APPENDIX A

9 Princess Close

Ripon

HG4 1

North Yorkshire Council

External Visual Structural Condition Survey

07th September 2023

NH2301-APP-07-XX-RP-S-000001

Rev: C01

Structural Engineer's Condition Report

Princess Close, Ripon – External Visual Structural Condition Survey

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C01	07/09/23	Initial Issue	LS	MJ	LS

Version 1.3

Contents

1 Introduction

1.1 Brief and Scope

Align Property Partners (APP) were instructed by North Yorkshire Council (NYC) to undertake an external visual structural survey and report on the condition of the property as shown in Figure 1 on Princess Close, Ripon. A surveyor from NYC had recommended that the property is inspected by a structural engineer due to reported excessive ground settlement under the properties piled ring beam.

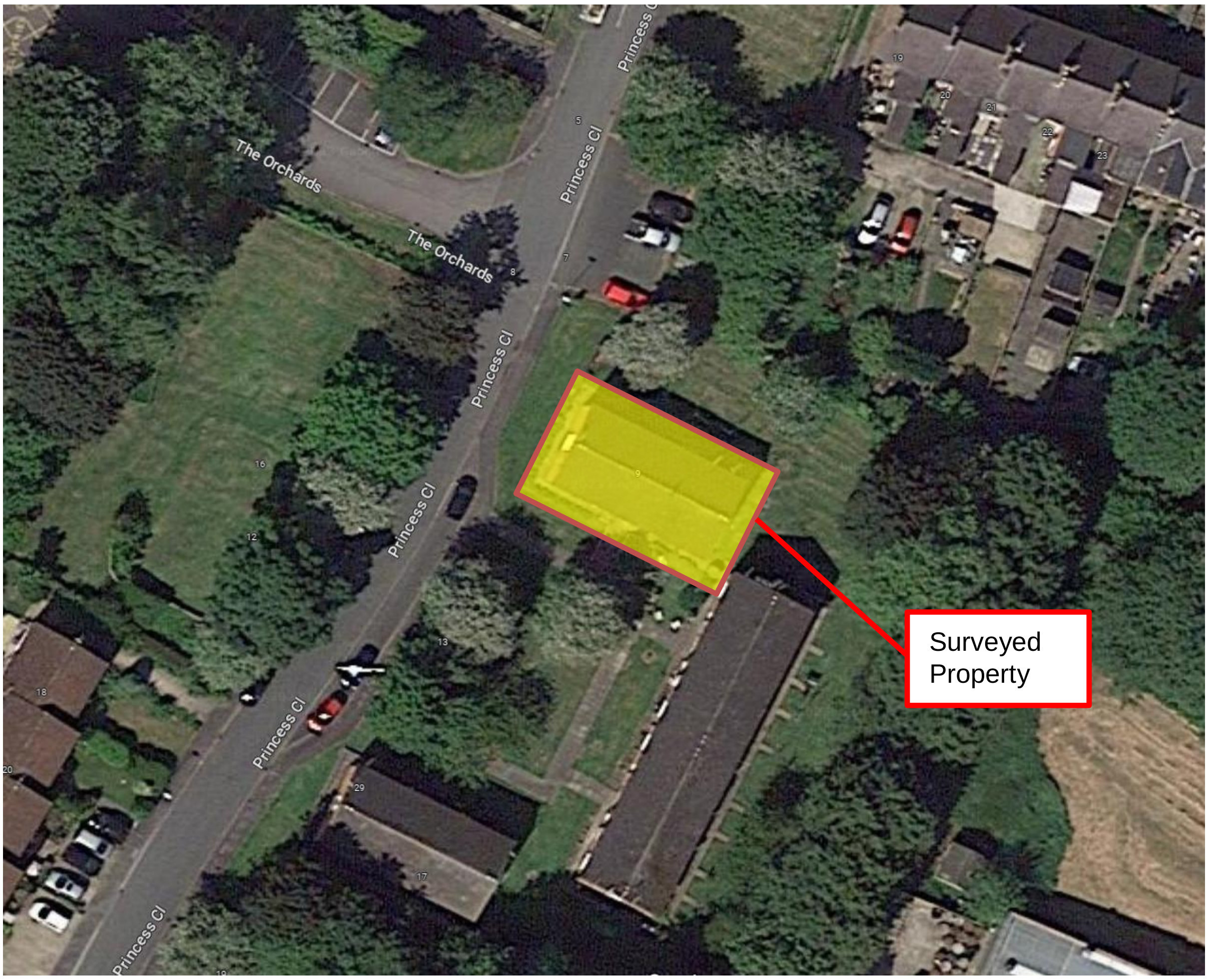


Figure 1 – Site Plan

The visual survey was conducted on Friday 18th of August 2023. The weather on the day of the survey was dry with temperatures around 15 degrees Celsius.

Prior to the survey the only information provided for the site was a series of images of the settlement and a log for the tell-tale measurements from August 2011 to March 2017 (file received via email from Paul Boreham of NYC on 15th of August 2023). At the time of writing there was no information available on Topography or any site investigation information.

The purpose of the Structural Engineer's Condition survey is to record the general condition and highlight any structural defects of the existing property as viewed externally on Princess Close, Ripon, providing outline recommendations for any further survey/investigations, repair and/or high-level remedial works that may be required to the property.

1.2 Constraints and Limitations

1.2.1 No finishes or elements were moved/removed as part of the survey. APP are therefore unable to comment on the condition of any structure other than those visible and within the scope of the survey. No comments can be made on any item that remained as hidden, unexposed, inaccessible and/or buried within the fabric of the building.

1.2.2 No trial pits were excavated and therefore no definitive commentary can be made about any structure below ground level

1.2.3 The survey was completed externally from ground level. No high-level access was available at the time of the survey.

1.2.4 The contents of this report are limited to the above brief and scope with no calculation and/or assessment of the existing structures, nor any validation of previous works on site.

1.2.5 No historical drawings nor any original design calculations have been provided regarding the existing structures at the time of the survey and writing the structural condition report.

1.2.6 No Existing Site Investigation information of the area was available at the tie of the survey and writing the report.

2 General Description

2.1 Location, Site and Orientation

The existing property as indicated in Figure 1, which is adjacent to Princess Close, Ripon, is situated in the suburban area to the North of Ripon City centre just to the East of the A61. The area is largely residential with a nearby supermarket and a mental health recovery unit. The site topography is sloped upwards both to the North and South from the property with the property situated at the lowest point of the slope. Across the road from the property is a grassed area with remains of demolished structures present. We are told from the surveyor that there were originally two structures in this area that have been demolished due to a “sinkhole” having formed in this area, we do not have any official records to confirm this, however viewing historical satellite images of the area did reveal the presence of two masonry structures in 2002, then in 2009 one of the structures was demolished and Google Street View imagery confirms this, then in 2012 both structures have been demolished. From a brief walk around on the site there was a sudden dip in the topographical levels which may be as a result of a sink hole.

The property is a single structure over two stories (ground and first floor) with multiple occupancy flats. The ridge line of the property is roughly orientated West-East and is constructed from traditional cavity wall masonry with a duo pitched concrete tiled roof likely utilising timber trusses. The base of the property has a reinforced concrete ring beam set upon 300mm diameter piles as measured on site. There are four gutter down pipes and soil pipes on the side elevations, the gutter down pipes feed into floor gullies, which are elevated from the path level.

Surrounding the building is a precast concrete slab forming a path, the main entrance to the building is accessed by a concrete ramp with steps either side adjacent to the building. There is also a grassed area surrounding the property on all four elevations with the larges grassed area to the North and East of the property. Within the grassed area there are a number of manhole chamber covers located to the North East corner of the building.

A desktop search of open source historical maps revealed a small stream named “Skittergate Gutter” which ran past the property to the North and also an old Sulphur Spa approximately 50m to the East of the property (see Figure 2)

Figure 2 - Historic map indicating position of property with spa and small stream.

3 Findings and Observation

The property was surveyed from the surrounding grounds around the building, the building was divided into four elevations and observations recorded at each elevation. Figure 3 shows a sketch of the property with various annotated features. The property in the sketch is aligned to North as indicated in Figure 3.

The observations are included in the following sub sections. Reference should be made to Appendix A for photo evidence of the findings mentioned below.

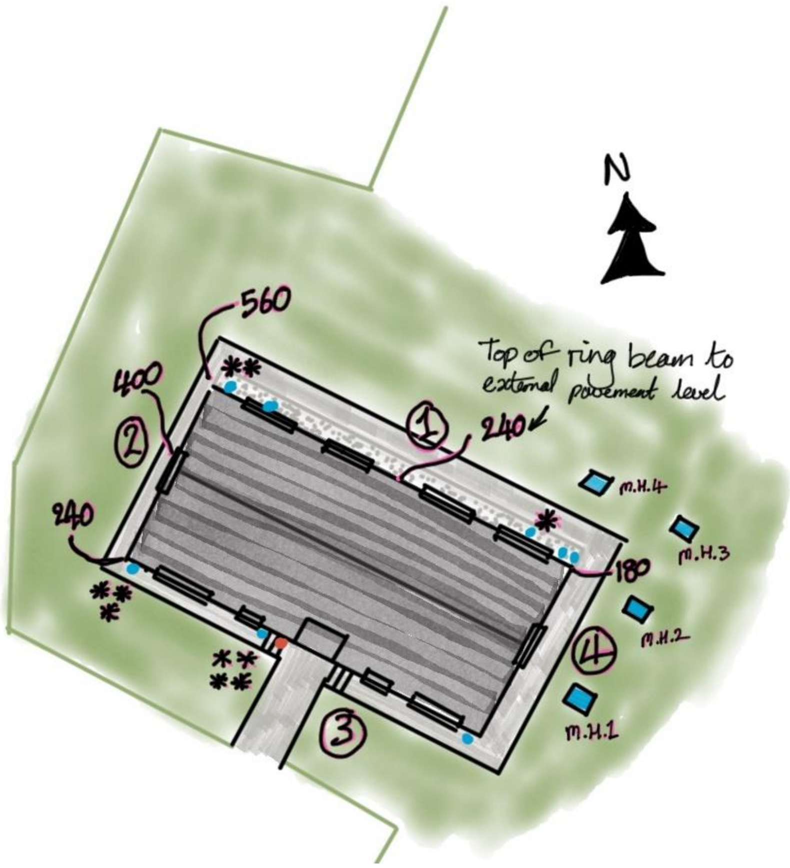


Figure 3 - Sketch of Property and Observation Locations

3.1 Elevation 1

- Vertical crack through masonry and running up the side of the second window frame along form the North corner. The crack starts from the top of the ring beam and opens up to approximately 6-8mm just under the window cill at first floor level. It must be noted that there is a tell tale installed across the crack at this location indicating the crack has been there since the tell tales were installed in 2011 according to the log received from the client. The window frames are pulling away from the masonry where the crack runs through.

- The ground adjacent to elevation 1 slopes significantly from the North East corner to the North corner. Figure 3 shows the level as measured from the top of the ring beam to the path has a difference of 380mm along the length of that elevation.

- The gutter downpipes no longer align with the gullies in the floor, the gullies have moved away from the side of the building.

- Gully marked as * on figure 3 has rotated and the ground around the gully has settled leaving the gully to project above the ground. There may be possible damage to the drain due to significant ground movement.

- Gully Marked as ** on figure 3 is blocked, allowing storm water to discharge into the ground under the ring beam adjacent to the foundation pile.

- There is a self-seeded sycamore tree that is growing out of the gravel bed adjacent to the property at roughly half way along elevation 1.

- At the North corner the ring beam is above the ground. The distance from the underside of the ring beam to the soil level is 300mm

- The foundation pile at the North corner is exposed due to the subsidence of the ground, the pile when measured is 300mm diameter and is spaced at approximately 3.6m centers where able to be measured. The ring beam is 350mm when measured.

3.2 Elevation 2

- The concrete path slab slopes upwards away from the North corner to the North West corner with a difference in levels being 320mm where measured.

- The height between the soil and the under side of the ring beam is greatest on this elevation measuring 500mm from soil to underside of ring beam and is below the level of the concrete slab path.

- External concrete path slab closest to the North West corner has moved away from the building by approximately 80mm where measured. The slab has also rotated and has a secondary slope away from the building elevation. The slab also looks to be supported on masonry along the edge adjacent to the ring beam.

- There is a vertical crack originating from the damp proof course and extending up to the under side of the window where it measures approximately 2mm. The window frame has separated from the masonry and the mastic sealant has detached slightly.

- The ground floor slab appears to be a concrete slab supported off the ground beams with a damp-proof membrane to the underside of the slab. It appears that the ground was once flush to the underside of the slab but now it has subsided some distance, it is assumed the slab does not rely on any ground bearing for support although this would need to be confirmed through additional investigations.

3.3 Elevation 3

- The floor gully marked on Figure 3 as *** has moved away from the face of the building by approximately 35mm where measured. The down pipe has been extended to ensure the storm water enters the gully.

- Self-seeded sycamore trees are growing between the concrete paving slab and the ring beam.

- The concrete paving slab has rotated and slopes away from the side of the building towards the West.

- The concrete paving slab has moved away from the building by approximately 45mm adjacent to the steps leading up to the entrance of the building.

- The side steps leading up to the concrete access ramp has subsided by approximately 80mm vertically

- The gas supply pipe appears to have been damaged due to ground movement and has been repaired with an extra piece of pipe set at an angle.

- Access ramp to the main entrance has a transverse crack at the point where the slope becomes level which is aligned with the outside face of the building elevation. The crack is approximately 12-15mm wide where measured and forms a sharp lip which is a potential trip hazard.

- The ground under the access ramp adjacent to the access steps has settled away from the underside of the ramp by approximately 150mm where measured and is no longer supported.

- The concrete paving slabs on the south side of the access ramp are also showing signs of ground movement and have moved away from the ground beam by approximately 30mm where measured.

- The gully on the South West corner has moved away from the building and the downpipe is now mis aligned.

3.4 Elevation 4

- The concrete paving slabs show signs of ground movement due to them sloping from the South to South east corner and also rotated to slope away from the building. There is a difference in level between the paving slab edge from elevation 3 to elevation 4 of 40mm approximately, where measured

- There is a difference in ground level of approximately 300mm between the neighbouring property and the one surveyed. The neighbouring property is approximately 3m at the closest point.

- A small diagonal crack can be seen running from DPC up to the underside of the window and measuring approximately 1.3mm

3.5 General Site Observations

- Manhole (M.H.) 3 and 4 are showing signs of the ground subsiding around them, they are protruding above the general surrounding ground level. M.H 4 shown on figure 3 is approximately 200mm above ground level.

- There are significant depressions in the grassed area around the North corner of the property and next to the small parking area.

- The paring area has a noticeable depression in the road surface adjacent to the floor gully.

- Princess road noticeably dips adjacent to the surveyed property.

- The land across the road where it was reported that two properties were reportedly demolished due to subsidence from sink holes showed significant depressions and variations in levels where the properties would have been located.

4 Discussion

The land around the property is showing significant signs of subsidence most likely due to an ongoing issue with subsidence from dissolution of the gypsum deposits in the bedrock resulting in void formation within the ground and subsequent hollows in the surface of the ground.

According to the historic maps of the area around the property there was a historic water course running through the site named “Skittergate Gutter” this was not evident during the visit and may be that it has been diverted below ground. The historic maps also indicated that there was a sulphur spa approximately 50m to the east of the property. Sulphur spa’s form from the breakdown of natural gypsum deposits to form sulphur dioxide gas, which dissolves into the water course to give the “Sulphur Spa’s when the water course breaks the surface. This is a good indicator of large gypsum deposits below ground around the site and with the change in the historic Skittergate Gutter course, this may be leading to dissolution of the gypsum below the property and surrounding area.

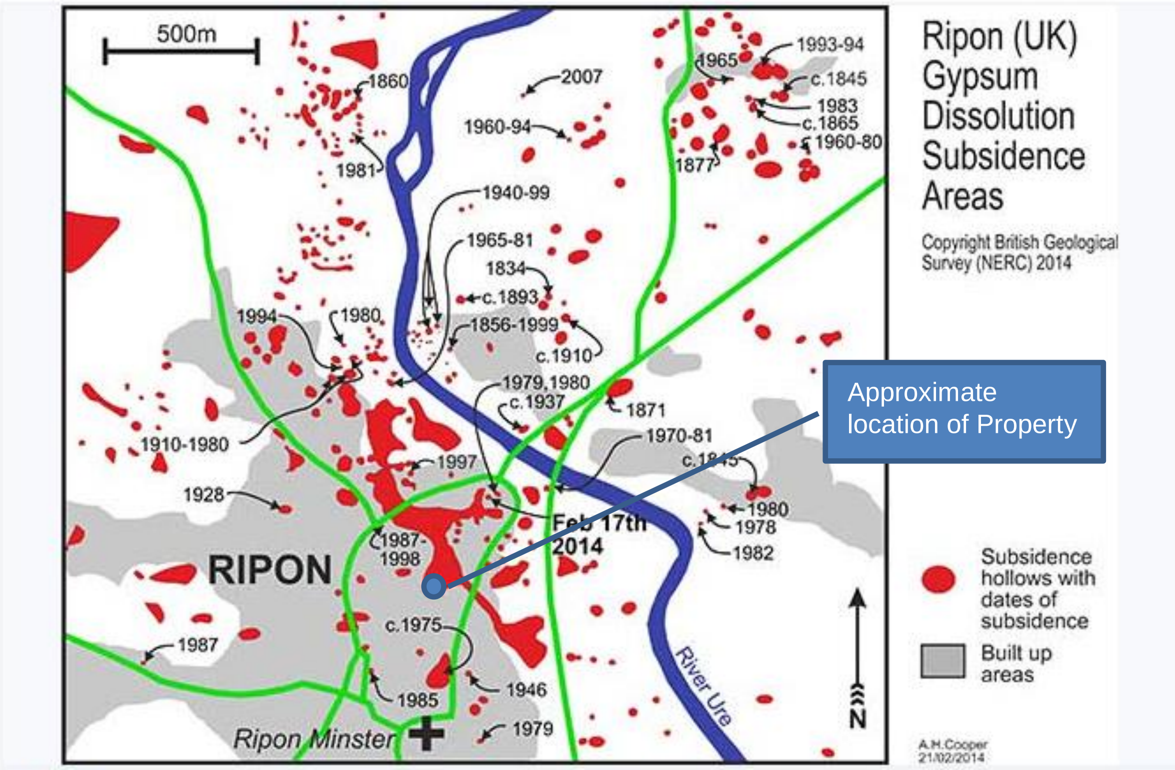
Further to this, figure 4 is an extracted image from the British Geological society showing the distribution of sinkholes around Ripon. For reference the property location is shown and is within a recorded large area of subsidence hollows.

Although we have not been able to confirm the comments regarding the demolition of the two properties across the road due to the formation of sink holes underneath them. The observations made of that particular site and the evidence from the historical maps and figure 4 all indicate that this was indeed a likely cause. This also helps to affirm the assumption that the subsidence observed around the surveyed property is also due to gypsum dissolution and is possibly linked to the site across the road. This will need to be confirmed through a Phase 2 site investigation to assess the severity and scale of the issue.

The surveyed property is constructed using a pile foundation and concrete ring beam as evidenced by the exposed piles. The piles are likely to be designed predominantly for end bearing given the large diameter although this could not be confirmed and appear to be stable with minimal vertical displacement compared to the ground. It is unknown how long the piles will remain stable with continued subsidence of the ground; however, this issue appears to have been ongoing for some time as can be seen from historic images on Google Street View.

The ground floor slab appears to be a concrete slab supported off the concrete ring beam, it could not be determined if the slab is designed to be bearing onto the ground. Access was not granted to the resident’s property and it was not safe or possible to get under the building therefore it was not possible to check for any signs of structural failure due to it now being suspended after the ground has fallen away from under it. It can only be assumed that the slab is adequate to be suspended from the ring beam only, however this would need to be confirmed through further investigations.

The tell-tale log provided by the client indicates that the cracks from the monitoring period showed variation in crack width of less than 1mm from the period of 2011 to 2017. One crack in particular on Elevation 1 from Figure 3 looks to be significantly larger than what has been recorded and would be prudent to take measurements from it to compare to the historical readings.



Map of the Ripon area showing the distribution of sinkholes, with the dates of reported collapses. The large areas are amalgamations of sinkholes mainly filled with peat and clay. BGS © UKRI.

Figure 4 - Extract from British Geological Society indicating sinkhole distribution around Ripon

5 Conclusions

It is highly likely that the observations around the site are due to the formation of subsidence hollows from dissolution of a gypsum deposit beneath the site.

The surveyed property appears to be stable in the short term, however there have been recorded instances in the Ripon area of piled foundations that were bearing onto the gypsum layer and continuing dissolution around the base of the pile had significantly reduced the bearing capacity. It has not been possible to confirm the depth of the piles and if they are bearing onto competent bedrock or not and is highly recommended this is confirmed at the earliest opportunity with the Phase 2 Site Investigation. The property is showing signs of movement cracks in the masonry, which may be due to some settlement of the piles resulting in the ring beam deflecting.

Another issue is the exposed piles are no longer adequately restrained against lateral movement, it is highly recommended that once the ground has been remediated, the ground under the property is built back up to restrain the foundations if the property is to be retained.

It is highly recommended that the issue is investigated with an extensive phase 2 site investigation, there may be a possibility that Princess Close at the point between the surveyed property and the site across the road may subside in time, cutting off access to the rest of the estate.

Remedial works to stabilise void formations in the ground are highly dependent on the size and contributing factors to the dissolution of the gypsum deposit. There is a strong possibility that the subterranean water flow may be altered after remedial works, resulting in issues arising elsewhere local to the site in time.

This subsidence issue is likely to be an ongoing concern, even with remedial actions to stabilise the ground under the property and consideration to a long-term plan of monitoring and further remedial actions should be given for the surrounding area. In addition, it would be recommended the client sought out any available records or surveys of gypsum dissolution in the area to confirm historical issues.

6 Recommendations

The site is currently showing significant signs of subsidence most likely due to dissolution of the gypsum deposits, it is strongly advised to initiate an in-depth phase 2 site investigation to determine an accurate ground profile of the site around the property and extending across the road to the site with the historical demolished buildings. The investigations will enable the formulation of an appropriate remedial solution to stabilise the ground for the property and Princess Close should it be found to be affected,

Recommended further works would consist of the following:

- A phase 2 site investigation with multiple boreholes to form a high-resolution ground profile of the surrounding area. This will help to confirm the extent of the gypsum dissolution within the ground.

- Allow for ground penetrating radar surveys over the wider area and surrounding properties to complement the data from the Phase 2 investigations.

- Design of remedial works to follow on after Phase 2 investigations

- Vegetation clearance including removal of the self-seeded trees between the concrete paving slab and the ring beam.

- Investigation of the ground floor slab both internal and under the building to determine if there are any signs of structural defects.

- Take readings of all the installed tell-tale markers to compare against the last readings and resume a monthly monitoring schedule.

- Search archives for any historical survey data on gypsum dissolution in the surrounding area.

7 Appendix A – Photographs

7.1 Elevation 1

Photo 1 - Floor Gullies miss aligned with down pipes

Photo 2 -Self-seeded Sycamore trees adjacent to the foundation ring beam

Photo 3 - Large vertical crack through masonry

Photo 4 - ground settlement below the underside of the ground beam and miss aligned gullies

Photo 5 - Blocked floor gullies discharging storm water into ground around foundation piles

7.2 Elevation 2

Photo 6 - Foundation piles measuring 300mm diameter

Photo 7 - View of the space under the ground floor slab

Photo 8 - Ground subsidence under the ring beam measuring 500mm from U/S to ground

Photo 9 - Pavement slab has moved away from the building opening up a gap

Photo 10 - Settlement difference between two slabs on Elevation 2 and 3

7.3 Elevation 3

Photo 11 - Paving slab has moved away from the building. Self-seeded trees between paving slab and ring beam

Photo 12 - Paving slab has moved away from the side of the building and settled

Photo 13 - Gas mains has been repaired most likely due to ground movement

Photo 14 - Ground has settled under the concrete ramp to the main entrance

Photo 15 - Concrete access ramp crack forming sharp lip

7.4 Elevation 4

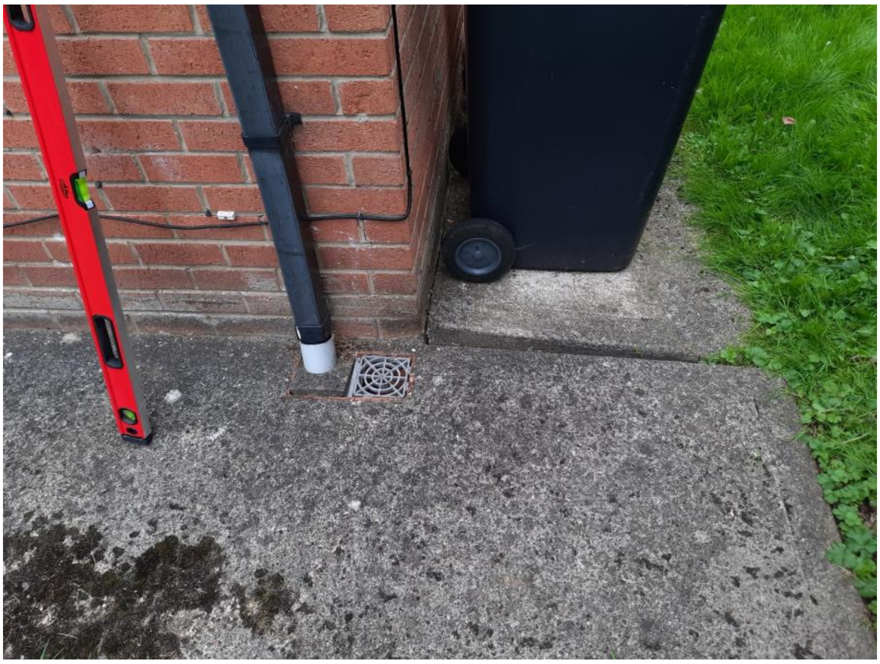


Photo 16 - Concrete paving slab differential settlement and miss aligned down pipes to floor gullies

Photo 17 - Small diagonal crack

7.5 General Site Photos

Photo 18 - Manhole chamber lids exposed above ground due to settlement of the surrounding ground

Photo 19 - signs of settlement in the nearby carpark next to the floor gully

Photo 20 - Site of demolished buildings across the road from 9 Princess Close showing significant level changes in the ground