**Chester Terrace Balustrade working group meeting 14 August 2020**

In person: Loretta Balfour, Richard Loftus, Nick Packard, Andrew Maskell, Michael Chung

On video/audio conference: Allan Murray – Jones, Stuart Ballantine, Jack Harrold

*Before the meeting the Listers Geo estimated cost for further investigations in to contaminated land at £2,550 + VAT, e mail chain from Platipus ground anchor contractors with Richard Loftus, cost plan from Buidt quantity surveyors showing an indicative cost of £1.7m + VAT for works in accordance with HP+M’s initial proposal (note this was not a worked up scheme) were circulated.*

It was agreed that as Allan Murray – Jones was attending by conference and Loretta Balfour was present in person, Loretta Balfour would chair the meeting.

Although an agenda had been circulated it was agreed that the first issue to be discussed should be the issue of safety and risk. This had been discussed within the HP+M report dated 26 June 2020 and Michael Chung was asked to advise on his view of the current performance of the balustrade and their foundations.

Michael Chung took the meeting to section 7 of the HP+M report (p25) and explained that the current regulations for loading strength specify 1.5 kN/m for a new relevant construction. It was noted this was the relevant pedestrian impact rather than vehicular impact. He then explained that as constructed at Chester Terrace when installed the balustrade had a loading strength of 0.6 kN/m. Where the original strength has been lost through removal of mortar, corrosion of reinforcement etc the loading strength is 0.3 kN/M.

There was a discussion about whether the condition of the balustrade had deteriorated since the 2017 BNP Paribas survey. Jack Harrold reported this was difficult to tell because of the methodologies used, but it may be that some areas have got worse.

Richard Loftus queried the strength if the existing balustrade was repaired so that it had the original structural integrity. Michael Chung confirmed this would take the loading strength back to 0.6 kN/m. However, he advised that if this was done, the balustrade would lose strength when vertical movement of the foundations took place, as it inevitably would being on made ground and then clay with the adjacent vegetation providing an additional influencing factor on the clay.

There was discussion about the nature of previous repairs to the balustrade. Jack Harrold reported that mortar from different eras had been encountered. This suggested that movement had been ongoing over a significant period. 93% of the joints in the coping stones (top of the balustrade) had moved and 69% of the plinths (bottom of the balustrade) had moved.

Richard Loftus asked Michael Chung’s views on a possible solution with flexible vertical jointing but tight horizontal jointing in the balustrade which would appear to retain lateral strength but give some allowance for vertical movement. Michael Chung advised that the vertical movement would not be uniformly straight up and down so that when it occurred the tight horizontal jointing in such a construction would likely fail, meaning the lateral strength would be diminished.

Possible alternative approaches to the HP+M initial approach to dealing with the vertical movement were discussed and Michael Chung asked for his views. It was generally considered that some form of retaining the existing foundations by anchors combined with piling connected to the underside of the existing foundations would be a viable alternative. There was discussion about partial underpinning the areas most affected (possibly those near trees). It was noted that in such a scenario there would be differential movement between the fixed section and the adjacent moving sections. This would again lead to the weakening of the balustrade below its initial loading capacity. Michael Chung confirmed that he would not recommend partial underpinning for these reasons.

Stuart Ballantine tabled exploring the feasibility of cross- bracing helical piles with ductile steels and tying these into the existing foundation raft along its length, then shuttering and facing these aspects off with concrete, and underpinning sections of the existing foundation raft along its length as to create foundation pads. As this might assist with bolstering resilience and resistance to the interchangeable forces of vertical movement.

Richard Loftus mentioned pumping concrete under sections of the existing foundation. [Post meeting note - modern no dig civils technology includes a wide range of non-invasive underpinning techniques including the use of geo polymer resins, grouting, and light weight concrete materials. These options could also be considered].

Michael Chung suggested the view that the options were to deal with the vertical movement or patch up the existing balustrade to give its strength back and then monitor the deterioration. It was noted the latter could lead to the quick failure of the strength of the balustrade and also that if parts of the balustrade were taken apart, more problems may be found and it could be increasingly difficult to put them back together to the existing and/or original strength. The question was asked of how quickly the vertical movement would come back. No one could say with any certainty, but 10 years was mentioned. Michael Chung suggested that extensions to the lifespan in this scenario would likely require structural works to the balustrade other than just repointing gaps. This was not considered desirable with the current balustrade owing to the difficulties of potentially finding more issues when taking apart the balustrade and putting it back together. An alternative could be to put a new balustrade in place, but this is a c.£500k cost and might be damaged by vertical movement which would mean the foundation issue and another new balustrade might be required in a relatively short timeframe.

There was a discussion about removing a section of the balustrade to assess whether they are affixed to the foundations. It was noted an estimate had been obtained from PAYE stonework at a significant cost (subsequent to the meeting confirmed as £14,467 + VAT for the removal, testing and reinstatement of 3 bays). It was suggested that alternatively the bay currently propped by scaffolding could be removed and its construction assessed instead.

Richard Loftus asked if it might be possible to reinforce the plinth (bottom part) of the existing balustrade in to the foundations to give some strength and then install new bottles and copings. Michael Chung suggested this may be possible.

Richard Loftus asked whether metal railings allowed for more movement than a stone balustrade. Michael Chung suggested they would. It was thought there may be a heritage issue in changing to metal railings.

It was acknowledged that whichever courses were investigated there would be a requirement for further investigations, possibly different ones, and so focus needed to be retained on which specific option(s) to investigate. It was also noted that with quantity surveyor costs at this stage there would be both extra items included and omitted as no detailed scheme had been produced. There was also no contingency, which as standard practice would be separate from this analysis.

Richard Loftus suggested that he would be keen to keep funds for the landscaping works so that improvement of that amenity could be offered to residents at the end of what looked like being a significant project on the balustrade.

There was some discussion of whether the CEPC could ask for voluntary costs up front from ratepayers if there was a desire on their part to expedite the project if its programme was constrained by the rate cap restriction.

Stuart Ballantine suggested that account for thermal movement should be made in consideration of the above ground aspects of the balustrade as is the case at Cumberland Terrace where the component stone parts i.e. coping stones have flexible joints between them as opposed to rigid cementitious mortar joints.

Michael Chung suggested that it might be possible to look at a scheme where the balustrade was strengthened and then the foundation strengthening designed but only implemented if ongoing monitoring showed it necessary. This would be less costly but ran the risk of damaging the balustrade by vertical movement as there would undoubtedly be significant mobilisation time even if the design was already in place. With such an approach there would also be the threat of ongoing major disruption at short notice to residents. [Post meeting comment - What would happen if there was a major reconstruction project on some of the properties in the terrace at the same time as the foundation works needed to be undertaken? One party may need to delay with potential significant financial penalty to that party. However, this may not be such an issue as access for materials and contractors for works to the houses is normally via Chester Mews.]

**It was agreed that as there was knowledge of the presence of possible contaminated land the further survey should be instructed.**

**It was agreed that a desktop study of services should be arranged by HP+M to establish services in the roadway.**

**It was agreed that HP+M would consider alternative approaches to dealing with the vertical movement which would be costed by Buildt quantity surveyors. Any further design work should take account of possible thermal movement as experienced at Cumberland Terrace. HP+M to provide a timescale for this work in advance.**

**It was agreed that HP+M would draft a scope of works to remove the currently scaffold-propped section of balustrade including a design for appropriate temporary works to keep the site safe in the event it could not be put back.**

**It was agreed that further work was needed before the issue was brought to ratepayers.**