Dennany Reidy Associates
CONSULTING CIVIL & STRUCTURAL ENGINEERS

Engineering Report

Property:

5 Riverbrook,
New Street,
Abbeyfeale,
Co. Limerick,
V94 H2AD.

Structural Engineering

Civil Engineering

Conservation Engineering

Health & Safety

Project Management

Legal / Expert Witness

Client:

Limerick City & County Council,
County Hall,
Dooradoyle,
Limerick.

Job Ref No.: L162

Directors:
Austin Dennany B.A.,B.A.I.,Dip.Proj.Mgmt.,PGDip.App.Bldg.Repr.Cons.,C.Eng.,M.I.E.I
John Reidy B.E., Dip.Proj.Mgmt., Dip.Const.Law & C.A., C.Eng.,M.I.E.I

Dublin:
30 Drumcondra Road Upr, Drumcondra, Dublin 9 D09FT7K
Tel: 01-4278320 Email: mail@dennanyreidy.ie

www.dennanyreidy.ie

Registered Address: Dennany Reidy Associates Limited.
Pamdohlen House, Dooradoyle Road, Limerick
VAT no. IE 9652275 Registered in Ireland No. 435811

Limerick:
The Park, Lord Edward Street, Limerick V94 840C
Tel: 061-310701 Email: mail@dennanyreidy.ie

Table of Contents

Document Control

Report. by:	Report Date:	Check. by:	Date:	App'd. by:	Date:	Filename:	Revision:
A.Dennany	07-12-2017	J. Reidy	07-12-2017	A.Dennany	07-12-2017	L162-Report-171207	0

1.0 Introduction & Background:

Dennany Reidy Associates were appointed by Limerick City and County Council to inspect and report on the collapse of the river bank along the River Feale in close proximity to No. 5 Riverbrook, New Street, Abbeyfeale, Co. Limerick V94 H2AD. Our initial inspection was carried out on Saturday 11th November with associated report issued on Monday 20th November 2017.

Subsequent to our initial visit we have been requested by Limerick City and County Council to propose permanent remedial works and also temporary works to stabilise the area.

To assist with the above design, Limerick City & County Council commissioned investigative and making safe works which allowed us to ascertain depth to existing foundations and soil conditions at foundation formation level.

2.0 Investigative & Making Safe Works

Roadbridge Ltd. were commissioned to demolish dangerous structures at the rear of No. 5 Riverbrook including the boundary wall with Leahy's (Please see attached map in Appendix B of this report for property arrangement) and decking, both of which were overhanging the collapsed river bank. Trial holes were also opened up at the rear left and right hand corners of the site.

Works to provide access to the site and remove overhanging elements were commenced on Friday afternoon 1st December 2017 and continued on Saturday 2nd December. The trial holes were excavated on Monday morning 4th December.

The foundations of the house appear to be conventional strip footings which are 1.5 metres below ground floor level to top of foundation, which is approx. 2.5 metres above river bank level. The strip footings are approx. 250 millimetres deep and are bearing on a firm, cohesive clay.

3.0 Remedial Works

3.1 Temporary Works

Options for temporary works to protect the exposed bank have been considered however, it is our opinion that any temporary measures would be futile for the following reasons:

- A failure plane has opened up behind the remaining gabions and there is also evidence of movement at the front of the car-park. Therefore, there is a high risk that the gabions along this section of the river, having already moved, could collapse with the next high water event. Providing sand bags or tonne bags along the already collapsed section will have little benefit to a section of potentially unstable wall further down-stream.
- If sand bags or similar were to be installed, they would have to return into the bank for a minimum of 2 metres to prevent the flow of the river penetrating in behind any such temporary wall.

  The base of any such temporary wall would have to be levelled and prepared.

  As per point above, the remaining section of wall down-stream is already unstable and therefore requires to be removed. Any such temporary wall would have to be removed to allow access to the main section of wall down-stream.

  Therefore, the works involved in installing any useful temporary wall are the same as those required for installing a permanent wall. Furthermore, the temporary wall would have to be removed in its entirety to allow access to install the permanent solution.
- To withstand the forces from the river at this corner, a properly designed retaining wall system is required. Sand bags or similar installed, without being incorporated into an overall design, will most likely be washed away during a high water event in the river. Installation of such temporary works could provide owners of

Number 5 Riverbrook and also users of the car-park with a dangerous perception that the bank had been fully stabilised and was now 100% safe.

3.2 Proposed Remedial Works

Erosion and deposition on river bends is part of the natural cycle of a river. If this bend on the river was located in farmland no action would be required except perhaps a fence line to be moved back.

In this instance, property is at risk and also there is potential risk to the Health & Safety of the occupants of No. 5 Riverbrook and also users of the adjoining car-park. Therefore, an engineering solution is required.

The following options have been considered:

3.2.1 Installation of Rock Armour (Riprap Revetment)

Installation of rock armour along the bank requires the grading of the bank to an angle of between 30 – 40 degrees. A gradient of this angle would require the demolition of Number 5 Riverbrook as there is not sufficient distance between the back wall of the house and the riverbank.

Even if Number 5 was demolished and the river bank re-graded to allow installation of rock armour at appropriate angle, the problem is being moved down-stream to the next property. I.e. if the ground is graded back to 35 degrees, the level of the neighbouring garden will be higher and take the force of the river during a high water event. This option would work perfectly if all the gardens down-stream to where the river straightens out could be graded back and rock armour installed.

Alternatively, the toe of the rock armour could be moved out further into the river. This is not desirable and should be avoided as it would disrupt the natural channel and flow of the river and could cause flooding on the other side of the river as well as accelerating erosion immediately up-stream of the rock armour.

3.2.2 Installation of Gabion Retaining Wall

Attached in Appendix C please find a proposal for construction of a new gabion wall along the line of the existing river bank. This differs from the gabion wall already installed in that the ends are returned into the bank to mitigate the risk of the flow of water getting in behind the retaining wall. The corners at these returns are to be rounded to reduce effects of erosion at these locations. Also, the gabion wall is wider and sloped inwards.

We are conscious that gabions are not an ideal solution as they can trap young fish in their mesh and also there is an issue with gabion mattresses hindering any maintenance works of the river bed. However, as the works are concentrated on only a portion of a river bend, the line of the bank must be maintained to minimise impact on neighbouring property owners. Increased erosion of neighbouring properties is a potential risk following the works however, the only way of avoiding this is to provide bank protection along the river until the course of the river straightens both up-stream and down-stream.

Initial cost estimates for installing these gabions, including required enabling works, have been placed at approx. €455,000. This figure is based on the following VAT inclusive figures:

○ Making Safe & Investigative Works	€ 10,725.75
○ Topographical Survey	€ 854.85
○ Site Investigation Boreholes	€ 6,810
○ Consultant's fees	€ 18,450
○ Temporary Hoarding & Maintenance	€ 13,393
○ Enabling Works	€ 90,800
○ Installation of new Gabion Wall	€ 261,050
○ Contingency – 15%	€ 52,777.50
Total	€454,861.10

4.0 Recommendations

As it is not practical to continue sloping rock armour around the bend until the river straightens, we recommend installing a gabion retaining wall which allows construction of a near vertical river bank. As these works would take place on only a section of a river bend there is the likelihood of accelerating erosion in the vicinity of the structure and therefore consultation with all stakeholders and authorities should be carried out prior to works commencing.

In tandem with this, it would be advisable to remove some of the bank of gravel from the river bed to increase the channel depth and help divert some of the flow away from the river bank affected.

Given the height of the existing foundations of Number 5 Riverbrook relative to the river bank level, and their close proximity, there is a real danger of a partial collapse unless remedial works are carried out. For this reason we advise that the house remains vacant until works are carried out and also that the adjoining car-park is not used as there is a danger of failure of the retaining wall in this location.

Access to this section of the river bank is severely restricted. Consent from third party land owners is relied upon. Consideration should be given to the pros and cons of demolishing No. 5 Riverbrook to allow improved access to the river bank and works.

End of Report

Signed: _____ **Date:** 7th December 2017

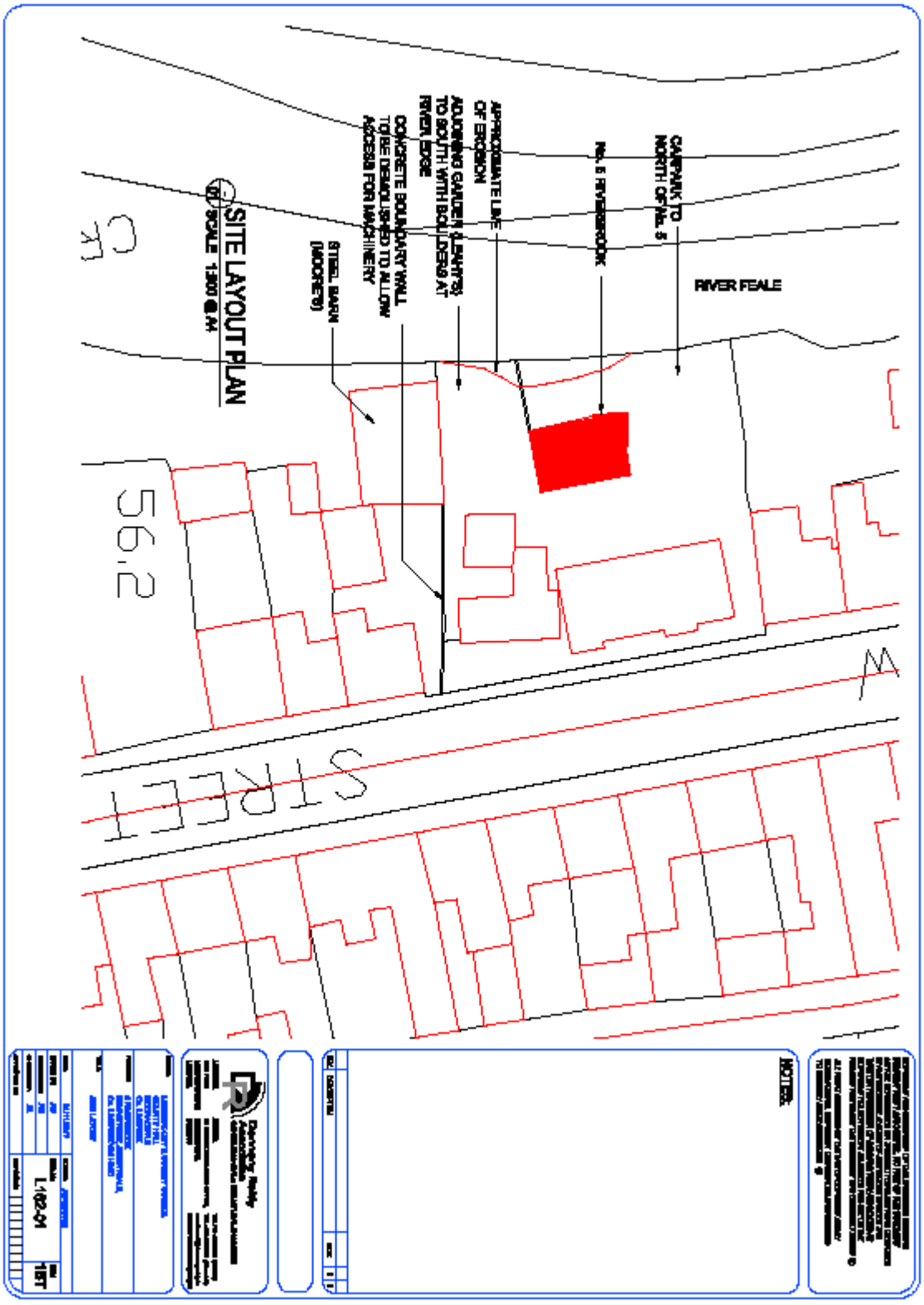
Austin Dennany B.A. B.A.I.,Dip.,Proj.Mgmt.,PGDip.ABRC., C.Eng., M.I.E.I
Chartered Engineer

Appendix A – Photographs

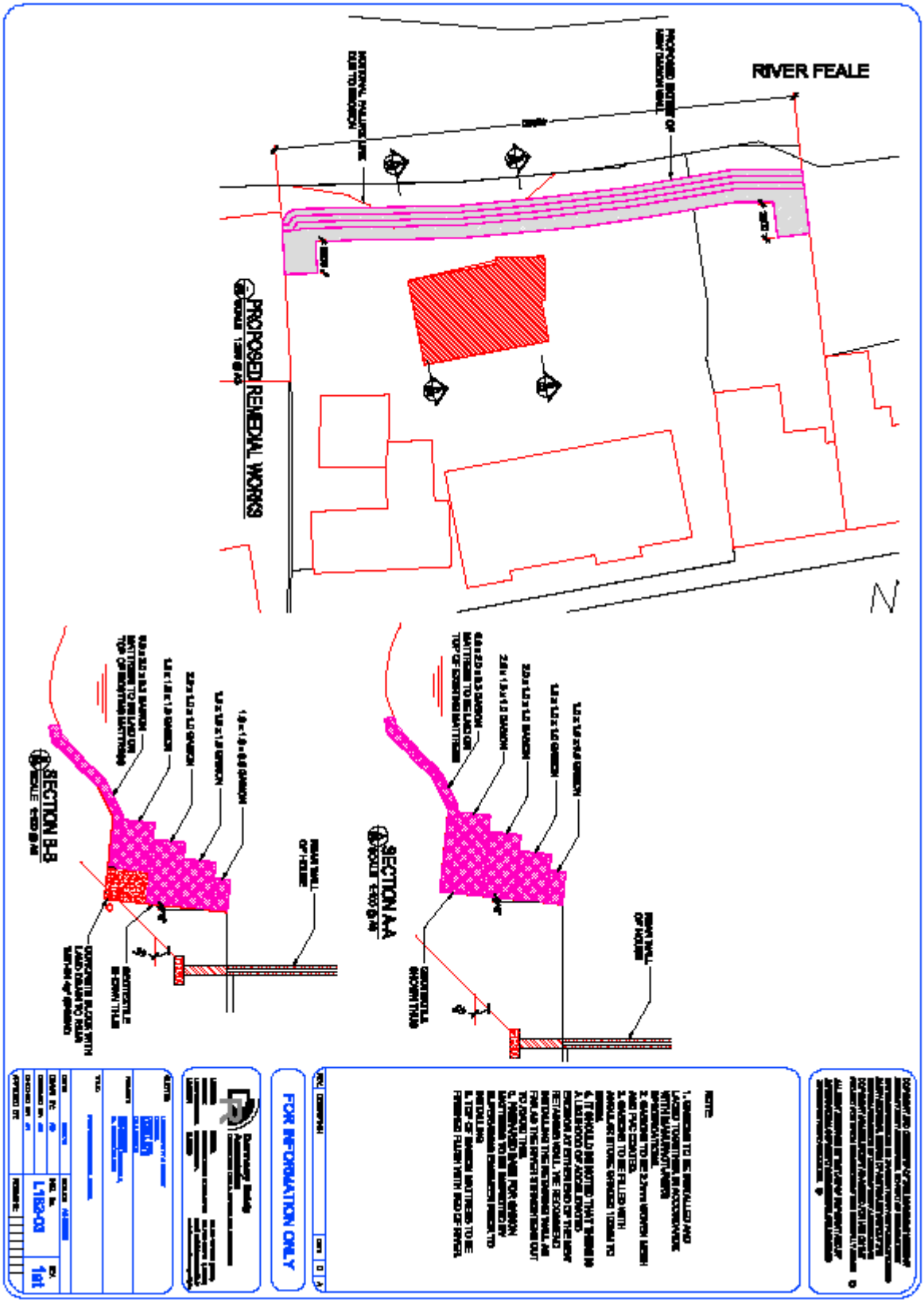
No.	Date	Photo & Description
1	04/12/17	Temporary Access Road Formed 
2	04/12/17	Failure of ground at rear of house 

No.	Date	Photo & Description
3	**04/12/17**	Dangerous structures at rear being removed. 
4	**04/12/17**	View of exposed foundation. 

Appendix B – Layout Plan


SITE LAYOUT PLAN
SCALE 1:500 @ A4
STEEL BARN (MOORE'S)
CONCRETE BOUNDARY WALL TO BE DEMOLISHED TO ALLOW ACCESS FOR MACHINERY
ADJOINING GARDEN ELEMENTS TO SOUTH WITH BOULDERS AT RIVER EDGE
APPROXIMATE LINE OF EROSION
No. 5 RIVERBROOK
CARPARK TO NORTH OF No. 5
RIVER FEALE
56.2
STREET
NOTES:

Appendix C – Proposed Remedial Works


RIVER FEALE
PROPOSED REMEDIAL WORKS
N
SECTION B-B
SECTION A-A
FOR INFORMATION ONLY

Appendix D – Survey Drawings