Alt Meadows Project:  
Green Infrastructure As-Built Report

October 2015

Prepared by The Mersey Forest for Cass Foundation
Contents

1. Introduction .................................................................................................................. 3

2. Assessment of Green Infrastructure “As-Built” Functionality ........................................... 5
   2.1 Overview of the assessment ......................................................................................... 5
   2.2 Individual functions ..................................................................................................... 5
      2.2.1 Accessible water storage ....................................................................................... 6
      2.2.2 Aesthetic .............................................................................................................. 7
      2.2.3 Biofuels production ............................................................................................... 10
      2.2.4 Carbon storage ..................................................................................................... 11
      2.2.5 Coastal storm protection ....................................................................................... 12
      2.2.6 Corridor for wildlife ............................................................................................ 12
      2.2.7 Cultural asset ....................................................................................................... 13
      2.2.8 Evaporative cooling .............................................................................................. 15
      2.2.9 Flow reduction through surface roughness .......................................................... 16
      2.2.10 Food production .................................................................................................. 18
      2.2.11 Green travel route .............................................................................................. 19
      2.2.12 Habitat for wildlife ............................................................................................ 21
      2.2.13 Heritage .............................................................................................................. 23
      2.2.14 Inaccessible water storage ................................................................................ 24
      2.2.15 Learning ............................................................................................................. 25
      2.2.16 Noise absorption ............................................................................................... 27
      2.2.17 Pollutant removal from soil and water ................................................................. 28
      2.2.18 Recreation private ............................................................................................... 30
      2.2.19 Recreation public ............................................................................................... 30
      2.2.20 Recreation public with restrictions .................................................................... 33
      2.2.21 Shading from the sun ......................................................................................... 33
      2.2.22 Soil stabilisation .................................................................................................. 35
      2.2.23 Timber production ............................................................................................. 36
      2.2.24 Trapping air pollutants ....................................................................................... 37
      2.2.25 Water conveyance .............................................................................................. 38
      2.2.26 Water infiltration ............................................................................................... 39
      2.2.27 Water interception ............................................................................................. 41
      2.2.28 Wind shelter ....................................................................................................... 42

3. Green Infrastructure Economic Valuation ......................................................................... 44

4. Summary, Recommendations and Conclusion .................................................................. 46
1. Introduction

The River Alt Restoration Project has created a new park in Liverpool, now called Alt Meadows. The project had four main objectives:

1. Create new, meandering water channels with margins and banks
2. Increase flora/fauna range/diversity of the river corridors by altering the morphology
3. Additional enhancement of linear, waterside, greenspace
4. Create educational and recreational opportunities for the community.

In 2013, The Mersey Forest produced a ‘Green Infrastructure (GI) Baseline Report’ for the project, on behalf of the Cass Foundation. The report set out the GI context of the River Alt Restoration Project for the baseline and the proposed design cases, considering the GI types (what is present and its distribution), functions (what the GI is doing and where), needs (what the GI needs to be doing and where) and an economic valuation (quantifying the benefits that the GI provides). It contained a summary and recommendations to support and amend the proposed design.

This latest report, a ‘Green Infrastructure As-Built Report’, is intended to consider the GI that was actually “built” on the site in order to understand its functionality and whether or not it is meeting needs identified in the baseline report.

There were some minor amendments to the proposed design for the site and what was actually built (for example, see Figure 1 and Figure 2). However, this latest report does not update any of the mapping or quantitative GI functionality assessments undertaken for the baseline report. This is because the amendments to the GI were fairly minor, and would be unlikely to make a major difference to the maps and results presented in the baseline report. Instead, this ‘as-built report’ has taken a more qualitative approach to understanding how the different GI functions were incorporated into the park, and whether or not these met identified needs (section 2). This took the form of an interview and site visit with Helen Rawlinson, the project manager for the Cass Foundation, on 7th April 2015. In addition, we have adjusted the economic valuation undertaken for the baseline report so that it takes into account any amendments to the design (section 3). We conclude with a summary and recommendations (section 4). This report is intended as a resource to inspire the functionality-based design of future projects, inform ongoing maintenance of the Alt Meadows Park, and provide a framework for similar assessments in the future.
Figure 1. Landscape plan for the project site; used for the proposed design GI mapping in the ‘baseline report’

Figure 2. The ‘as-built’ landscape plan for the project site (with the exception of the path detail and steps to the top of the mound at the left of the image, and no compost was added to the left mound, labelled 1)
2. Assessment of Green Infrastructure “As-Built” Functionality

2.1 Overview of the assessment

In order to assess the “as-built” functionality of the green infrastructure, and to judge whether this met identified needs, we undertook an interview and site visit with Helen Rawlinson, the project manager for the Cass Foundation, on 7th April 2015. Taking each of the 28 functions considered in the baseline GI report in turn, the interview and site visit considered:

- What was done on site to ensure that this function is performed?
- Does this reflect the identified spatial distribution of the need for the function (refer to maps)?
- Does planned management ensure that this function will continue to be provided?

In line with the four objectives of the River Alt Restoration Project (see section 1), the main functions considered through the design of the site related to water (‘accessible water storage’, ‘inaccessible water storage’, ‘water conveyance’, and ‘soil stabilisation’ in particular), biodiversity (‘corridor for wildlife’ and ‘habitat for wildlife’), education (‘learning’), and recreation / amenity (‘recreation public’, ‘green travel route’, ‘aesthetic’, and ‘cultural asset’). For six of these eleven functions (‘accessible water storage’, ‘inaccessible water storage’, ‘water conveyance’, ‘soil stabilisation’, ‘corridor for wildlife’ and ‘habitat for wildlife’) the mapping undertaken for the baseline survey showed that the design resulted in an increase in functionality on site. For two of these functions (‘green travel route’ and ‘recreation public’) the mapping suggested a decrease in functionality as a result of the design, however the interview demonstrated that this is not really case and that the quality of the provision of these functions has greatly increased. For another three of these functions (‘aesthetic’, ‘cultural’ and ‘learning’) no change in functionality was detected by the mapping, but this is largely due to the inherent difficulties in mapping these functions; the interview, demonstrated that these functions have been considered in the design and delivery of the project.

There were four other water-related functions that were arguably less of a consideration in the design (namely ‘flow reduction through surface roughness’, ‘pollutant removal from soil and water’, ‘water infiltration’ and ‘water interception’), where the slight losses in functionality were most likely as a result of the broad brush mapping approaches used rather than actual losses in functionality on site.

The remaining 13 functions were not really a consideration of the design. In some cases they were not applicable at all because of location (e.g. for ‘coastal storm protection’) or because the site was designed to be publicly accessible (e.g. as such ‘recreation private’ and ‘recreation public with restrictions’ were not applicable). In some cases, whilst functionality has been provided to some extent as a by-product of the design, it may have been possible to build in a greater level of functionality if this had been considered earlier or through future management options (e.g. for ‘biofuels production’, ‘carbon storage’, ‘evaporative cooling’, ‘food production’, ‘heritage’, ‘noise absorption’, ‘shading from the sun’, ‘timber production’, ‘trapping air pollutants’, and ‘wind shelter’).

2.2 Individual functions

In the sub-sections below we set out a discussion of each function in turn (presented alphabetically), drawing on information presented in the baseline assessment (in particular the mapping of individual functions presented in section 3.1, of ‘unmet’ needs in section 4.2, and of ‘met’ needs in section 4.3), as well as from the interview and site visit.
2.2.1 Accessible water storage
A key objective of the River Alt Restoration Project was to “create new, meandering water channels with margins and banks”. As such, water-related functions were an inherent part of the design of the site from the outset.

The creation of a new water channel in the design meant that the ‘accessible water storage’ function was increased on site, with less than 1% of the green infrastructure performing this function in the baseline case, increasing to 10% for the design case. Whilst this water channel was not designed in order for the water to be used for human consumption, it has the potential to be used in this way in the future subject to abstraction licences. There is an option, if needed, to extract up to 20,000 litres a day from the river without having to apply for an abstraction license. This water could be used at the discretion of Lancashire Wildlife Trust (who are maintaining the site), for example, in a dry summer to irrigate some of the plants (e.g. plug plants) and trees.

The increase in the proportion of the ‘accessible water storage function’ on site goes some way towards meeting the mapped need for the function (Figure 3), with an increase from less than 1% of the on-site need being met in the baseline case to 7% in the design case. Whilst these figures sound low, it would never be realistic for 100% of the need to be met for this function, as need was mapped in a broad-brush manner for the whole of flood zone 2.
Figure 3. Areas where the need for the ‘accessible water storage’ function has been met by the proposed design or remains unmet, as well as other provision of the function (i.e. in an area which was not identified as needing the function). The need here was mapped as being in areas falling within flood zone 2.

2.2.2 Aesthetic

A key objective of the River Alt Restoration Project was the “enhancement of linear, waterside, greenspace”. As such, improving the ‘aesthetic’ function was an inherent part of the design of the site from the outset.

The mapping of where the aesthetic function is provided is very crude, in that all GI is deemed to provide this function (and all non-GI as not providing it). Therefore it suggested that there was no improvement in this function as a result of the improved design. It also suggested that the design resulted in a reduction in the proportion of the on-site need that is met for this function, from 97% in the baseline case to 88% in the design case. These figures are misleading due to the crude mapping of function provision and the fact that there is only a very small area mapped as needing this function (Figure 4). As such, they should be disregarded.
Figure 4. Areas where the need for the ‘aesthetic’ function has been met by the proposed design or remains unmet, as well as other provision of the function (i.e. in an area which was not identified as needing the function). The need here was mapped as being areas within 100m of key gateways or 25m of Environmental Improvement Corridors.

It is clear that the aesthetics of the site have greatly improved through the project. In particular, views from the north end of the site are especially important because of its location on the East Lancashire Road, which is a major access route into Liverpool (as reflected in the need mapping (Figure 4)). This is considered to be one of the best views of the site (Figure 5). Residents in houses on the south east edge of the new park have also reported being really pleased with the views.
The site has been designed to be low maintenance. In the mid-term, there is funding for three years’
of management, with about £19k for the first year. This covers basic maintenance, bin emptying,
managing agent fees, and a small contingency. Windblown litter is currently an issue on the site
(Figure 6), and volunteers and Community Payback teams (part of the Probation Service) have been
doing clear ups. After this 3-year period, future bids will try to secure funds for continued
maintenance. Discussions are underway with the Neighbourhood Services Company, which is part of
Alt Valley Community Trust, to ascertain what they may be willing to take on (perhaps with training
from Lancashire Wildlife Trust in relation to habitat management). There will also be further
developments along the East Lancashire Road corridor, so section 106 agreements will help with
funding for maintenance.
2.2.3 Biofuels production

The production of biofuels was not considered in the design of the site. However, the potential for this function to be provided has increased, with 1% of the on-site GI having potential to provide it in the baseline case and 30% in the design case. There has also been a corresponding increase in the proportion of on-site need for this function being met, from 0% in the baseline case to 38% in the design case. These increases are due to the increase in tree and woodland areas as a result of the project. This function would only be realised if the woodland were managed for it, for example using a ‘wood allotments’ management model. Indeed, the location of dwellings surrounding the site suggests that there could be a need for some kind of biofuels production (Figure 7). That said, the woodland areas are fairly small, so may not be suitable for management as wood allotments. Such management may be considered in the future, and there is interest in its potential on nearby sites.
2.2.4 Carbon storage

Carbon storage was not considered in the design of the site. The mapping suggests that carbon storage actually reduces on site, with 69% of the GI on-site performing it in the baseline case and 40% in the design case. It also suggests a decrease in on-site need for this function being met (Figure 8), from 62% of needs met in the baseline case to 37% in the design case. These losses are due to the loss of scrubland on the site, which is not counteracted by the increase in woodland. In fact, without a proper survey of carbon storage on site before and after the creation of the new park, it is difficult to get a handle on whether carbon storage will have increased or decreased. For example, the tree species planted on site may be better stores of carbon in the longer term than the scrub cover. The soil on site is unlikely to be particularly rich in carbon, as it is mainly sandy loam and clay soils. All soil was re-used on the site, apart from 10 tonnes which was taken to help level some local playing fields.
2.2.5 Coastal storm protection
This function is not applicable as the site is not in a coastal location.

2.2.6 Corridor for wildlife
A key objective of the River Alt Restoration Project was to “increase flora/fauna range/diversity of the river corridors by altering the morphology”. As such, the two functions relating to wildlife were an inherent part of the design of the site from the outset. The creation of a new wetland and woodland habitats, and the better connectivity of these habitats to each other and to other habitats outside of the project site meant that the ‘corridor for wildlife’ function was increased on site, with 22% of the green infrastructure performing this function in the baseline case, increasing to 100% for the design case. This also helped to meet the need for this function on the site (Figure 9), with an increase from 69% of the on-site need being met in the baseline case to 94% in the design case.
‘Daylighting’ the river on the surface through the park helps to connect it to the open river channels to the north and south of the site. The river channels off-site are not so natural, and there is not really scope for making them more natural, and the river remains culverted under the East Lancashire Road to the north of the site. There is anecdotal evidence that kingfishers, spotted either end of the site, are starting to use the river as a corridor as a flyway.

Figure 9. Areas where the need for the ‘corridor for wildlife’ function has been met by the proposed design or remains unmet, as well as other provision of the function (i.e. in an area which was not identified as needing the function). The need here was mapped as being Connectivity Areas identified in Liverpool City Region Ecological Framework.

2.2.7 Cultural asset
A key objective of the River Alt Restoration Project was to “create educational and recreational opportunities for the community”. These are largely considered under the ‘learning’ and ‘recreation public’ functions (sections 2.2.15 and 2.2.19, respectively). However, there is clearly some crossover with the ‘cultural asset’ function, which relates to the use of the site for cultural purposes, the hosting of public art, events and festivals. This function is difficult to map, and as a result none of the GI on-site was deemed to be performing it either for the baseline or design case. There was judged
to be some need for the function, due to the proximity of dense housing areas (Figure 10), and none of this need was met by the baseline or design cases.

It is clear from the interview that some cultural aspects are being explored. The linear shape of the site does not really lend itself to community events as such, but Unicorn Park, just outside of the southern end of the site, has been used for small scale community events (Figure 11). In addition, a proposal has been submitted to the Arts Council for £15k to work with community groups to make mosaics for the footpaths, and the mound at the northern end of the site on the East Lancashire Road has been identified as a potential site for a major public artwork, as it is a key gateway into Liverpool.

Figure 10. Areas where the need for the ‘cultural asset’ function has been met by the proposed design or remains unmet, as well as other provision of the function (i.e. in an area which was not identified as needing the function). The need here was mapped as being areas where the density of addresses is greater than 1,500/km².
2.2.8 Evaporative cooling
This was not really a consideration of the design for the site. The mapping of where the evaporative cooling function is provided is very crude, in that all GI is deemed to provide this function (and all non-GI as not providing it). Therefore it suggested that there was no improvement in this function as a result of the design. It also suggested that the design resulted in a slight reduction in the proportion of the on-site need that is met for this function, from 99% in the baseline case to 94% in the design case. This change is insignificant, and is due to the positioning of the footpath (mapped as non-GI and therefore not providing this function) at the southern end of the site, which has a need for this function due to the density of housing at this end (Figure 12).

Despite this function not being an explicit design consideration, the new open water will obviously provide evaporative cooling, even at times when other vegetation on the site dries out and may not transpire. Further, during droughts, if water were abstracted from the river and used to irrigate vegetation (see the ‘accessible water storage’ function in section 2.2.1), this could also help ensure that there was some ongoing evaporative cooling from the vegetation.
Figure 12. Areas where the need for the ‘evaporative cooling’ function has been met by the proposed design or remains unmet, as well as other provision of the function (i.e. in an area which was not identified as needing the function). The need here was mapped as being areas where the density of addresses is greater than 1,500/km².

2.2.9 Flow reduction through surface roughness

A key objective of the River Alt Restoration Project was to “create new, meandering water channels with margins and banks”. As such, water-related functions were an inherent part of the design of the site from the outset.

The mapping suggests that the ‘flow reduction through surface roughness’ function actually reduces slightly on site, with 89% of the GI on-site performing it in the baseline case and 85% in the design case. This is because the removal of areas of scrubland and grassland is not counteracted by the increase in wetland and woodland. However, this decline is not significant given the fairly crude way of mapping surface roughness; it could be that the new habitats actually have a greater surface roughness if measured more accurately.
The mapping also suggests a slight increase in the on-site need for this function being met (Figure 13), from 70% of needs met in the baseline case to 78% in the design case. This is due to the concentration of GI types providing this function in relation to need, here mapped as flood zone 2. In fact, the daylighting of the River Alt through the project will most likely result in an alteration to the flood zones.

In terms of surface roughness of the project site, the eastern banks now have shrub planting, and in some areas the banks have a higher proportion of grass for slope stabilisation, all of which should help to slow runoff. The design has also given careful consideration to the flow of the river itself, and the new river channel will have a slower flow rate compared to when the river was culverted. There are some features, such as boulders and brash bales proposed for the channel, which would slow the flow further whilst adding habitat diversity. But there is a careful balance to be struck with slowing the flow too much, as this could lead to deposition of sediment. Until there is a better understanding of how the river channel will evolve, trees have not been planted below the 1 in 100 year flood level within the floodplain. However, there may be opportunities to add some later, which would further increase roughness. Water flow rates are maintained during low flow periods using a 3m wide channel cut within the floodplain. The size and dimensions are designed to maintain flow speed over a longer distance than when the river was culverted.
2.2.10 Food production

Food production was not a consideration of the design. None of the GI on-site was deemed to be performing this function for either the baseline or design case. There was judged to be some need for the function, due to the proximity of housing areas with smaller domestic gardens to the south of the site (Figure 14), but, as the function is not provided at all on site, this need was not met by the baseline or design cases. There may be some minor opportunities for foraging on the site, for example of brambles, fennel and water mint, which are all growing on the site. Currently no fruit trees have been planted on the site, although this may be a possibility in the future.
Figure 14. Areas where the need for the ‘food production’ function has been met by the proposed design or remains unmet, as well as other provision of the function (i.e. in an area which was not identified as needing the function). The need here was mapped as being in areas where the average size of private domestic gardens is low, or in school grounds.

2.2.11 Green travel route

Two key objectives of the River Alt Restoration Project were the “additional enhancement of linear, waterside, greenspace” and to “create educational and recreational opportunities for the community”. Creating recreational opportunities is clearly linked to the provision of green travel routes.

The mapping suggests a loss of the ‘green travel route’ function on site, with 89% of the GI on-site performing it in the baseline case and 44% in the design case. It also suggests a decrease in the on-site need for this function being met (Figure 15), from 80% of needs met in the baseline case to 34% in the design case. These losses are less significant than they initially sound, and are due to the way that the mapping took into account the informal provision of green travel routes in the baseline case; the site did not previously have formal routes through it, but it was used informally. There
were previously desire lines across the site; at the southern tip of the site, and an east-west route across the site. There is now formal provision of green travel routes on the site, which are of better quality than the informal provision previously. The main pathway runs down the length of the site and along the southern part, with access at various locations, and the paths and gradients have been designed to be accessible to all. The previous east-west desire line has been severed due to the river channel being ‘daylighted’. In addition, there is actually still informal public access on the eastern side of the site, which was not mapped for the design case.

There have been no surveys undertaken of users of the site, but anecdotal evidence suggests that use was previously sporadic but is less so now. There are now more cyclists and walkers using the site. The path across the southern tip of the site is particularly well used by families and school children as a thoroughfare between housing estates and the schools. A new ‘Friends of Croxteth Green Spaces’ group, set up as part of the project, are mapping different walks and things to explore in the area, and take part in monthly ‘walk and explore’ events.

In terms of linking into longer distance routes, to the north of the site there are links to Fazakerley, and discussions are underway with Sustrans about strategic links through to Knowsley. There is a proposal to develop cycle routes along the river to the south of the site and into green spaces such as Croxteth Estate. There is currently no signage of routes on the site, but there may be potential for adding some in the future.
2.2.12 Habitat for wildlife

A key objective of the River Alt Restoration Project was to “increase flora/fauna range/diversity of the river corridors by altering the morphology”. As such, the two functions relating to wildlife were an inherent part of the design of the site from the outset.

The creation of a new wetland and woodland habitats meant that the ‘habitat for wildlife’ function was increased on site, with only 1% of the green infrastructure performing this function in the baseline case, increasing to 38% for the design case. This also helped to meet the need for this function on the site (Figure 16), with an increase from 4% of the on-site need being met in the baseline case to 31% in the design case.
A lot of different habitats have been created on site, and kingfishers and water voles were key species targeted. Daylighting the river itself provides habitat for wildlife; and fish are present in the river. The gravel bed to the river increases aeration of the water and provides habitat for invertebrates. The bank to the east was originally designed as an ‘Eco Zone’, with no formal public access. A meadow has been sown on the west side of the site and mound. The mound has the same soil type as at Woolfall Heath Meadows on the edge of Stockbridge, which was sown by Landlife about 15-20 years ago and is a really good example of a man-made meadow. As part of the engagement in the project, residents were taken to visit this site; photos can be seen on the Facebook page https://www.facebook.com/RiverAltproject. An Ecological Survey of the site noted the presence of bee orchids. Topsoil from this location was stripped and relocated to a known location in the ‘Eco Zone’. Baseline surveys were also undertaken for birds, a water quality and invertebrate survey, and vegetation monitoring is planned for the next year. Japanese knotweed was
present on site and was buried and contained. Potential future, localised, tree planting in the flood plains could help to increase habitat for kingfishers and increase habitat diversity for aquatic wildlife through shading. Some additional habitat features may also be added to the river over time (e.g. boulders or wetland planting), but initially the river is being observed to see how it evolves.

Figure 17. Flora and vegetation that was beginning to emerge on site, 7th April 2015

2.2.13 Heritage
This was not really a consideration for the design. The mapping suggested that none of the GI on-site performed this function for either the baseline or design case. It was also judged that there was no need for the function (Figure 18).

It is clear from the interview that heritage has featured marginally in the delivery of the project. For example, when choosing a new name for the park, Viking Park was suggested as one of 54 names put forward by the local community and made it into the 4 short-listed names that were then voted for by the community (Alt Meadows was ultimately selected as the name). This name reflected the Viking heritage of the area, which can be seen in local names such as Croxteth. However, the design of the park itself does not reflect this Viking heritage. Some of this history could potentially be included in any interpretation or artwork that may be going in on the site (see the ‘cultural asset’ and ‘learning’ functions in sections 2.2.7 and 2.2.15, respectively). A further example is that during construction of the site a 1930s beer bottle from a Knotty Ash brewery was found; it is planned to give this to a local school for a project.
2.2.14 Inaccessible water storage

A key objective of the River Alt Restoration Project was to “create new, meandering water channels with margins and banks”. As such, water-related functions were an inherent part of the design of the site from the outset.

The creation of a new wetland areas in the design meant that the ‘inaccessible water storage’ function was increased on site, with less than 1% of the green infrastructure performing this function in the baseline case, increasing to 38% for the design case. These low-lying floodplain areas tend to be boggy and have been planted with a special riparian mix. Need for this function was not significant, as it has been mapped in areas with impermeable surfaces (Figure 19).
Figure 19. Areas where the need for the ‘inaccessible water storage’ function has been met by the proposed design or remains unmet, as well as other provision of the function (i.e. in an area which was not identified as needing the function). The need here was mapped as being areas with impermeable surfaces.

2.2.15 Learning
A key objective of the River Alt Restoration Project was to “create educational and recreational opportunities for the community”. As such, the ‘learning’ function was an inherent part of the project from the outset. This function is difficult to map, and as a result none of the GI on-site was deemed to be performing it either for the baseline or design case. There was judged to be some need for the function, due to the proximity of dense housing areas (Figure 20), and none of this need was met by the baseline or design cases. However, it is clear that the mapping is not adequate at a site level of getting a handle on this function.
Figure 20. Areas where the need for the ‘learning’ function has been met by the proposed design or remains unmet, as well as other provision of the function (i.e. in an area which was not identified as needing the function). The need here was mapped as being areas where the density of addresses is greater than 1,000/km² or within 100m of educational establishments.

Most of the community engagement to date has been about the green space itself, rather than about issues relating to flooding or the more technical sides of the project. Future engagement could focus more on these areas.

Four local schools have been involved / engaged in the project. For example, De La Salle Academy has created a blog of the project [http://delasalle-riveralt.blogspot.co.uk/](http://delasalle-riveralt.blogspot.co.uk/), which includes video interviews and information on bird species present on site. Schools have also taken part in tree planting events on the site. One of the local primary schools won an eco-award for work in their grounds, as well as on the project. There have also been twice monthly ‘Walk and Talk’ events since November 2013 for the general public and additional walks for local schools and stakeholder organisations. The planned mosaic project (see the ‘cultural asset’ function in section 2.2.7) involves 10 community groups, including all four local schools and another that is further away. Further
funding is being sought from Cash4Kids to run summer activities such as Forest Schools. The plan is to use these to encourage the Friends of Group to run or commission similar activities in the future.

Whilst there is a large sign at the north end of the site on the East Lancashire Road (Figure 21), informing passers-by of the project, there is no on-site interpretation at the moment. Funding will be sought for this once the site has established itself. This will also ensure that there is ongoing activity on the site, rather than the whole project being delivered at once. This interpretation could potentially include information about some of the other functions, for example wildlife (sections 2.2.6 and 2.2.12), heritage (section 2.2.13), and aspects relating to the design of the site for water-related functions.

Figure 21. A sign displayed at the north end of the site and visible from the East Lancashire Road informs passers-by of the project

2.2.16 Noise absorption
Noise absorption was not really a consideration in the project design. However, the increase in tree cover on site has meant that this function has increased, with only 2% of the green infrastructure performing this function in the baseline case, increasing to 15% for the design case. However, the mapping suggests that there is no particular need for the function on site, as it is not near to dense housing which is also near to motorways or A roads (Figure 22).

The site’s orientation is perpendicular to, rather than along, the East Lancashire Road, which is the main source of noise. Tree species and planting densities were not selected with this function in mind. As such, the surrounding housing probably does not benefit from increased noise absorption. If there is to be a development on the eastern edge of the site (it is currently not clear if this will be warehouses/mixed residential), then the site may help to absorb noises for surrounding housing. That said, when you are in the park itself, the mound at the north end by the East Lancashire Road does help to muffle the sound from the road, and the footpaths alongside the river, which are low in places to draw you closer to the water, allow for more natural sounds to be heard.
Figure 22. Areas where the need for the ‘noise absorption’ function has been met by the proposed design or remains unmet, as well as other provision of the function (i.e. in an area which was not identified as needing the function). The need here was mapped as being areas where the density of addresses is greater than 1,000/km$^2$ which also fall within 250m of motorways or A roads.

2.2.17 Pollutant removal from soil and water

A key objective of the River Alt Restoration Project was to “create new, meandering water channels with margins and banks”. As such, water-related functions were an inherent part of the design of the site from the outset. The mapping suggests that the ‘pollutant removal from soil and water’ function actually reduces slightly on site, with 69% of the GI on-site performing it in the baseline case and 57% in the design case. This is because the removal of areas of scrubland and grassland is not counteracted by the increase in wetland and woodland. However, this decline is not significant given the fairly crude way in which this function is mapped. The mapping also suggests an increase in the on-site need for this function being met (Figure 23), from 0% of needs met in the baseline case to 49% in the design case. Again, this is actually not significant as there is not really any need for this function on site.
A water quality baseline was undertaken in 2014, and was repeated, but this was after heavy rain. There were metals and sediments in the water. However, this poorer water quality is largely as a result of upstream runoff, which is too great an influence for the site to make much difference. As the site settles in, there is likely to be an improvement in water quality compared to the previously culverted river. There was not much contamination of the soils on site, only a few hotspots.

Figure 23. Areas where the need for the ‘pollutant removal from soil / water’ function has been met by the proposed design or remains unmet, as well as other provision of the function (i.e. in an area which was not identified as needing the function). The need here was mapped as being areas with the most polluting land uses (refuse collection, industrial, loading bays, lorry parks, and main roads) and downstream of them.
2.2.18 Recreation private
The provision of the ‘private recreation’ function has not been a consideration as the site was designed as a public park.

2.2.19 Recreation public
A key objective of the River Alt Restoration Project was to “create educational and recreational opportunities for the community”. As such, the ‘public recreation’ function was an inherent part of the design of the site from the outset.

The mapping suggests a loss of the ‘public recreation’ function on the site, with 99% of the GI on-site performing it in the baseline case and 47% in the design case. It also suggests a decrease in the on-site need for this function being met (Figure 24), from 99% of needs met in the baseline case to 75% in the design case. These losses are less significant than they initially sound, and are due to the way that the mapping took into account informal recreation in the baseline case; the site did not previously have formal access to it, but it was used informally. There is now formal access to the west side of the site at several locations (Figure 25), which is of better quality than the informal provision previously. In addition, there is actually still informal public access on the eastern side of the site, which was not mapped for the design case.
Figure 24. Areas where the need for the ‘recreation public’ function has been met by the proposed design or remains unmet, as well as other provision of the function (i.e. in an area which was not identified as needing the function). The need here was mapped as areas where the density of addresses is greater than 1,500/km².
Walkers, dog walkers, cyclists, and bird watchers use the site. There is provision of benches on the site at a number of points, and paths and gradients are accessible to all (Figure 26). The paths on the mound at the northern end of the site included in the design were not built. There has been some anti-social use of the site by scramblers (motorbikes), particularly on the mounds of soil left on site (Figure 27). This is not desirable, but there have not been many complaints from residents. When this soil is used or re-positioned it may be less of an issue. Also see the ‘green travel route’ and ‘learning’ functions, which are closely related to this function (sections 2.2.11 and 2.2.15, respectively).
2.2.20 Recreation public with restrictions
The provision of the ‘public recreation with restrictions’ function has not been a consideration as the site was designed as a public park.

2.2.21 Shading from the sun
Shading from the sun was not considered in the design of the site. The mapping suggests that this function actually reduces on site, with 49% of the GI on-site performing it in the baseline case and 40% in the design case. It also suggests a decrease in on-site need for this function being met (Figure 28), from 69% of needs met in the baseline case to 63% in the design case. These losses are due to the removal of larger trees on the site, which is not counteracted by the increase in woodland.

The tree species planted (e.g. pine, birch) will not have especially large canopies, although they will provide some shade. There are some limes and acers along the south east edge and the boundaries of the site. Bench location has not really been considered in relation to shaded areas (Figure 29); some of the benches may have some afternoon shade due to location by steeper banks and heavy standard trees. There is no tree planting in the floodplain at the moment, so no riparian shade is provided, although this may be a consideration in the future. Tree planting may be a possibility here in the future. There is some willow starting to grow in the floodplain, although this is likely to be managed.
Figure 28. Areas where the need for the ‘shading from the sun’ function has been met by the proposed design or remains unmet, as well as other provision of the function (i.e. in an area which was not identified as needing the function). The need here was mapped as being in school grounds, nursing homes, places of worship, parks, and within 25m of bus stops and shops.
2.2.22 Soil stabilisation

A key objective of the River Alt Restoration Project was to “create new, meandering water channels with margins and banks”. As such, soil stabilisation of the banks was an inherent part of the design of the site from the outset.

The increase in relatively steep slopes on the site, covered with appropriate vegetation to stabilise soils, has increased this function, with 1% of the green infrastructure performing this function in the baseline case, increasing to 22% for the design case. There has also been an increase in the on-site need for this function being met (Figure 30), from 44% of the need met in the baseline case to 78% in the design case.

Coir rolls and pallets on the sides of the river channel, and plug planting all help to stabilise soils. The steep channel banks were hydro-seeded as part of the engineering contract as there was quite some time between their construction and the start of the landscape works. The low flow channel will be allowed to erode and soften naturally, to some extent. In addition, planting on the mounds will help to reduce erosion.
Figure 30. Areas where the need for the ‘soil stabilisation’ function has been met by the proposed design or remains unmet, as well as other provision of the function (i.e. in an area which was not identified as needing the function). The need here was mapped as areas where the slope was greater than 20° or within flood zone 3.

2.2.23 Timber production
The production of timber was not considered in the design of the site. However, the potential for this function to be provided has increased, with 1% of the on-site GI having potential to provide it in the baseline case and 30% in the design case. There has also been a corresponding increase in the proportion of on-site need for this function being met (Figure 31), from 1% in the baseline case to 28% in the design case. These increases are due to the increase in tree and woodland areas as a result of the project. This function would only be realised if the woodland were managed for it. But the woodland areas are fairly small, so it is probably unsuitable for such management unless it was part of a more strategic plan to manage urban trees as a timber or wood resource. There may be some scope for smaller scale harvesting of wood products, for example, for community craft projects.
2.2.24 Trapping air pollutants

Trapping air pollutants was not really a consideration in the design of the site. That said, existing trees were retained on the boundary of the site where possible, and shrubs have been planted on the northern mound near the East Lancashire Road; both of which will help to trap air pollutants to some extent. The mapping suggests that this function actually reduces on site, with 69% of the GI on-site performing it in the baseline case and 40% in the design case. This is because the removal of areas of scrubland is not counteracted by the increase in woodland. However, the mapping suggests that there is no particular need for the function on site, as it is not near to dense housing or Core Biodiversity Areas which are also near to motorways or A roads (Figure 22).
Figure 32. Areas where the need for the ‘trapping air pollutants’ function has been met by the proposed design or remains unmet, as well as other provision of the function (i.e. in an area which was not identified as needing the function). The need here was mapped as areas where the density of addresses is greater than 1,000/km² or Core Biodiversity Areas (from Liverpool City Region Ecological Framework), which are also within 100m of motorways or A roads.

2.2.25 Water conveyance
A key objective of the River Alt Restoration Project was to “create new, meandering water channels with margins and banks”. As such, water-related functions were an inherent part of the design of the site from the outset.

The creation of a new water channel in the design meant that the ‘water conveyance’ function was increased on site, with less than 1% of the green infrastructure performing this function in the baseline case, increasing to 10% for the design case. A lot of consideration was given to designing the river channel to maintain flow and not drop too much sediment. Design tweaks included narrowing the low flow channel and adjusting its sinuosity. This will help to reduce upstream flood risk/severity.
The increase in the proportion of the ‘water conveyance’ function on site goes some way towards meeting the mapped need for the function (Figure 3), with an increase from less than 1% of the on-site need being met in the baseline case to 22% in the design case. Whilst these figures sound relatively low, it would never be realistic for 100% of the need to be met for this function, as need was mapped in a broad-brush manner for all impermeable surfaces.

Figure 3. Areas where the need for the ‘water conveyance’ function has been met by the proposed design or remains unmet, as well as other provision of the function (i.e. in an area which was not identified as needing the function). The need here was mapped as being impermeable surfaces, downstream of impermeable surfaces, and downstream of historic flooding locations.

2.2.26 Water infiltration
A key objective of the River Alt Restoration Project was to “create new, meandering water channels with margins and banks”. As such, water-related functions were an inherent part of the design of the site from the outset. However, the mapping suggests that the water infiltration function actually decreases on site, with 48% of the green infrastructure performing this function in the baseline case,
decreasing to 40% for the design case. This is due to the removal of larger trees, which counteracts the increase in woodland on site.

In fact, there is probably little change in water infiltration on site, and there may even be a slight increase. Existing soils were kept on site, so there has been no change in their permeability. There were some areas previously where there was concrete or rubble under a thin layer of soil, and these have now been removed. Where there was hard standing that did not require moving out of the way of the new river channel it remained in situ but was broken up or punctured to allow water infiltration. The paths that have been put in are not permeable but are at a very slight camber to aid drainage and a gravel channel is located along the path boundary.

There is no change in the need for the ‘water infiltration’ function being met on site. However, this need is mapped in a fairly crude way, as it only highlights need where there are impermeable surfaces (Figure 34).
2.2.27 Water interception

A key objective of the River Alt Restoration Project was to “create new, meandering water channels with margins and banks”. As such, water-related functions were an inherent part of the design of the site from the outset. However, the mapping suggests that the water interception function actually decreases on site, with 48% of the green infrastructure performing this function in the baseline case, decreasing to 40% for the design case. This is due to the removal of larger trees, which counteracts the increase in woodland on site. The new plantings do include some evergreen species which will help to intercept water throughout the year, including ornamental shrubs, and Corsican and Scots pine.

There is no change in the need for the ‘water interception’ function being met on site. However, this need is mapped in a fairly crude way, as it only highlights need where there are impermeable surfaces (Figure 35).
2.2.28 Wind shelter

Wind shelter was not really a consideration in the design of the site. The mapping suggests that this function actually reduces on site, with 49% of the GI on-site performing it in the baseline case and 40% in the design case. It also suggests a decrease in on-site need for this function being met (Figure 36), from 68% of needs met in the baseline case to 61% in the design case. These losses are due to the removal of larger trees on the site, which is not counteracted by the increase in woodland.

The prevailing winter wind direction for the site is from SSE to NNW. This is also the main orientation of the site, which was determined by the river channel. The site is therefore quite exposed and can be a wind tunnel at times, although the lower areas by the river tend to be more sheltered. Some of the benches are next to steeper banks which may help to shelter them from wind from certain directions (e.g. Figure 29). Due to the orientation of the site, the project has probably not made any difference in terms of sheltering surrounding residential areas from this wind.
Figure 36. Areas where the need for the ‘wind shelter’ function has been met by the proposed design or remains unmet, as well as other provision of the function (i.e. in an area which was not identified as needing the function). As the prevailing winter wind direction is from SSE, the need here was mapped as being NNW-SSE oriented roads and the SSE sides of houses, parks, bus stops, shops, school grounds, nursing homes, and places of worship (where they are not sheltered by buildings).
3. Green Infrastructure Economic Valuation

We have adjusted the economic valuation undertaken for the baseline report so that it takes into account amendments to the proposed design (e.g. as in Figure 1 and Figure 2).

This is a valuation of some of the additional green infrastructure benefits provided by the project, calculated using the Green Infrastructure Valuation Toolkit. This economic value will be accrued over 30 years following the completion of the project.

<table>
<thead>
<tr>
<th>BENEFITS</th>
<th>BENEFIT MONETISATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benefits groups</td>
<td>GVA value</td>
</tr>
<tr>
<td>1 Climate Change Adaptation &amp; Mitigation</td>
<td>£0</td>
</tr>
<tr>
<td>2 Water management &amp; Flood Alleviation</td>
<td>£1.4k</td>
</tr>
<tr>
<td>3 Place &amp; communities</td>
<td>n.a.</td>
</tr>
<tr>
<td>4 Health &amp; Well-being</td>
<td>£975</td>
</tr>
<tr>
<td>5 Land &amp; Property Values</td>
<td>n.a.</td>
</tr>
<tr>
<td>6 Investment</td>
<td>n.a.</td>
</tr>
<tr>
<td>7 Labour Productivity</td>
<td>£1.2m</td>
</tr>
<tr>
<td>8 Tourism</td>
<td>£0</td>
</tr>
<tr>
<td>9 Recreation &amp; leisure</td>
<td>n.a.</td>
</tr>
<tr>
<td>10 Biodiversity</td>
<td>n.a.</td>
</tr>
<tr>
<td>11 Land management</td>
<td>£445k</td>
</tr>
<tr>
<td>TOTAL ECONOMIC VALUE OF BENEFITS</td>
<td>£1.7m</td>
</tr>
</tbody>
</table>

These three figures should not be added together, as they represent different kinds of value.

The value of recreation & leisure benefits has not been included in the other economic value total because of the risk of double counting.

GVA (Gross Value Added) is a measure of the additional income to businesses that will result from the project. For example, if workers are encouraged to walk or cycle to work more by the scheme, they will likely be healthier, and therefore off work less, which will increase the productivity of the business.

This monetisation of the benefits can be compared with the project costs:

- Capital: £1.816m
- Management and maintenance: £23k per annum

The net present value of these investments together comes to £2.3m.

It is interesting to note that the investment will not be recouped by the GVA benefit calculated here alone, but that the total benefit, taking into account land and property value and other economic value, will easily exceed it. Note also that the figures presented here are only part of the total value of the project’s benefits – there are many benefits that cannot yet be valued using the toolkit.

The input values for the valuation of are a mixture of information about the site as it is post-project, and estimates of the impact it could have (for example, in terms of recreation and commuting). The values used, together with the completed toolkit calculator, are available from The Mersey Forest.

As well as monetary values, the toolkit provides other quantification of some benefits:

<table>
<thead>
<tr>
<th>BENEFITS</th>
<th>Functions</th>
<th>Tools</th>
<th>BENEFIT QUANTIFICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Climate Change Adaptation &amp; Mitigation</td>
<td>Reduction of urban heat island effect</td>
<td>1.4 Reduced peak summer surface temperatures</td>
<td>0.37 °C in surf. temperature reduction</td>
</tr>
<tr>
<td></td>
<td>Carbon storage and sequestration</td>
<td>1.7 Carbon stored and sequestered in woodland and forests</td>
<td>3 kgCO₂ sequestered</td>
</tr>
<tr>
<td>2 Water management &amp; Flood Alleviation</td>
<td>Interception, storage and infiltration of rainfall</td>
<td>2.1 Energy and carbon emissions savings from reduced stormwater volume entering combined sewers</td>
<td>1,640,000 L/yr water diverted from sewers</td>
</tr>
<tr>
<td>3 Place &amp; communities</td>
<td>Catalyst for community cohesion and pride</td>
<td>3.2 Increase in volunteering</td>
<td>20 new volunteers</td>
</tr>
<tr>
<td>4 Health &amp; Wellbeing</td>
<td>Provision of attractive opportunities for exercise</td>
<td>4.2 Reduced mortality from increased walking and cycling</td>
<td>0.13 lives saved per yr</td>
</tr>
<tr>
<td></td>
<td>Air pollution removal</td>
<td>4.6 Avoided costs for air pollution control measures</td>
<td>Between 371 and 1,980 work days lost avoided per yr</td>
</tr>
<tr>
<td>7 Labour Productivity</td>
<td>Attraction and retention of high quality staff</td>
<td>7.3 Savings from reduced absenteeism from work</td>
<td>Between 371 and 1,980 work days lost avoided per yr</td>
</tr>
<tr>
<td>9 Recreation &amp; leisure</td>
<td>Provision of recreation opportunities</td>
<td>9.1 Recreational value for use by local population</td>
<td>32,000 Local users</td>
</tr>
<tr>
<td>11 Land management</td>
<td>Land management</td>
<td>11.2 Employment supported by land management</td>
<td>2.5 FTE jobs</td>
</tr>
</tbody>
</table>
4. Summary, Recommendations and Conclusion

This report is intended as a resource to inspire the functionality-based design of future projects, inform ongoing maintenance of the Alt Meadows Park, and provide a framework for similar assessments in the future.

It is clear from the assessment that the River Alt Restoration Project delivered on green infrastructure functionality relating its four main objectives (1. create new, meandering water channels with margins and banks; 2. increase flora/fauna range/diversity of the river corridors by altering the morphology; 3. additional enhancement of linear, waterside, greenspace; 4. create educational and recreational opportunities for the community). In many cases this was evident in both the mapping and from the interview and site visit.

In other instances the mapping, which is often fairly broad brush in nature, did not pick up on the detail relating to the functions that was more easily assessed through the interview. This highlights the importance, at a site level, of always combining the mapping method with an interview in order to gain a greater understanding of functionality. It also highlights the importance of understanding how the function and needs maps have been compiled, and being able to interpret what this means at a site level. It is recommended that future mapping of these functions is re-considered and alternative approaches are explored that may be more appropriate at a site level.

The interview also highlighted that many green infrastructure functions were not really a consideration of the design. In some cases, whilst functionality has been provided to some extent as a by-product of the design, it may have been possible to build in a greater level of functionality if this had been considered earlier or through future management options. It is recommended that funding bids for ongoing maintenance and activity on the site builds in these functions where appropriate. It is also recommended that the green infrastructure functionality list is used as a checklist when designing future projects (and the green infrastructure function and needs maps as appropriate), as it may be that even if not a key consideration of the project, amendments can be made to the design to increase functionality at no additional cost.