastern corner of the site, this highway leads to Althorpe and Keadby Bridge (to Scunthorpe and Gunness).

3.0 Proposed Development

3.1 The proposal is to provide a single storey tyre storage unit that will be located against the west and south boundaries of the site. The unit whilst not containing office space will provide basic welfare facilities for employees such as a wc and shower facility. The unit will be of portal frame construction with a profiled metal sheet roof in keeping with the adjacent existing storage and distribution business. The external walls will be constructed out of rendered block which will be an off white colour. Below the render at DPC level there will be a band of engineering bricks visible. These will both be in keeping with the adjacent residential property.

3.2 There will be no windows in the unit however there will be a pedestrian access door and vehicle access door to the front of the unit. The vehicle door will be a metal roller shutter and the pedestrian door will be a timber or UPVC door. To the side elevation to the rear of the unit there will be a fire door constructed out of timber or UPVC. All rainwater goods will be black UPVC. Four general needs parking spaces will be created along with one disabled parking space and a vehicle waiting area. A metal vehicle access gate will be located within a rendered block boundary wall on the south eastern corner of the site with other boundaries comprising 2.4m high metal security fencing. The surface treatment of the yard will consist of a tamped concrete, as with the existing development.

3.3 The proposed class use of 'B8 Storage and Distribution' on the site is in accordance with Table 2 of the National Planning Policy Framework Technical Guidance 'less vulnerable' development to flooding. The flood risk vulnerability of the site is therefore reduced in comparison to the pre-development site, as are the number of people using the site with staff understood to comprise three full time workers of good health, opposed to a typical pub workforce of two or three staff, with an unknown number of patrons. The usage of the site would also be reduced with the licensed hours of public houses typically 11:00-23:00 whilst the proposal would operate only during the day. It is understood that the proposal would continue to discharge runoff to the public sewer, respecting the Axholme and North Notts Water Level Management Board Imposed rate of 98l/s/ha (70% of 140l/s/ha), equating to approximately 8.0l/s for the site catchment or 3.7l/s for the built footprint.

4.0 Flood Risk Assessment

4.1 The Strategic Flood Risk Assessment describes the settlement of Keadby and its associated flood risk and provides a good overview against which evacuation procedure may be assessed. The settlement is on the left bank of the River Trent and north of the Stainforth & Keadby Canal. The Strategic Flood Risk Assessment indicates that the site is located in an area of flood zone 3 the high flood risk area without consideration for flood defences with an annual probability of inundation greater than 0.5% from the tidal River Trent. The SFRA shows large areas of land within the district to be below 2.0mOD with this flat, low-lying land that forms the Trent floodplain extending well beyond the North Lincolnshire Council border. There are a number of villages, generally located on local high spots. Crowle, for example, stands on a noticeable high point and as such is located in an area of flood zone 1.

4.2 Water levels in the lower section of the River Trent (north of Keadby) are dominated by tidal conditions and so are related to water levels in the Humber Estuary. Work carried out for the Humber Flood Risk Management Strategy, indicates water levels with given probabilities of occurrence in the river, these are shown in the table below. The base date for these figures is 1991 and current guidance indicates that allowance should be made for sea levels to rise by 1.201m and wave heights increase by 10% by 2115.

Location	Water level (mOD) for given annual probability		
	1.0%	0.5%	0.2%
Trent Falls	5.61	5.65	5.79
Keadby	5.79	5.82	5.83

4.3 The above table shows the tidal water level in the River Trent with a 0.5% annual probability of occurrence to be between 5.82 mOD (with a base date of 1991). As discussed, current guidance suggests sea levels could rise by 1.201m and wave heights increase by 10% by 2115 however the SFRA indicates a Critical (+Climate Change) flood level of 6.82m AOD which is used for the purposes of this assessment. This level is 2.92m above the OS Spot Level adjacent to the site with a value of 3.9m AOD.

4.4 The River Trent flood defences within the vicinity consist largely of earth embankments although there are some short lengths of wall adjacent to the site and the settlement of Keadby in general. The flood defence crest levels vary between 6.0 and 6.3mOD so the embankments are sufficiently high to prevent overtopping during events with a 0.5% annual probability, whilst the defences are generally in good to fair condition (Grades 2 and 3) which would reduce the risk of flood defence breach, although this remains a 'residual risk'. Overtopping of flood defences associated with future + Climate Change Flooding remains, with the 6.82m AOD flood level up to 0.82m greater than flood defence crest height.

4.5 As a crude assessment of the residual flood risk to the proposal site utilising the generic residual flood hazard guidance contained within joint EA and DEFRA guidance 'Flood Risk Assessment Guidance for New Development, Technical Report FD2320/TR2' is considered as a means of quantifying such a flood hazard on the proposal site.

Overtopping Hazard

4.6 With the assumption of a 1.0m head of flood water over the defence crest height, inferred as the worst case scenario it is anticipated that sites within 0.1km would be subject to a 'danger for all' flood hazard rating.

Table 12.1 - Danger to people from overtopping relative to distance from defence

Distance from defence (m)	Head above crest level (m)			
	0.5	1	2	3
100				
250				
500				
1000				
1500				
2000				
2500				
3000				
3500				
4000				
4500				
5000				

Key:
- Danger for some
- Danger for most
- Danger for all

Table 1: Extract from 'Flood Risk Assessment Guidance for New Development, Technical Report FD2320/TR2'

4.7 Owing to the predictability of the flood risk associated with overtopping of flood defences and flood warnings issued by the EA direct to businesses and residences, the potential impacts of flooding can easily be prepared for prior to the onset of flood water (refer to section 5 of the report).

Breach Hazard

4.8 A potentially more potent flood risk and hazard to property and residents respectively would be associated with a failure of the flood defences due to a breach of the flood defence wall/embankments adjacent to Keadby, which would result in a surge of flood water through the defences and on to the land lying behind them. The primary concerns would relate to the potential depth and velocity of flood water across the site and adjacent floodplain. Based upon a potential head of water of 2m above the floodplain (based upon a 6.0m AOD flood defence crest level, the 3.9m AOD spot level adjacent to the site and with reference to the generic guidance contained within joint EA and DEFRA guidance 'Flood Risk Assessment Guidance for New Development, Technical Report FD2320/TR2' (relevant extract is included in Table 2) there would be a 'danger to all' people on the site in such an event with the site within 0.1km of flood the defence.

Table 12.2 - Danger to people from breaching relative to distance from defence

Distance from breach (m)	Head above floodplain (m)						
	0.5	1	2	3	4	5	6
100							
250							
500							
1000							
1500							
2000							
2500							
3000							
3500							
4000							
4500							
5000							

Key:
- Danger for some
- Danger for most
- Danger for all

Table 2: Extract from 'Flood Risk Assessment Guidance for New Development, Technical Report FD2320/TR2'

Other Sources of Flooding

4.9 Other sources of theoretical flood risk include the land drainage network, notably the Three Rivers which discharge via the Keadby pumping Station in to the River Trent, however such a scenario would be attributable to failure of this asset and would be a very predictable flood risk, whereby water levels within the land drainage network would gradually rise, eventually overtopping their banks. The large areas of land below 2.0m AOD cited within the SFRA would form obvious points for flooding from these perspectives, and in a real life situation, it is anticipated that the risk of flooding to the site (at approximately 3.9m AOD) from this perspective is considered negligible, and most certainly a secondary risk to that posed by the River Trent

4.10 Due to the proximity of the site to the Stainforth and Keadby Canal to the site, flooding from this perspective is considered, however, in practice this watercourse poses only a limited risk since it carries no flow, therefore if it breaches the water stored in the canal would drain out but gates at either end would prevent more water entering the channel. It is noted that adjacent to the site that the Stainforth and Keadby Canal is not sufficiently raised to pose a breach flood risk to the proposal site.

5.0 Flood Evacuation Plan

5.1 It is noted from the North Lincolnshire Strategic Flood Risk Assessment that there are no specified 'rest centres' within this document, a matter which it is anticipated will be resolved with the impending Local Authority Flood Response Plan for issue by the Emergency Planning Team. Safe refuges within this Flood Evacuation Plan are therefore assumed as the nearest publically accessible areas above the design flood level and/or in flood zone 1, although in reality places of refuge will be specific to staff of the proposed facility which at this stage remain unknown and so impossible to specify.

Evacuation

5.2 The Environment Agency (EA) provides an early flood warning service in England and Wales, and supports the public taking action to prepare and respond when these warnings are issued. The warnings are provided for flooding from rivers and the sea but are not for localised flash flooding from blocked or overloaded sewers or groundwater flooding.

5.3 Warnings are issued through the media on TV and radio weather bulletins and on its website (www.environment-agency.gov.uk/floodline). In areas of particular risk, the Environment Agency can send a warning message direct to people at home or at work by telephone, mobile, email, SMS text message, fax or pager using an Automatic Voice Messaging (AVM) system. The EA's Floodline 0845 988 1188 service for England and Wales carries recorded information on flood warnings in force anywhere in England and Wales. The information is regularly updated and is available 24 hours a day.

5.4 The Environment Agency's early flood warning system is divided into four categories, depending on the stage of flooding and the predicted severity of flooding;

	**What it means** • Flooding is possible. Be prepared. **When it's used** • Two hours to two days in advance of flooding. **What to do** • Be prepared to act on your flood plan. • Prepare a flood kit of essential items. • Monitor local water levels and the flood forecast on our website.
	**What it means** • Flooding is expected. Immediate action required. **When it's used** • Half an hour to one day in advance of flooding. **What to do** • Move family, pets and valuables to a safe place. • Turn off gas, electricity and water supplies if safe to do so. • Put flood protection equipment in place.
	**What it means** • Severe flooding. Danger to life. **When it's used** • When flooding poses a significant threat to life. **What to do** • Stay in a safe place with a means of escape. • Be ready should you need to evacuate from your home. • Co-operate with the emergency services. • Call 999 if you are in immediate danger.

5.5 The proposed development site lies within the River Trent at Amcotts flood alert and flood warning area. The site also lies downstream of the River Trent at Gainsborough flood warning and flood alert area. Public flood warnings are issued on local TV and radio stations, and can also be disseminated to individuals within the high flood risk area. Direct flood warnings can also be sent directly to mobile phones, pagers and via email directly to people living within the flood plain.

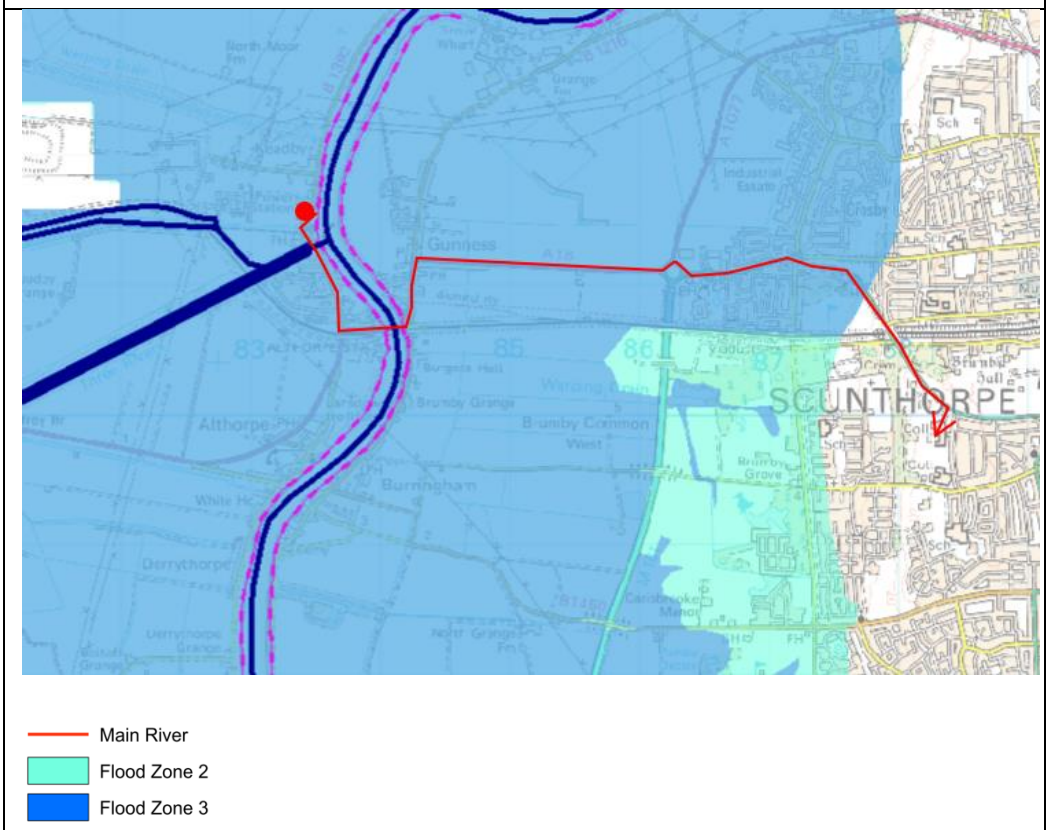
5.6 It is anticipated that all residents of the proposed dwelling would be subscribed to the River Trent at Amcotts and River Trent at Gainsborough Flood Warnings Direct

Systems by phone and mobile phone. Following an advanced flood alert or warning received from the Environment Agency when the staff are within the premises, the site would be evacuated. If a flood alert or warning is issued when residents are not in the property then they should not return to it until the flood alert, or flood warning is no longer in place.

5.7 As a matter of prudence, the flood alert system associated with the River Trent at Gainsborough would be utilised as an evacuation stimulus as this is issued at a 5m AOD tidal flood, upstream of the site opposed to nearly 6m AOD at Keadby. Due to the location of Gainsborough upstream (and at a higher gradient), when the flood level at Gainsborough is 5.0m AOD, the equivalent impending flood level at Keadby will be lower. This is demonstrated by the Black and Veatch hydraulic modelling of the River Trent which shows a 0.5% AEP flood level of 6.4m AOD at Gainsborough, whilst the equivalent 0.5% AEP flood level at Keadby is 5.8m AOD. The above approach could fully mitigate any impending flood hazard attributable to overtopping of flood defences by +Climate Change tidal flooding due to the predictability of this scenario. We understand from the Environment Agency that a flood alert at Gainsborough would typically be issued 12 hours prior to peak flows within the River Trent which would be most likely to cause flood defence failure through breaching or overtopping.

5.8 As discussed evacuation would **be to a known area of flood zone 1 specific to the staff off the facility**, and it will not be possible to determine where this area will be until the unit is occupied. **For generic purposes**, a route of escape is shown to the nearest publically available areas both above the design flood level and/or within flood zone 1 as it is noted that no 'rest centres' are specified within the SFRA, although their use is inferred by both the Local Authority and Environment Agency. It is noted historically that community buildings such as schools have been used for rest centre purposes therefore for the purposes of this assessment, evacuation to North Lindsay College is assumed, however it is noted that several other 'public' which may comprise possible rest centres are also located within the vicinity of this school and would share the same route from the proposal site in to flood zone 1. An emergency refuge at Althorpe Station is also assumed. The proposed route of escape to the is summarised on the map in red below;

PROPOSED ROUTE OF ESCAPE



- Leave the property, turn right on to B1392 Trent Side, follow 0.9km south to the junction with the A18 Station Road
- Turn left on to A18 Station Road
  (ALTHORPE STATION IS ABOVE THE EXTREME FLOOD LEVEL AT 11.2m AOD AND SO MAY BE USED AS EMERGENCY REFUGE)
- Follow A18 Station Road 0.2km east, crossing Keadby Bridge
- Bear left on A18 Station Road, follow 0.5km north to junction with B1216 Station Road
- Bear right on to A18 Doncaster Road follow 1.9km east to the junction with the A1077 and M181 highways.
- Continue straight on to A18 Doncaster Road 0.9km east to the roundabout
- Continue on to A18 Kingsway highway, follow 1.6km east
  ENTER FLOOD ZONE 1
- Continue on to A18 Kingsway highway, follow 1.0km east to North Lindsay College site entrance

5.9 At the time the Gainsborough flood alert is issued, the head of flood water will have reached and exceeded the base height of the flood wall, however the head of flood

water will only be approximately 1m above the foot of the flood defence. Breaching would be considerably less likely to occur in this scenario in comparison to the 'River Trent at Amcotts' flood warning which would be issued at nearly 6m AOD, 2m above ground level. Based on the generic guidance contained within joint EA and DEFRA guidance 'Flood Risk Assessment Guidance for New Development, Technical Report FD2320/TR2' (relevant extract is included in Table 2) there would be a 'danger to most' people on the site with 'most' people being the general public with the assumption of a site 0.1km from defences, which the head of flood water 1.0m above the floodplain following a breach.

Containment

5.10 In the scenario of a breach of flood defences adjacent to Trent Side whilst residents are within the new unit safe evacuation will not be possible due to the site lying within a rapid inundation zone with flood depths close to 1m, and high velocity flows resultant from a breach event combined with the 5.0m AOD flood alert threshold. Containment of staff on site is not possible due to the single storey design of the development, it is therefore fundamental that evacuation of the site is undertaken **immediately** following the issue of the Gainsborough Flood Alert.

5.11 As discussed, although a residual risk to the site from this perspective remains and is acknowledged by the applicant**,** because the flood risk vulnerability of the site is reduced, as are the number of people using the site with the number of staff understood to comprise three full time workers of good health, opposed to a typical pub workforce of two or three staff, with an unknown number of patrons, the principle of development on this site is considered acceptable in accordance with the National Planning Policy Framework Technical Guidance. This point is acknowledged by the Environment Agency in their correspondent reference AN/2013/116707/01-L01. It should also be noted that the usage of the site would also be reduced (and so improved) with the licensed hours of public houses typically 11:00-23:00 whilst the proposal would operate only during the day. The proposed flood evacuation plan represents the best achievable flood evacuation procedure available for the development in its current form.

6.0 Conclusion

6.1 The proposal is for the erection of a new tyre storage unit in an area broadly classified by The Environment Agency (EA) as Flood Zone 3a, under the jurisdiction of North Lincolnshire Council Local Planning Authority.

6.2 Although the actual risk to the site is relatively low with an annual probability of less than 0.5% each year, a level of protection that will fall each year due to increased flood levels attributable to climate change, a high residual risk to the site remains associated with a failure of flood defences through breaching.

6.3 Due to a 'danger to all' flood hazard potentially associated with the proposed unit following flood defence failure, an advanced warning evacuation plan must be followed in conjunction with the Environment Agency's flood alert system at Gainsborough, due to an onsite containment approach not being viable within the single storey unit.

6.4 Subject to the proposed residents adhering to the advice contained within this flood evacuation plan, the proposal would allow for safe escape from the site prior to the design tidal flood and as such the proposal is considered to comply with the objectives of local and national planning policy, and current good practice. The exception would be the remote possibility of a breach in flood defences adjacent to the River Trent between Keadby and Althorpe, however this risk is mitigated through well maintained defences with a condition rating of 2 good, to 3, which is acceptable.

6.5 Because the flood risk vulnerability of the site is reduced, as are the number of people using the site the principle of development on this site is considered acceptable in accordance with the National Planning Policy Framework Technical Guidance. This point is acknowledged by the Environment Agency in their correspondent reference AN/2013/116707/01-L01. It should also be noted that the usage of the site would also be reduced (and so improved an terms of the probability of people being on the site). The proposed flood evacuation plan represents the best achievable evacuation procedure available for the development in its current form and is an improvement in existing evacuation protocol.