

Beckenham Place Park (III)|Lewisham Council|2020

The Lewisham Council

Beckenham Place Park Regeneration



WPI

An Interactive Qualifying Project Report

submitted to the Faculty of

WORCESTER POLYTECHNIC INSTITUTE

**in partial fulfilment of the requirements for the degree of Bachelor of Science
by:**

Brian Earl | CS-IMGD | '21

Noah Goren | ME | '21

Connor Guyette | BME | '21

Revant Mahajan | RBE-CS | '21

John Trainor | AE | '21

Date:

11th May 2020

Report submitted to:

Lucy Mitchell, Community Engagement Officer, Lewisham Council

Advisors: Professor Dominic Golding | Professor Suzanne LePage

This report represents the work of WPI undergraduate students submitted to the faculty as evidence of completion of a degree requirement. WPI routinely publishes these reports on its website without editorial or peer review. For more information about the projects program at WPI, please see <http://www.wpi.edu/academics/ugradstudies/project-learning.html>

Abstract

The goal of our project was to aid the Borough of Lewisham in the South of London with their ongoing regeneration of Beckenham Place Park. The project included focus on both the park itself as well as the River Ravensbourne flowing through its eastern side. We developed a web-based tool to aid in data collection, which gives users the ability to work offline and sync data to a master spreadsheet when online. We developed custom macros to conduct in-depth data analysis, which include tools to perform data significance tests to identify trends and patterns among park user's survey responses. We also investigated river restoration case studies that were comparable to the River Ravensbourne project where we identified the best practices and lessons learned.

Acknowledgments

Our team would like to thank several people from WPI and Lewisham Council who made our project possible. First, we would like to thank Lucy Mitchell from the Lewisham Council. Lucy was very supportive of our project, even after switching gears due to the COVID-19 Pandemic. Lucy provided continuous insight, feedback, and resources that we needed to complete the project. We are extremely grateful for the opportunity of working with the Lewisham Council.

Secondly, we would like to thank our advisors, Professors Dominic Golding and Suzanne LePage, for guiding us through this tough time. With a completely new setting for our IQP, they both did an incredible job helping us every step of the way, providing us with regular guidance and feedback. With this, we were able to reach our goals and produce the highest quality of work from home.

Executive Summary

Since 2016, the WPI London Project Center has assisted the Lewisham Council with various aspects of the regeneration of Beckenham Place Park. Building on a previous evaluation of Beckenham Place Park that was conducted in 2018 (Flores et. al, 2018), the goal of our project was to aid the Lewisham Council in planning further restoration efforts with a special emphasis on the eastern portion of the park and the River Ravensbourne. We identified the following objectives:

Objective 1: Assess public opinions about Beckenham Place Park.

Objective 2: Streamline the data collection process.

Objective 3: Identify best practices for the restoration of the River Ravensbourne.

We performed a detailed analysis of the data collected in 2018 to determine public opinion on recent and ongoing restoration efforts. Due to time constraints, the results of the 2018 team's analysis were presented mostly in the form of summary statistics, simple bar graphs and pie charts. Our analysis of this data consisted primarily of testing for significant differences in responses based on different groups of visitors.

The Beckenham Place Park survey and observational sheets featured several different types of responses. Among these were multiple-choice responses, check-all-that-apply (CATA) responses and ranking responses. Using Visual Basic and Microsoft Excel, we developed a series of data analysis tools, which can be used with very little expertise with either Microsoft Excel or statistics. The tools automate the Chi-squared and Kruskal-Wallis tests, thereby streamlining the data analysis process. The tools were used to test for significance and make connections between different groups of visitors and their responses. When applied to the 2018 survey and observational data, the tools showed that factors such as age, gender, ethnicity, and location in the park significantly affected public opinion and behaviors. We determined, for example, that older visitors (aged 50 and older) have a significantly better understanding of the park's heritage than younger. Likewise, we determined that children and families tend to visit parks the most on Sunday afternoons and spend their time in the playground area. We delivered the tools to the Lewisham Council for future usage, along with a user guide (Trainor, 2020, Data Analysis Tools User Guide) on how to implement and use them.


In addition to data analysis, data collection was a key component of our project. We aimed to streamline the process of data collection through the standardization of the tools used. The two major data collection tasks for ongoing evaluation efforts of Beckenham Place Park are conducting surveys and observational studies. Previously, observational studies were conducted using physical observational sheets or QuickTap surveys. The data from this then had to be manually ported over to a master database. This data collection tool and methodology had several shortcomings like redundant data entry, missing metadata that we wanted to resolve.

From our conversations with Lucy Mitchell and our own analysis of the observational study conducted in the previous IQP, we determined and implemented the following design criteria for the observational sheet:

- Simultaneous multi-user usability
- Quick and easy to fill out
- Usable on mobile phones and tablets
- Operational both online and offline
- Precise location mapping
- Ability to export data to an Excel sheet.

Taking all these considerations into account, we built a web tool for the observational sheet that can record data offline. The web page only needs to be loaded once on the device to be used. Since it is a web tool, multiple users can access it at the same time on their phones and tablets. It includes an interactive map to determine geographical location, as well as the questions from the observation sheets. The survey can be filled out by selecting checkboxes and filling out the text boxes. The complete button at the end verifies all the required data fields are filled out.

Please click on the map below to select the location of the observed activity 3. Please fill in data for each individual (Scroll horizontally)



1. Weather *

Cloudy

Rainy

Sunny

Windy

Overcast

2. State *

Alone

Family Group

Other Group

| Gender | Zone | Age |
|------------------------------|------------------------------|-----------------------------|
| <input type="radio"/> Male | <input type="radio"/> Zone 1 | <input type="radio"/> 0-4 |
| <input type="radio"/> Female | <input type="radio"/> Zone 2 | <input type="radio"/> 5-16 |
| | <input type="radio"/> Zone 3 | <input type="radio"/> 17-24 |
| | <input type="radio"/> Zone 4 | <input type="radio"/> 25-49 |
| | <input type="radio"/> Zone 5 | <input type="radio"/> 50-69 |
| | | <input type="radio"/> 70+ |

4. Any Comments?

1)

Figure ES1: Observational Tool

The final portion of our project included researching relevant case studies of projects that reflect the attributes the Lewisham Council is looking for in the Beckenham Place Park restoration. These case studies were chosen to reflect a range of size and complexity, but all the projects had similar goals as the BPP restoration. The similarities and differences among the case studies were tabulated, and we reported how they addressed similar challenges faced in the BPP restoration effort. Additionally, the restoration experts we contacted provided information on projects they have worked on in the past.



Figure ES2: Locations of the six case studies

Table ES1: River Restoration Attributes

| | Year Completed | Cost (£) | Flood Mitigation | Naturalization | Public Engagement | Accessibility (Paths, bridges, walkways, etc.) | Aesthetic Appeal | Structure Additions (Buildings) |
|---------------------------------------|-------------------|-------------------|------------------|----------------|-------------------|--|------------------|---------------------------------|
| River Ravensbourne at (BPP) | In Process | In Process | X | X | X | X | X | X |
| River Ravensbourne at Ladywell Fields | 2008 | 400,000 | | X | X | X | X | X |
| River Brent | 2003 | 1,400,000 | X | X | X | X | X | |
| River Quaggy | 2004 | 14,700,000 | X | X | | X | X | |
| River Skerne | 1995 | 1,758,621 | X | X | | X | X | |
| River Wandle | 2012 | N/A | X | X | X | | X | |
| Mayesbrook River | 2012 | 5,000,000 | X | X | X | X | X | |

Some of the desired outcomes for the Beckenham Place Park River Ravensbourne project include developing effective flood mitigation, preserving natural scenery and biodiversity, creating a visually appealing and functional space for the public, etc. We found that the most prominent aspects throughout the case studies we reviewed were public involvement, flood mitigation, aesthetic enhancement, and naturalization improvements.

In cases such as Ladywell Fields, the River Skerne, and the River Brent, we saw different ways in how people perceived the park purely from its look and welcoming features. In Ladywell Fields, the river was moved to the park’s center to become more of a focal point within the park. At the River Skerne, new flora was introduced to improve the aesthetics of the area, resulting in a 40% increase in visitation rates and a 90% increase in the public’s perception of visual appeal of the scenery. Public engagement is also a key consideration for the restoration at BPP. The River Brent, which runs through Tokyngton Park, the Borough of Brent, also had a focus on

community engagement. They surveyed the public on what they would like to see done within the park and they were physically able to connect two disconnected communities before the restoration of the river.

Authorship

| Chapter and Section Numbers | Primary author(s) | Editor(s) |
|---|--------------------------|--------------------|
| Abstract | N.G, B.E, C.G | J.T |
| Acknowledgments | C.G | J.T, B.E |
| Executive Summary | N.G, J.T, C.G | B.E, R.M |
| Chapter 1. Introduction | B.E | C.G, N.G, J.T, R.M |
| Chapter 2. Background | C.G, B.E, N.G, J.T, R.M | |
| 2.1 Promoting green spaces in London | R.M | C.G, B.E, N.G, J.T |
| 2.2 Green space in Lewisham | J.T | C.G, B.E, N.G, R.M |
| 2.3 Beckenham Place Park | C.G, B.E | N.G, J.T, R.M |
| 2.4 Remaining restoration efforts | N.G, J.T | C.G, B.E, R.M |
| Chapter 3. Scope of work | N.G, C.G | C.G, B.E, N.G, R.M |
| Chapter 4. Refined tools to assess visitor opinions of Beckenham Place Park | J.T | C.G, B.E, N.G, R.M |
| Chapter 5. Observational study tool | R.M | C.G, B.E, N.G, J.T |
| 5.1 Evaluation of existing data collection process | R.M | C.G, B.E, N.G, J.T |
| 5.2 Observational tool design | R.M | C.G, B.E, N.G, J.T |
| Chapter 6. River restoration best practices for BPP | C.G, B.E, N.G | J.T, R.M |
| 6.1 River restoration expert interviews | N.G, C.G | B.E, J.T, R.M |
| 6.2 Case study review | N.G | C.G, B.E, J.T, R.M |

| | | |
|---|-------------------------|--------------------|
| 6.2.1 River Ravensbourne at Ladywell Fields | N.G | C.G, B.E, J.T, R.M |
| 6.2.2 River Brent at Tokyngton Park | C.G | B.E, N.G, J.T, R.M |
| 6.2.3 River Skerne | B.E | C.G, N.G, J.T, R.M |
| 6.2.4 River Wandle restoration project: Butter Hill Phase 3 | N.G | C.G, B.E, J.T, R.M |
| 6.2.5 Mayesbrook Park restoration | R.M, C.G | B.E, N.G, J.T |
| 6.2.6 Quaggy River restoration | B.E | C.G, N.G, J.T, R.M |
| Chapter 7. Conclusions and recommendations | C.G, B.E, N.G, J.T, R.M | |
| 7.1 Data analysis | J.T | C.G, B.E, N.G, R.M |
| 7.2 Observational tool | R.M | C.G, B.E, N.G, J.T |
| 7.3 River restoration case studies | C.G, N.G, B.E | J.T, R.M |

Table of Contents

| | |
|--|------|
| Abstract | i |
| Acknowledgments..... | ii |
| Executive Summary | iii |
| Authorship | viii |
| Table of Contents | x |
| List of Figures..... | xii |
| List of Tables | xiv |
| Chapter 1. Introduction | 1 |
| Chapter 2. Background..... | 2 |
| 2.1 Promoting green spaces in London..... | 2 |
| 2.2 Green space in Lewisham | 5 |
| 2.3 Beckenham Place Park..... | 7 |
| 2.4 Remaining restoration efforts..... | 12 |
| Chapter 3. Scope of work | 15 |
| Chapter 4. Refined tools to assess visitor opinions of Beckenham Place Park..... | 16 |
| Chapter 5. Observational study tool..... | 26 |
| 5.1 Evaluation of existing data collection process | 26 |
| 5.2 Observational tool design..... | 27 |
| Chapter 6. River restoration best practices for BPP..... | 33 |
| 6.1 River restoration expert interviews..... | 33 |
| 6.2 Case study review | 34 |
| 6.2.1 River Ravensbourne at Ladywell Fields..... | 35 |
| 6.2.2 River Brent at Tokyngton Park | 40 |
| 6.2.3 River Skerne..... | 42 |

| | |
|---|----|
| 6.2.4 River Wandle restoration project: Butter Hill Phase 3 | 44 |
| 6.2.5 Mayesbrook Park restoration | 46 |
| 6.2.6 Quaggy River restoration..... | 48 |
| Chapter 7. Conclusions and recommendations..... | 50 |
| 7.1 Data analysis..... | 50 |
| 7.2 Observational tool..... | 50 |
| 7.3 River restoration case studies | 51 |
| References | 53 |
| Appendices | 58 |
| Appendix A: Influence of various factors on observational data..... | 58 |
| Appendix B: Revised survey..... | 61 |
| Appendix C: Observational study sheet | 67 |
| Appendix D: Observational tool user guide..... | 68 |
| Appendix E: River expert interview questions | 74 |

List of Figures

| | |
|---|----|
| Figure 1. Green spaces in London | 2 |
| Figure 2. Map of green spaces in Lewisham | 5 |
| Figure 3. The original (green) and current (red) boundaries of Beckenham Place Park | 7 |
| Figure 4. Stables and garden before the fire | 8 |
| Figure 5. Public swimming lake of Beckenham Place Park..... | 10 |
| Figure 6. Volunteers planting trees as part of Trees for Cities program..... | 11 |
| Figure 7. Vintage market community event outside of the mansion | 12 |
| Figure 8. Beckenham Place Park overview | 13 |
| Figure 9. Schematic of restorations initially planned for the eastern side of BPP | 14 |
| Figure 10. Frequency of large-scale events vs. gender | 20 |
| Figure 11. Distribution of responses to method of travel..... | 24 |
| Figure 12. Distribution of responses to visit frequency | 25 |
| Figure 13. Previous routes taken for observational studies | 27 |
| Figure 14. The interactive map of Beckenham Place Park with a marker | 29 |
| Figure 15. Zones modified | 29 |
| Figure 16. Integrated observational data entry form..... | 30 |
| Figure 17. Error displayed for an incomplete observation | 31 |
| Figure 18. A counter to show the number of locally stored data entries..... | 31 |
| Figure 19. Alerts displayed after saving and syncing | 32 |
| Figure 20. Locations of the six case studies | 34 |
| Figure 21. Plan for Ladywell Field restoration..... | 36 |
| Figure 22. Ladywell Fields improvement in WFD status | 37 |
| Figure 23. Initial space for backwater..... | 38 |
| Figure 24. Finished backwater with platform and seating | 39 |
| Figure 25. Ladywell Fields before restoration..... | 39 |
| Figure 26. River meandering through the middle of the park | 39 |
| Figure 27. Ladywell Fields after restoration completion | 39 |
| Figure 28. River Brent running through Tokyngton Park..... | 40 |
| Figure 29. River Brent at Tokyngton Park | 41 |
| Figure 30. River Brent footbridge..... | 41 |

| | |
|--|----|
| Figure 31. Map of River Skerne restoration area..... | 42 |
| Figure 32. Walking path built around river | 43 |
| Figure 33. (a) Fence before restoration, (b) Fence after restoration | 43 |
| Figure 34. Map of River Wandle - Butter Hill restoration..... | 44 |
| Figure 35. (a) before and (b) after Butter Hill restoration..... | 45 |
| Figure 36. (a) before and (b) after weir removal | 46 |
| Figure 38. Open field along the brook | 47 |
| Figure 37. Mayesbrook project phase 1 landscape masterplan | 47 |
| Figure 39. Enclosed portion of brook | 47 |
| Figure 40. Map of Quaggy River..... | 48 |
| Figure 41. Concrete bridge created during the 1950 channelization | 49 |
| Figure 42. Cycle of a restoration project..... | 52 |

List of Tables

| | |
|--|----|
| Table 1. Economic Value of London Parks..... | 3 |
| Table 2. Beckenham Place Park restoration milestones..... | 9 |
| Table 3. Survey question statistical tests breakdown..... | 17 |
| Table 4. Factors of interest | 19 |
| Table 5. Kruskal-Wallis test Excel results: Understanding of the heritage of BPP vs. age | 21 |
| Table 6. 2018 Survey data analysis results/conclusions | 22 |
| Table 7. River restoration attributes..... | 35 |
| Table 8. WFD classification | 37 |

Chapter 1. Introduction

London is one of the greenest cities in the world with almost half the city being green space, including small and large parks, garden allotments, and nature reserves. The Greater London Authority (GLA) recognizes the tremendous value of parks to the economy and to the health and wellbeing of citizens. In 2019, the GLA declared London a National Park City to promote green space and improve public access.

The London borough of Lewisham also recognizes the value of green space and is engaged in an ambitious effort to improve and promote its parks. More than 50% of the borough is greenspace, making it the most highly rated borough for parks in 2018 (Good Parks for London Report 2018). At 97 hectares, Beckenham Place Park (BPP) is Lewisham's largest park and the jewel in the crown of Lewisham's park system. Since 2016, Lewisham has engaged in a major effort to restore the park to its former glory with the renovation of historic buildings, the creation of a new swimming lake and other play areas, rewilding of a previous golf course, and the establishment of new footpaths.

Building on a previous evaluation of Beckenham Place Park that was conducted by WPI students in 2018 (Flores, Howell-Munson, Riley, Schmidt, 2018), the goal of our project is to aid the Lewisham Council in planning further restoration efforts with a special emphasis on the eastern portion of the park and the River Ravensbourne. We identified the following objectives to achieve this goal:

Objective 1: Assess public opinions about Beckenham Place Park.

Objective 2: Streamline the data collection process.

Objective 3: Identify best practices for the restoration of the River Ravensbourne.

We treat each objective in a separate chapter. Chapter 4 focuses on our deep analysis of the survey and observational data collected in 2018. We developed tools in Microsoft Excel to perform statistical tests and determine that factors such as age, gender and ethnicity influence visitors' opinions and usage of the park. The tools and a user guide were delivered to the Council for their future usage. Chapter 5 focuses on how we used the previous protocols for collecting data in the park to develop new tools to make the data collection process smoother. Finally, Chapter 6 features an overview of various river restorations case studies, from these we were able to find the best practices of river restoration to aid the Lewisham Council with the River Ravensbourne.

Chapter 2. Background

With the renovation of the western side of the Beckenham Place Park complete, the Lewisham Council wants to continue with the regeneration of the eastern side of the park. The Council also wants to include the River Ravensbourne in these restoration plans. In this chapter, we focus on the existing green spaces in London and Lewisham, the history of the Beckenham Place Park, the restoration so far and the remaining efforts.

2.1 Promoting green spaces in London

London is one of the greenest cities in the world, with 47% classified as green space (Figure 1). Of this 47%, approximately 33% is natural habitats within open spaces and 14% is estimated to be domestic gardens and other vegetated private land (Raven-Ellison, 2017). The open natural habitats comprise 3,000 parks, 30,000 allotments and 142 local nature reserves, which are home to over 13,000 species of wildlife (Raven-Ellison, 2017).



Figure 1. Green spaces in London (Raven-Ellison, 2017)

These green spaces offer a variety of benefits to Londoners and are considered an asset valued at over £90 billion. Table 1 shows these benefits along with their monetary values to public services, businesses, and residents. The residents benefit the most from these green spaces, amounting to approximately £82.4 billion which accounts for 90% of all the value. The

greatest benefit to the residents is the increase in the monetary value of residential properties. People prefer to live and pay extra for places that have aesthetic appeal and easy access to green spaces. The Greater London Authority (GLA) found that having an urban park within 600 meters of property added between 1.9% to 2.9% to the property's value. This amounts to £55.9 billion in benefits according to Table 1. Green spaces also stimulate tourism and attract businesses, further boosting the economy.

Table 1. Economic Value of London Parks (Natural capital accounts for public green space in London, 2017)

| VARIABLE | PUBLIC SERVICES (£bn) | RESIDENTS (£bn) | BUSINESSES (£bn) | TOTAL (£bn) | SHARE % |
|----------------------|-----------------------|-----------------|------------------|-------------|---------|
| Recreation | | 17 | | 17 | 19 |
| Mental health | 1.4 | 3.4 | 2 | 6.8 | 7 |
| Physical health | 2.1 | 5.5 | 3.1 | 10.7 | 12 |
| Residential property | | 55.9 | | 55.9 | 61 |
| Carbon (soil) | | | | 0.2 | 0 |
| Carbon (trees) | | | | 0.1 | 0 |
| Temperature | | 0.6 | | 0.6 | 1 |
| Gross asset value | 3.5 | 82.4 | 5.1 | 91.3 | 100 |
| | 4% | 90% | 6% | 100% | |

By providing opportunities for solitude, relaxation, and recreational activities, green spaces promote better physical and mental health. It is estimated that green spaces provide £6.8 billion worth of economic value for mental health in Greater London (Table 1). Additionally, parks contribute to better physical health by lowering obesity and improving cardiovascular and respiratory health to the tune of £10.7 billion.

Green spaces also improve environmental conditions in the city. They cool the air by providing shade and because vegetative ground cover absorbs less heat than man-made surfaces. Green spaces reduce the temperature between 1-2 degrees Celsius on a typical summer day. Green spaces also improve the air quality of urban areas through pollution absorption (Benefits of Green Infrastructure, 2010). Furthermore, these green spaces also aid in climate change mitigation through carbon capture. According to the National Assessment of UK Forestry and Climate Change, a 4% increase in the UK woodland area can abate approximately 10% of total

greenhouse gas emissions. All these environmental benefits improve the quality of life and add an economic value of about £1 billion/year for the residents.

The Greater London Authority (GLA) has heavily invested in the improvement and maintenance of green spaces. Multiple programs were created to improve the quality of existing green spaces and to create new ones. For example, the Big Green Fund (2013-2015) was intended to create high-quality open spaces that connect residential areas, town centers, and transport hubs with parks, open spaces, and rivers. The Pocket Parks Program (2013-2015) created over 100 pocket parks (small areas of inviting public space with trees and greenery for all the community residents to enjoy) across 26 boroughs. The Mayor's Street Tree program was one of the longest-running programs, running from 2008-2015. The program was designed to enhance London's identity as one of the leafiest cities and create partnerships to plant and care for 20,000 street trees.

Even though these programs have improved the parks in London, access to parks remains uneven. About 20% of the wealthiest wards have almost five times more green space as compared to the poorest 10% (Public Health England, 2014). Currently, one-fifth of greater London is designated as publicly accessible parks but there are plans in place to improve the number of these parks and their accessibility.

London was declared a National Park City on the 22nd of July 2019 by signing the National Park City Charter. The National Park City Foundation (NCPF), in association with World Urban Parks and Salzburg Global Seminar, created the first International Charter for National Park Cities. While London is the first city to sign this charter, NCPF aims to have at least 25 National Park Cities by 2025. As a National Park City, London will try to be greener in the future than it is now and provide its residents with an opportunity to better connect with nature. The city will protect its network of parks and green spaces and improve the wildlife habitat to provide every child with an opportunity to explore and learn outdoors. Furthermore, there will be a growing emphasis on the need for cleaner air, more green spaces, and sustainable development where buildings are more than just a design of steel and concrete (London National Park City, 2020). To help achieve all this, the GLA created a £12 million Green City Fund with several affiliated programs, including the Community Tree Planting and Green Space Grant which has awarded about £5 million to more than 250 projects since 2017, and London's Urban

Forest funds and Community Engagement funds which have awarded £3 million to plant trees and £1 million to improve community engagement respectively (Greener City Fund, 2020).

While London is committed to investing in green spaces and a sustainable future, much of the responsibility of creating and regenerating green spaces falls on London’s individual boroughs. The borough of Lewisham is among many of the city’s 32 boroughs that are actively committed to becoming greener.

2.2 Green space in Lewisham

The borough of Lewisham features a variety of parks and nature reserves. Within Lewisham there are 514 hectares of publicly accessible green space (Vivid Economics, 2019), including 45 local parks (Local parks, 2020). The locations of these green spaces are shown in Figure 2 below:



Figure 2. Map of green spaces in Lewisham (Mayow Park Masterplan Final Draft, 2009)

Lewisham's green spaces are used extensively by residents and non-residents of the borough. A 2011 survey of 431 Lewisham park users indicated that 47% of users visited a park or open space daily (Open Space Strategy 2012-2017, 2011). Lewisham's local parks provide visitors with numerous opportunities for recreation, including sports facilities such as basketball courts, tennis courts, and cricket pitches. As such, Lewisham's green spaces serve as social hubs for the community.

In its open space strategy, the Lewisham Council acknowledges community engagement as a key reason to improve and expand public parks. There are many opportunities to volunteer in parks for events that draw much recognition from the public. To support daily use and special events, public parks must be adequately maintained. Beginning in 2000, the Lewisham Council contracted a private company, Glendale, to maintain the local parks and their facilities citing the role parks play in social cohesion and the importance of maintaining green spaces for the benefit of the public (Glendale managed parks among the best in London, 2019). “[Glendale combines] events management, sports development and infrastructure maintenance with traditional grounds maintenance” (Glendale managed parks among the best in London, 2019).

While short term maintenance is critical for the upkeep of parks, long-term sustainability is among the foremost interests of policymakers. Public green spaces are an asset to a highly populated area that is expected to grow in the coming decades. Furthermore, they are the first line of defense when fighting growing issues such as climate change and pollution. From a financial standpoint, public green spaces in Lewisham are valued at over £460 million/year for their ability to regulate temperature, store carbon and provide recreational space (Vivid Economics, 2019). It is critical that policymakers adapt the green spaces to maximize these benefits and create a more sustainable future.

The Lewisham Council is committed to promulgating policies that will provide resources for green spaces and promote a more sustainable future. Establishing low emission zones, promoting cycling, and providing incentives for electric vehicle use, such as increased accessibility to charging points, are some schemes the council hopes will rectify growing concerns about pollution (Making Lewisham Greener, 2020). Furthermore, the Council continues to maintain and restore the green spaces with the aim to make Lewisham the greenest borough in London. Lewisham has received the Green Flag Award, which “recognizes and rewards well-managed parks and green spaces, setting the benchmark standard for the

management of recreational outdoor spaces across the United Kingdom and around the world” (What is the Green Flag Award, 2020). The Council continues to restore public spaces through its own capital expenditure with help from non-government organizations such as the Heritage Lottery Fund. Several of the borough’s 45 parks have been restored in recent years, including Beckenham Place Park, which is considered a jewel in the borough.

2.3 Beckenham Place Park

Beckenham Place Park was established as a public park in 1927. Prior to that, the land was owned by the Cator family. John Cator was a prominent timber merchant and member of the House of Commons from 1772 to 1793 (Mitchell, 2018). The park, when it was opened to the public in 1927, was about half its current size (Figure 3). During World War II an Italian prisoner-of-war camp called “Summerhouse” was built on Crab Hill on the western side of the park, and the area surrounding the stables was transformed into a farm to support it (Mitchell, 2020). After World War II, the park was managed by the Greater London Council (GLC) and London County Council (LCC) until 1971, when the control and ownership of the park shifted to the London Borough of Lewisham (Mitchell, 2018).

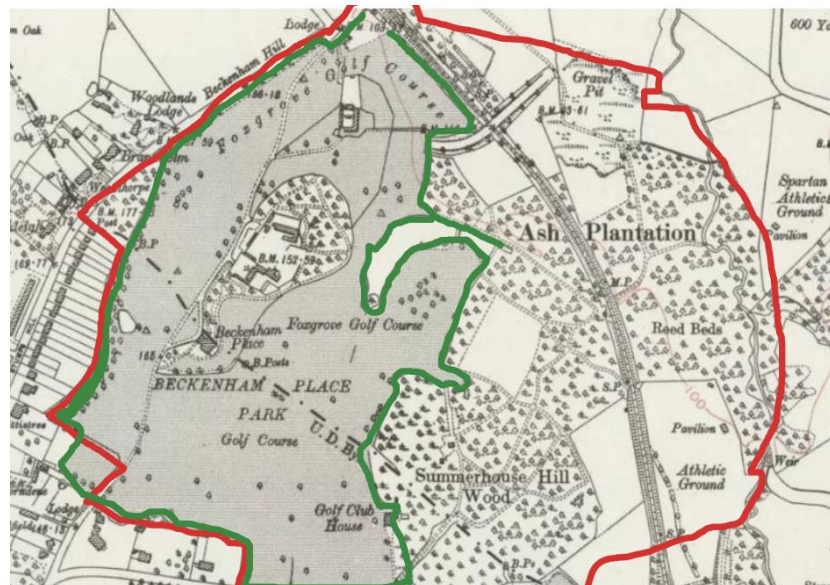


Figure 3. The original (green) and current (red) boundaries of Beckenham Place Park (Mitchell, 2018)

In 1995, a major change to the park was made: Lewisham decided to incorporate the land on the east side of the rail tracks into the park. Henceforth the tracks acted as a physical divide between the east and west sides of the park. At the same time, an organization called “The Friends of Beckenham Place Park” opened a volunteer-run visitor center, currently located in the Cator Mansion (Mitchell, 2018). On July 2, 2011, a fire swept through the stables, burning several cottages and a clock that had been in the park since the Cator family owned the estate (Fisk, 2011). The fire also destroyed a vast garden behind the buildings, which can be seen in its original state in Figure 4.



Figure 4. Stables and garden before the fire (Mitchell, 2020)

After a long history of growth and decline over 90 years, the park was overdue for major restoration to meet the diverse needs of different park users and benefit the community once again. In 2014 while reviewing possible improvements for the park, the Lewisham Council submitted a bid to the Heritage Lottery Fund as part of the “Parks for People” scheme (Mitchell, 2018). In 2016, the council closed an underutilized golf course in the park and secured substantial funding from the Heritage Lottery Foundation to conduct the restoration of the park (McCulloch 2019). The projected funds for the park consisted of £3.6 million (37%) from the Lewisham Council and £6.2 million (63%) primarily from the Heritage Lottery Fund and Environment Agency. Lewisham wishes to complete the restoration efforts within the park by 2021. The Heritage Lottery Fund (HLF) has many new physical attributes for Beckenham Place Park, as can be seen in Table 2. Besides the physical features that the HLF has contributed to the

park; it will also offer residents training, education, and employment opportunities (Beckenham place Park to be RESTORED AND REVITALISED, 2016).

Table 2. Beckenham Place Park restoration milestones(Mayor and Cabinet, 2019)

| Milestones | Date |
|---|--|
| Golf course closed | Nov. 2016 |
| 12,000 trees planted | Feb. 2017 |
| BMX track opened | Sept. 2017 |
| Planning permission granted | Oct. 2017 |
| Works started on site | Apr. 2018 |
| Environment Agency scheme withdrawal | Summer 2018 |
| Works completed on the western side of the park | May 2019 |
| Opening celebration | 20th July 2019 |
| Funding sought for the eastern side of the park | 2019 |
| Program for the eastern side of the park works dependent on funding | Earliest possible completion summer 2021 |

The restoration efforts are organized around five themes: (1) encouraging community involvement; (2) preserving the heritage and history of the park; (3) offering opportunities for outdoor activities; (4) protecting the natural life of the park; and (5) providing a space for relaxation and play for the community (Beckenham Place Park Regeneration, 2019). These themes are intended to ensure the restoration encompasses the whole community and makes the park appealing to as many people as possible, thus increasing park attendance.

The restoration effort has made huge strides in just four years and dramatically transformed the aesthetics and functionality of the park. For example, in 2019, the Lewisham Council opened a public swimming lake that features a running track around its perimeter, as well as a beach area which can be seen in Figure 5. The lake is kept clean via aquatic plant life that absorbs unwanted nutrients from the water (McCulloch, 2019). This project encompasses several of the themes the council wants to promote: offering swimming and running as outdoor activities as well as a place to relax, creating a common space for the community to come together, and preserving the nature of the park by using natural methods to keep the lake clean.



Figure 5. Public swimming lake of Beckenham Place Park (Reynolds, 2019)

While those past projects embody multiple themes of the council’s framework, other projects focus on individual themes. To bring the community together, Beckenham Place Park has made extensive use of volunteers. For example, volunteers from the community helped to plant hundreds of trees as seen in Figure 6 (Beckenham Place Park Regeneration, 2019). The borough encourages volunteers to help at events and seasonal activities within the park to spur community awareness and engagement. The Gardener's Cottage, for example, serves as a horticultural site in the summer but also hosts wood carving in the winter.



Figure 6. Volunteers planting trees as part of Trees for Cities program (London's largest ever planting event, 2018)

For the borough of Lewisham, Beckenham Place Park is one of the most important green spaces with respect to nature conservation. It encompasses habitats including ancient woodlands and meadows along the river. In 2017 the Greater London Authority indicated it would like to introduce two new habitats: open water and wet woodlands to the park (Beckenham Place Park Regeneration, 2019). The Lewisham Council's goal was to promote relaxation in the park by encouraging visitors to engage with the nature of the park. The council wants the community to have a communal place that anyone from the community or outside can access (Beckenham Place Park Regeneration, 2019).



Figure 7. Vintage market community event outside of the mansion. (Anne C, 2017)

In 2016 with funding for restoration, the Lewisham Council wanted to ensure the history of the park was preserved, especially the Cator mansion and Georgian Stables. The restoration plan involved restoring both prominent buildings so they will be capable of hosting 21st-century events and activities, one such event can be seen in Figure 7 (Beckenham Place Park Regeneration, 2019). The reconstruction and renovation of the stables will provide a new entry into the park on the western side.

Since the closure of the golf course in 2016, there has been an increase in available free parking. In June of 2019, a new car park, built on the opposite side of the brand-new stables, was opened. The new car park allows for the demolition of the park near the mansion, thus minimizing unauthorized parking. (Beckenham Place Park Regeneration, 2019). By mid-2020 the council would like to install charging stations for electric cars and implement a pay-to-park policy.

2.4 Remaining restoration efforts

With restoration efforts on the western side of Beckenham Place Park completed in 2019, the Lewisham Council is now focusing restoration efforts on the eastern side of the park. In this restoration effort, the council plans to create new paths for runners and walkers while encouraging and protecting the wildlife and wetlands. Along with the improvements for the

runners, the council would like to provide better accommodations for cyclists (Beckenham Place Park Regeneration, 2019). Additionally, the council would like to add play areas for children to entice more families to make outings in the park. The red triangle on the right-hand side of Figure 8 indicates the eastern side of Beckenham Place Park, where these efforts will be focused. Figure 9 illustrates previous plans for the eastern side of the park that have since been shelved following the Environmental Agency’s withdrawal from the scheme due to cost escalation.



Figure 8. Beckenham Place Park overview (Mitchell, 2020)



Figure 9. Schematic of restorations initially planned for the eastern side of BPP (Mitchell, 2020)

Moving forward, the Lewisham Council is revising a new restoration plan with help from the local community to improve Beckenham Place Park. River Ravensbourne, a tributary of River Thames, flows through the end of the eastern side of the park but is not well integrated in the park experience. The Council wants to improve access to the river and replace the informal footpaths along the riverbanks with more formal and handicap accessible walkways. Other goals include utilizing the wetlands for flood relief rather than building levees and retaining the most natural configuration of the River Ravensbourne (Personal Communication with Lucy Mitchell, Community Engagement Officer, 2/14/2020).

Chapter 3. Scope of work

The goal of this project was to aid the Lewisham Council with furthering the regeneration efforts of Beckenham Place Park. We identified the following objectives to achieve this goal:

- Assess public opinion about Beckenham Place Park.
- Streamline the data collection process.
- Identify best practices for the restoration of the River Ravensbourne.

These are the revised objectives due to the global pandemic surrounding COVID-19. Originally, we planned to collect data on public opinion from visitors of the park in 2020 and compare it to the data that had been collected previously in 2018. Since we were unable to collect new data within the park, we restructured our project to accomplish all necessary deliverables for the Lewisham Council.

The sections that follow outline methods we used throughout the project, accompanied by the corresponding findings. Chapter 4 focuses on our review of previous surveys and observational data from 2018 and analysis of the data to assess the usage and opinions of the park by the local community. It speaks to what testing was done, what our results showed, and how we went about conducting the tests. Along with this section is a user guide to instruct future users on how to use the analysis tools was created. Chapter 5 outlines in detail the tool created for future data collection. This tool will assist the Lewisham Council in collecting and maintaining comparable observational data in years to come and includes easy to use features. A user guide was also created for this tool. Chapter 6 evaluates different options and possibilities for restoration of the eastern side of the park by assessing current and best practices in river restoration based on projects found across the UK. All these findings and best practices are later outlined in corresponding sections of Chapter 7: Conclusions.

Chapter 4. Refined tools to assess visitor opinions of Beckenham Place Park

We performed a detailed analysis on the data collected in 2018 to determine public opinion on recent and ongoing restoration efforts. Due to time constraints after the data was collected in 2018, the previous team was unable to perform a deep analysis of all permutations of the data. Specifically, they did not make connections between factors such as age and gender and the responses to most of the questions. The results of their analysis were presented primarily in the form of summary statistics, simple bar graphs and pie charts. Our analysis uncovered additional patterns in public usage and opinions that may offer deeper insights as to how the park can be improved. Our analysis of this data consisted primarily of testing for significant differences in opinions between different groups of visitors.

Within the Beckenham Place Park survey and observation sheets, there were several different types of responses. Among these were multiple-choice responses, check-all-that-apply (CATA) responses and ranking responses. The observational studies were completed by volunteers or staff members of the Lewisham Council. As such, each response on the sheet was completed with no blank responses left. The surveys, however, were completed by park visitors, who may have left one or more responses blank. Furthermore, visitors often differed from each other, whether it was by age, gender, or any number of additional categories. As a result, the sizes of data sets to be compared were often different from each other. We chose the Chi-squared and Kruskal-Wallis tests for their ability to analyze data sets of differing sizes. Additionally, each test can be used on multiple types of data sets, corresponding to each type of response found in the survey and observation sheets. A breakdown of where each test was used, by question, is shown below in Table 3. Both tests indicate the presence of significant differences between the distribution of responses in each data set.

Table 3. Survey question statistical tests breakdown

| Survey Questions | Test Used |
|---|---------------------|
| 1. On average, how often do you visit BPP? | Chi-squared test |
| 2. On average, how often do you visit BPP mansion? | |
| 3. Why do you visit BPP? | |
| 4. Did you visit BPP before the closure of the golf course (October 2016)? | |
| 5. How do you travel to BPP? | |
| 6. Ideally, how would you like to travel to BPP? | |
| 7. Do you think there is a good community spirit where you live? | |
| 8. Do you think BPP enhances your quality of life? | |
| 9. Do you feel safe in this area (in the park and 1-2km from the park)? | |
| 10. Please tell us your views on the scale and frequency of future events at BPP (small, medium & large)? | |
| 11. Which form of communication is most useful for finding out information on BPP? | |
| 12. Which of the following outdoor activities are you/ would you be interested in doing in BPP? | |
| 13. Would you be interested in attending any of the following types of events in BPP? | |
| 14. Have you attended any of the following types of events in BPP in the past year? | |
| 15. Would you be interested in taking part in any of the following volunteer activities? | |
| 16. How informed do you feel about the changes in BPP? | Kruskal-Wallis test |
| 17. How do you feel about the park as it is now? | |
| 18. Please rate the current condition of the park. | |
| 19. How good is your understanding of the heritage of the park? | |
| 20. All observational study data | Chi-squared test |

The Chi-squared test can be applied to multiple-choice and check-all-that-apply responses. The test utilizes a contingency table, which shows the distribution of the frequencies of responses. Each row in the contingency table represents a different group of people or, in our case, visitors. Each column represents a different response to a question. The test determines if there are significant differences between the observed response frequencies and the expected response frequencies (Chi-squared test, 2003). The test will not directly indicate which observed frequencies are significantly different from their corresponding expected frequencies. The adjusted residuals post hoc can do this. This test adjusts the critical value below which the null hypothesis is rejected based on the number of combinations in the contingency table and compares it with the test statistics from the Chi-squared test.

The Kruskal-Wallis test can be applied to ranked responses. The responses often follow a 1-10 scale or Likert scale (1-5). This test, which is an extension of the popular Mann-Whitney U test, determines if at least one data set is stochastically dominant over another. For ranked responses, stochastic dominance means that a data set has a significantly greater proportion of high ranked responses to low ranked responses than another set (Kruskal-Wallis test, 2004). The Kruskal-Wallis test will not indicate which pairs of data sets result in significance. A post hoc Dunn's test will determine which pairs are significant. This test compares all possible combinations of data sets and determines if their respective test statistics are above or below the critical value.

A significant difference is a difference that is unlikely to be due to chance alone. The threshold for significance is dictated by Cronbach's alpha. For most social sciences, the value of alpha is set to 0.05, or 5%. Any probability less than or equal to 5% indicates a significant difference. Using these statistical tests, we tested for significance in each data set with respect to a series of factors of interest. There are numerous factors of interest that may have an impact on responses to the survey questions. A number of these factors of interest are listed in Table 4.

Table 4. Factors of interest

| Factors of Interest |
|------------------------------|
| Age |
| Gender |
| Ethnicity |
| Disability |
| Residential Status |
| Visit frequency |
| Zone where surveyed |
| Reason for visiting the park |

To test for significance in the data with respect to these factors of interest, a standardized procedure was required. Having a standardized procedure eliminates inaccuracies in the results. To test the survey and observational study data, we used Microsoft Excel. Excel has a powerful set of tools for manipulating and analyzing data. Microsoft Excel allows users to create custom tools and functions for niche tasks, such as statistical tests. Using this functionality, we developed a series of macros, which require very little prior experience with Microsoft Excel or statistics, to streamline and standardize the data analysis process for the Lewisham Council. The tools were developed using Microsoft Visual Basic, tested on the 2018 survey data, and were packaged into an add-in that could be installed on any computer with Microsoft Excel. Additionally, we created the Data Analysis Tools User Guide (Trainor, 2020), which provides further background information and instructions on how to install and use the tools. A first version of the add-in and user guide was delivered to Lucy Mitchell for testing on April 25. Based on her feedback, we fixed bugs in the code and revised the user guide to make it more understandable. The final version was delivered to the Lewisham Council for use in the analysis of data on park visitor opinions and behaviors collected in the future or previously.

The add-in consists of 5 custom tools that appear in a custom tab called *Statistics*. Detailed instructions on how to use them are provided in the Data Analysis Tools User Guide (Trainor, 2020). The *Delete Current Sheet*, *Clear Cells*, and *Delimit* tools were designed to

format data, and provide additional convenience to the user. The *Clear Cells* tool can be used in situations where multiple statistical tests are being performed back-to-back. The *Delete Current Sheet* tool can be used to easily remove unneeded sheets. Many of these tools are designed to be used in tandem with the *PivotTable* tool. For check-all-that-apply responses, the *Delimit* tool can be used to format data into a table that can be turned into a pivot table. Based on the type of responses being compared, the user may use either the *Chi-Squared Test* tool or *Kruskal-Wallis Test* tool.

The *Chi-Squared Test* tool executes a Chi-squared test on a pivot table. Further details regarding the set-up and usage are provided in the Data Analysis Tools User Guide (Trainor, 2020). If the results of the test are significant, the post hoc will automatically be performed on the same sheet to pinpoint which relationships have significance. Our focus was developing tools that could be used in more detailed analysis of data on visitor opinions and behaviors, so we did not conduct a comprehensive analysis of all the 2018 data. An example illustrates the value of the Chi-squared tool, however. Figure 10 shows that the number of large-scale events favored by respondents varies substantially by gender. Only 32% of women are in favor of one major event per year compared with more than 50% of men. By contrast, 52% of women would prefer no large-scale events, while 22% of men would be in favor. Very few men or women support multiple large-scale events. The Chi-square tool shows that this finding is robust and there is a strong statistically significant difference in male and female responses.

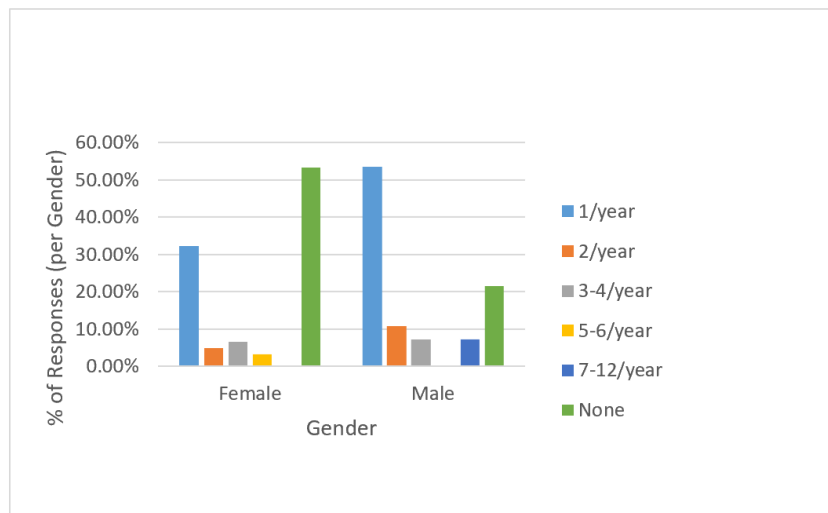


Figure 10. Frequency of large-scale events vs. gender

The *Kruskal-Wallis Test* tool executes a Kruksal-Wallis test directly on the table containing the master spreadsheet data. Like the other test, further details for set-up and usage are provided in the Data Analysis Tools User Guide (Trainor, 2020). If the results of the test are significant, the post hoc will automatically run, and the results will be shown in a separate sheet. Based on the results, the user can determine which groups of visitors had the greatest differences between their responses. One such example of significance from our analysis of the 2018 survey data, was the relationship between age and understanding of the heritage of the park. Table 5, taken directly from Microsoft Excel, shows the results of the post hoc test. Green cells labeled yes indicate significant differences, and the row and column labels corresponding to those cells represent the two groups that are significantly different. Table 5 indicates that the significant differences in understanding of the park’s heritage were between visitors aged 18-29 and 50-59, as well as between visitors aged 18-29 and 60-69. Further graphical analysis confirmed that understanding of the park’s heritage, on average, increased with age. We discovered a similar relationship from another test comparing the responses to the same question between visitors of different ethnicities. Specifically, we determined that a White British visitor had significantly greater understanding of the park’s heritage than both Black visitors and White non-British visitors.

Table 5. Kruskal-Wallis test Excel results: Understanding of the heritage of BPP vs. age

| | 18-29 | 30-39 | 40-49 | 50-59 | 60-69 | 70-74 |
|--------------|--------------|--------------|--------------|--------------|--------------|--------------|
| 18-29 | - | | | | | |
| 30-39 | No | - | | | | |
| 40-49 | No | No | - | | | |
| 50-59 | Yes | No | No | - | | |
| 60-69 | Yes | No | No | No | - | |
| 70-74 | No | No | No | No | No | - |

Using these tools in the same fashion, we made several additional connections between various factors of interest and the survey questions. Table 6 below lists all the significant relationships found during the analysis of the 2018 survey data, and the conclusions drawn from them. Table 6 summarizes the results described above, as well the connection between where visitors were surveyed and how their visit patterns have changed since the closure of the golf course. The results of the Chi-squared test showed that fewer visitors in zone 5, which can be seen on the map in Figure 15 (Chapter 5), responded “Unchanged” than was expected. Further

analysis showed that most of the visitors in zone 5 reported that they visit the park more frequently now. Additionally, the data in the contingency table showed that most of the visitors who visit the park more frequently now, were surveyed in or around where the golf course was.

Table 6. 2018 Survey data analysis results/conclusions

| Statistically Significant Relationship | | Nature of Difference/ Conclusions |
|---|--|---|
| Factor of Interest | Survey Question | |
| Gender | Desired frequency of large-scale events (5000+ people) | The percentage of female visitors that wanted no large-scale events is far greater than the percentage of male visitors that wanted the same. Overall, most visitors, in general, preferred one large scale event per year or less. |
| Age | Understanding of the Heritage of BPP | The greatest differences in understanding of the heritage of the park were between visitors aged 18-29 and 50-59 years old, and between 18-29 and 60-69 years old. The data showed the visitors' understanding of the park's heritage increased with age. The sample size of visitors aged 70 and older is too small to have a significant impact on the results. |
| Ethnicity | Understanding of the Heritage of BPP | The greatest differences in understanding of the heritage of the park were between White British and Black visitors, and between White British and White non-British visitors. A vast majority of the visitors identified as being White British, suggesting they make up most of the park's visitors in general. |
| Zone where surveyed | Did you visit BPP before the closure of the golf course? | The number of people that were surveyed in zone 5 (West fields) that responded "Unchanged" was significantly lower than expected. Further analysis showed that most of the visitors who visit the park more frequently now were surveyed in the area in or around where the golf course was. |

In addition to applying the analysis tools to the 2018 data, we used them to analyze the observational data. The observational data required much formatting and organization before it could be properly analyzed. These changes included extracting the day of the week from the timestamp for each entry, as well as formatting time of day to differentiate between morning and afternoon. The most important changes were organizing the weather and activities columns to

avoid creating separate groups of the same things. Entries in the activities column that fell under that “Other” category were not standardized and multiple entries could often be considered the same though they were entered differently. For example, there were several entries mentioning drones, but they were entered as “drone”, “drone flying”, “flying drone” and “using drone”. All such entries, not just those pertaining to drones, were changed to “Other”. Likewise, in the weather column there were several responses with the same entries in different orders, prompting us to standardize the order for all possible combinations of entries. Microsoft Excel does not automatically recognize “Sunny, Windy” and “Windy, Sunny” as being the same, which would lead to inconsistencies in the results.

The *Chi-squared Test* tool was primarily used to analyze all the observational data. Appendix A lists all the statistically significant relationships, provides details about the nature of the differences, and lists conclusions that can be drawn from the results. Observations were compared based on the day of the week, time of day, weather, and location in the park. The results in Appendix A show that each of these factors impacted almost every aspect of the observations. Based on the day of week and/or time of day, one may observe different groups of people in the park doing vastly different activities. They may also witness these groups of visitors change based on what part of the park they visit or what the weather is.

To further support the results of our statistical tests, we converted the visitors’ postcodes, which they provided in the survey, into coordinates. We plotted these coordinates over a map London to gain a deeper understanding of where the visitors are travelling from. Furthermore, we also combined the visitors’ coordinates with survey questions to visualize the distributions of responses. Figure 11 shows the distribution of visitors around the park, which is represented by the white star, and their current methods of travel to the park. The plot demonstrates that visitors who live closer to the park tend to walk to the park, while those who live further away from the park tend to drive. Figure 12 also shows the distribution of visitors around the park and how often they visit the park. This plot shows that visitors who live further away from the park tend to visit far less than those who live closer to the park. Those who live closest to the park tend to visit every day or 1-2 times per week.

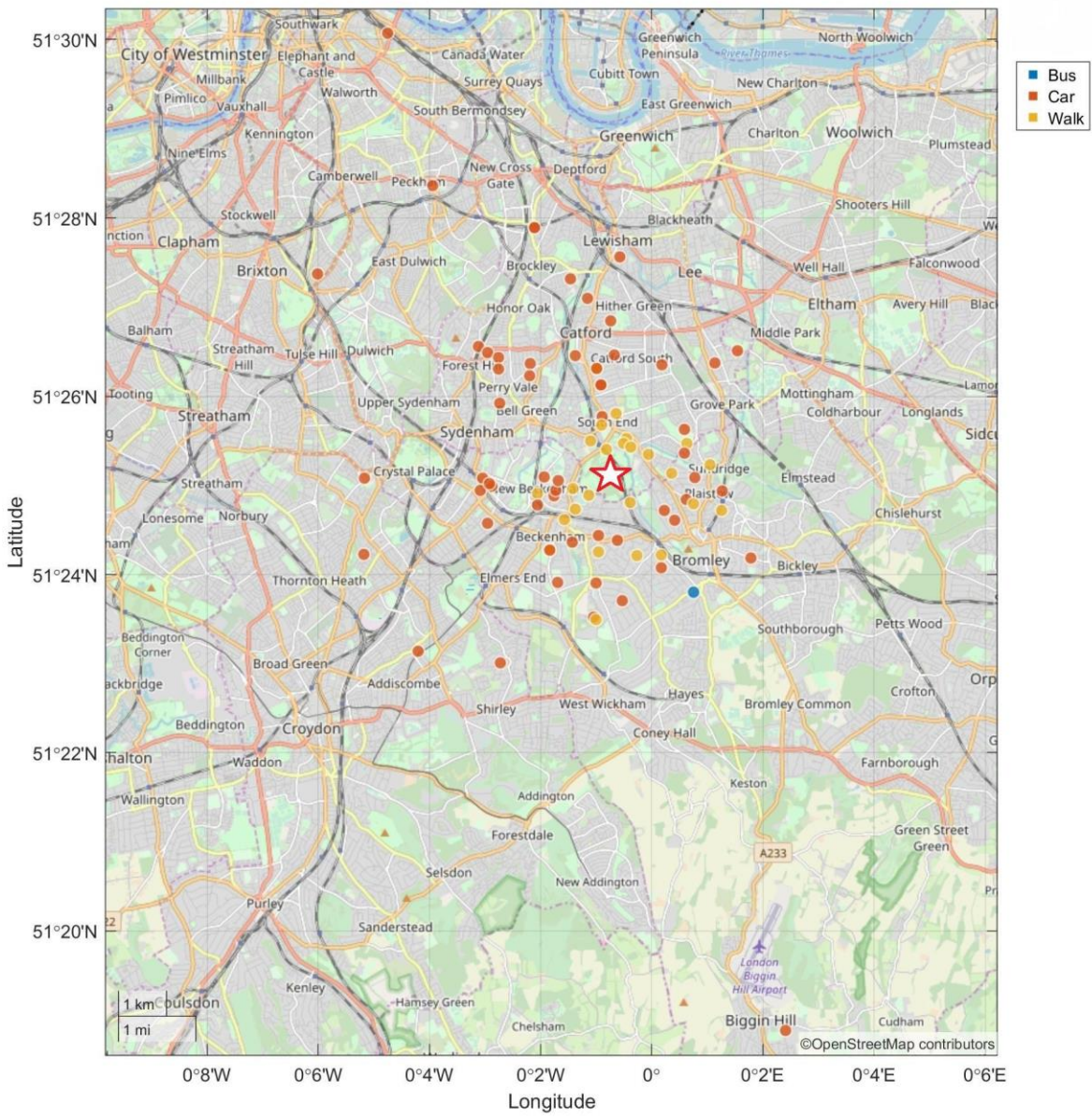


Figure 11. Distribution of responses to method of travel

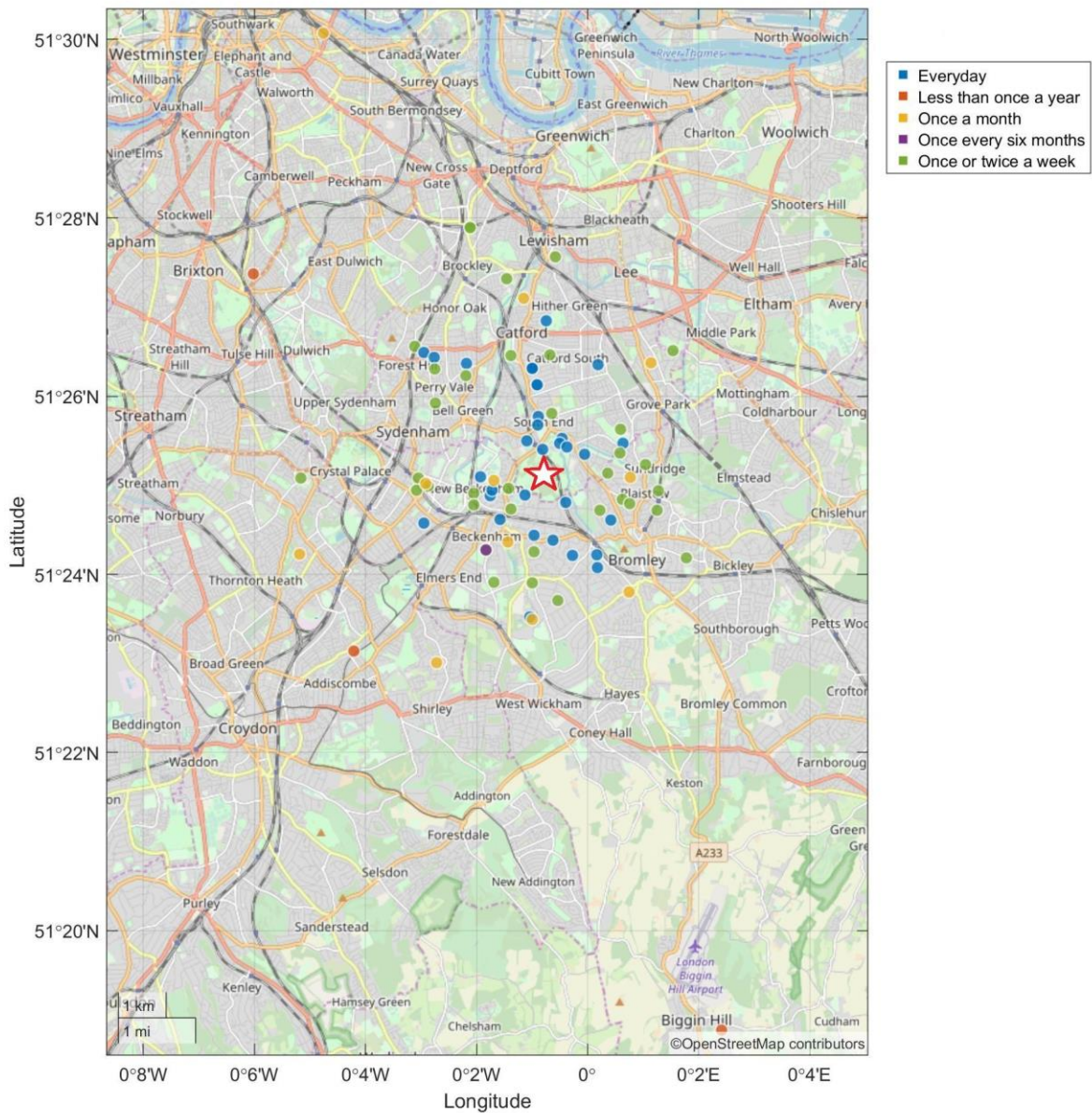


Figure 12. Distribution of responses to visit frequency

The tools developed to analyze the survey and observational data can be used in the future to examine new data that will be collected by volunteers. Furthermore, new data can be compared to the 2018 data to determine if any changes have occurred over time. These may change in the public's opinion of the park, or the usage of the park.

Chapter 5. Observational study tool

Data collection is a major part of the project. Since a new iteration of this project is carried out every few years, it is essential to have standard tools and protocols to streamline this process and ensure the quality and comparability of data. To achieve this, we proposed standardized tools for different data collection requirements. We proposed that these tools be used along with the protocols employed in the previous iteration of this project.

5.1 Evaluation of existing data collection process

The two data collection tasks for ongoing evaluation efforts of Beckenham Place Park are conducting observational studies and in-person questionnaire surveys. In the previous project iteration in 2018, the WPI student team collected data using QuickTapSurvey for both the survey and observational sheet. Lewisham council uses paper sheets to collect observational data whenever they use volunteers. This process includes a significant amount of post-processing to transfer the data from individual sheets to a master Excel spreadsheet. In the future, the Council plans to use a third-party vendor named CFP UK to develop the survey instrument and conduct basic analysis. Accordingly, we did not develop a refined survey instrument or protocols, but we did identify changes in questions that the council might like to consider in the future. These amendments are summarized in Appendix B.

Previously, volunteers and students observed visitor activities and various points along the paths shown in Figure 13. Volunteers filled out primarily paper observational sheets (Appendix C) while the students used a digital version on QuickTap Survey. Frequently, the activities observed were being carried out in a group, so the information was recorded for all the members. In the QuickTap Survey and the observational sheet, this was done by filling the questionnaire multiple times. Some questions had the same answers for everyone in the group but still had to be repeatedly filled. The filled-out observation sheet had to be then ported over to an Excel file by manual entry. For future implementation, we suggested a switch to an electronic data collection process to avoid the tedious post-processing work involved with physical observational sheets. While the QuickTap survey was online tool as well, it had certain limitations. The free version only works for 14 days and has a limit on the number of devices that can use it simultaneously. The paid version would have been sufficient to compensate for all the drawbacks of paper observational sheets, but it was a little too expensive. Taking this

consideration into account, we proposed finding another electronic solution that would not suffer from these drawbacks



Figure 13. Previous routes taken for observational studies (Flores et al. 2018)

Furthermore, only zones were used to record any location-based metadata. While zones give a general sense of usage within different areas of the park, we felt that the exact location of the observed activities would help identify more specific localized trends within the park. This would, in turn, help the Lewisham council effectively allocate resources for the restoration of the targeted areas within the park. To this effect, we implemented a way to capture a more precise location of the observed activities within the park.

5.2 Observational tool design

From our conversations with Lucy Mitchell and our own analysis of the observational study conducted in the previous IQP, we determined the criteria for the new observational tool. Conducting a side by side data analysis on the previously collected data (as presented in Chapter 4) played a big part in finalizing the design criteria. For example, we found out that having “other” as a possible answer category for the observed activities complicated the analysis portion. It introduced a lot of permutation which then manually had to be condensed because they had the same semantic meaning. With these insights in mind, we reached a consensus on the following design criteria for the observational tool.

1. Ability to be used by multiple users simultaneously.
2. Quick to fill out and easy to use. Because observers try to monitor multiple visitors engaged in multiple different activities at the same time, the tool must be quick and easy to use.
3. Operable on mobile phones (Apple and android) and tablets - Mobile phones and tablets are the most convenient devices that the volunteers can use. Also, the tool should be operable on both Android and IOS for convenience of the volunteers.
4. Operable both online and offline – Internet access is limited in some areas of Beckenham Place Park, so it is essential that the tool work irrespective of if there is internet availability or not.
5. Option to record the location of the observed activity. As mentioned previously, this feature will help the council analyze more closely the location of observations and activities.
6. Ability to export the collected data to an Excel sheet for data analysis. Since multiple volunteers collect data at the same time, data must be coalesced into one master spreadsheet with minimal post-processing.

Taking all these considerations into account, we decided to build a web tool for the observational sheet that can record data offline. The web page just needs to be loaded once on the device to be used regardless of internet access thereafter. Since it is a web tool, multiple users can access it at the same time on their phones and tablets.

We also added an interactive map of the Beckenham Place Park taken from OpenStreetMap. OpenStreetMap is a community driven mapping project that maintains up to date maps all over the world. When the map is clicked (Figure 14), it overlays a red circle on the clicked location and records the latitude and longitude for that location. This is the way the observers can record the location of the observed activities.



Figure 14. The interactive map of Beckenham Place Park with a marker

For the zone, a reference image (Figure 15) can be used to find the exact zone the observers are recording the data in. This reference image can be made visible or invisible from the tool by clicking the checkbox on the top toolbar. This image is only for reference of the observer. It is expected after repeated data entry, the observer would be well versed with the zone areas and will hide the zone map. As such, it can be hidden from view as needed.



Figure 15. Zones modified (The Friends of Beckenham Place Park, 2017)

The survey, as shown in Figure 16, can be filled out by selecting radio boxes (squared boxes for multiple answers and circles for single choice answers) and filling out the appropriate text boxes. Each question is requirement except “Additional Comments” question. Since the questions are presented as radio boxes, it is easy and fast to fill them out. Furthermore, there is no limit on the group size the data can be recorded. By clicking the “Add More Participant” button, a new row can be added to the tool. After all the data is filled out, the survey can be completed by pressing the “complete” button. The “complete” button verifies if all the required data fields are filled out. If not, then the question gets highlighted with a red background or text that requests the user to complete the survey (Figure 17).

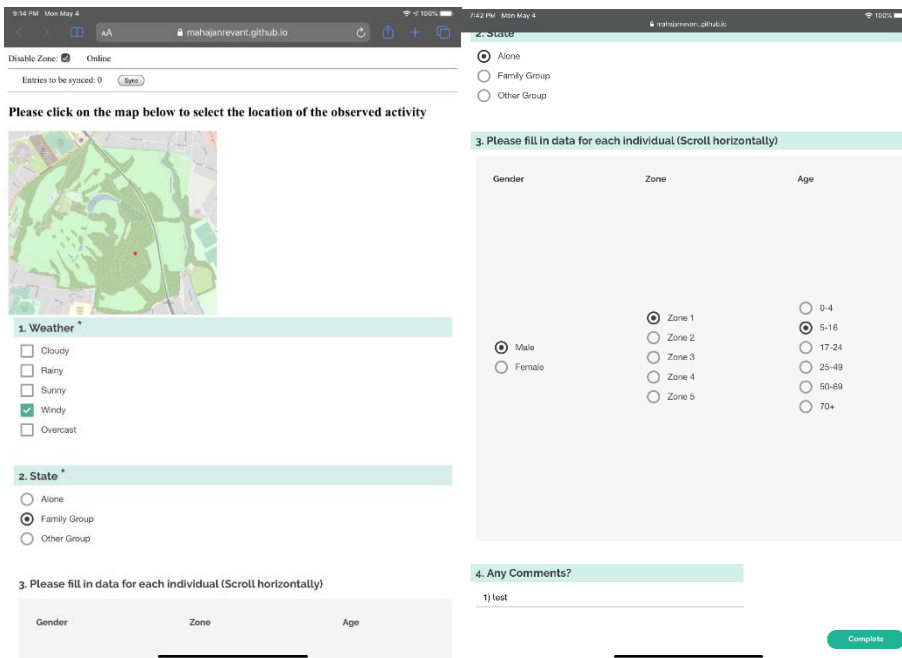


Figure 16. Integrated observational data entry form

2. Weather *

Please answer the question.

Cloudy

Rainy

Sunny

Windy

Overcast

3. State *

Alone

Family Group

Other Group

Figure 17. Error displayed for an incomplete observation

If the survey is filled, all the answer choices in the survey are cleared and the data is stored in local storage. The local storage of a browser is persistent and data in it will not be deleted unless explicitly done so in the setting. This gives the tool the ability to store the data locally irrespective of internet availability within the park. The number of data entries that are currently saved in the browser are shown at the top in the toolbox, after “Number of Entries to be Synced” (Figure 18). This counter gets updated to show that the completed survey has been saved in the browser’s local storage. An alert is displayed to the user with a confirmation (Figure 19a).

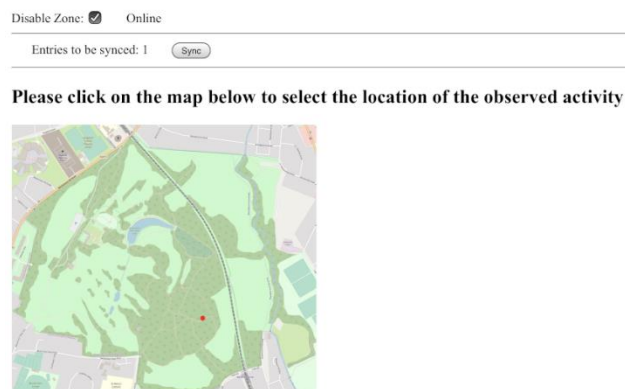


Figure 18. A counter to show the number of locally stored data entries.

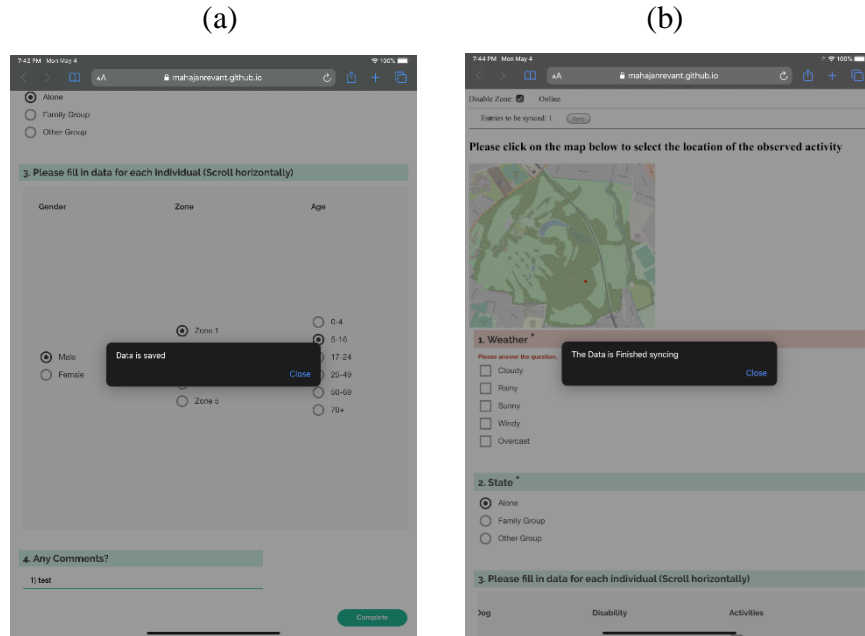


Figure 19. Alerts displayed after saving and syncing

Wherever there is adequate internet connectivity, the data can be synced with the connected Google sheet. In this case, we are using the account for Beckenham Place Park. If there is no internet connectivity, the label “Online” will change to “Offline” and the sync button will be greyed out to avoid any loss of data. After the sync is completed, the data is transferred to the connected Google sheets and the “Number of Entries to be Synced” counter goes down to 0. An alert is displayed to the user with a confirmation of the data being synced (Figure 19-b). If the sync fails, it gives user an error for each entry that fails to sync. The user can check the internet connection and try again. After all the data collection, the master Google sheet can easily be downloaded as an Excel file for data analysis. A user guide was created for the volunteers to quickly get them up to speed on the tool and was submit.

Chapter 6. River restoration best practices for BPP

At the time of our project, the Lewisham Council was in the process of evaluating options for the restoration of the River Ravensbourne on the eastern side of Beckenham Place Park. To assist in this effort, we identified and assessed current and best practices on river restoration, and reached out to experts to gather their opinions and expertise regarding the restoration of projects like the River Ravensbourne at BPP within the U.K.

6.1 River restoration expert interviews

To assess current and best practices, we extended our initial literary review on river restoration to solicit the opinions of river restoration experts. From our background research, we identified an initial list of possible organizations and experts involved in river restoration projects. We consulted our sponsor to identify other potential contacts and determine what kinds of case studies would be most useful. Numerous case studies were reviewed that differed in scale, cost, and setting (e.g. park versus urban setting). Together they covered most of the types of restoration projects in the London area. This was to show the Lewisham Council the diversity of projects and possibilities for Beckenham Place Park. Sources, such as the River Restoration Center website, proved useful for gathering information on current and past restoration efforts.

We gathered information on best practices to compose a preliminary set of questions with the expectation that they would evolve during the implementation of the study, based on feedback from our advisors and sponsor. Due to the circumstances of the global pandemic, we initially switched to conducting phone and online interviews, depending on the availability and preferences of the experts. Our team used email as the primary form of initial contact with these experts. After making contact, emailing a detailed set of questions was the main method used for interviewing and further communication. Each email began with a preamble (Appendix E) to give context to who we were and what we were trying to accomplish. The sample questions we formed were adjusted on a case-by-case basis and helped us ascertain best practices (Appendix E).

Our team characterized both the advantages and disadvantages associated with the best river restoration practices identified throughout our research. We created a list of restoration practices that cover the major aspects of the planning, execution, and monitoring processes. Through further research, we were able to determine which methods had advantages over others,

and what practices proved to be not useful for the Lewisham Council to contribute to the River Restoration of the River Ravensbourne.

6.2 Case study review

We compiled a set of projects that reflect the attributes the Lewisham Council is looking for in the Beckenham Place Park restoration. These case studies were chosen to reflect a range of size and complexity, but all the projects have similar goals as the BPP restoration. We examined six case studies in-depth including five in Greater London (the River Ravensbourne at Ladywell Fields, the River Brent at Tokyngton Park, the River Quaggy, the River Wandle, and the Mayesbrook River) and the River Skerne near Middlesbrough in the northeast of England (Figure 20).



Figure 20. Locations of the six case studies

The following sections describe each case study, tabulate the similarities and differences among them, and report how they address the challenges faced in the BPP restoration effort. Additionally, the restoration experts we contacted provided information on projects they have

worked on in the past. Table 7 lists the topics we identified from each case study that relate to the Lewisham Council’s topics of interest.

Table 7. River restoration attributes

| Project location | Year Completed | Cost (£) | Flood Mitigation | Naturalization | Public Engagement | Accessibility (Paths, bridges, walkways, etc.) | Aesthetic Appeal | Structure Additions (Buildings) |
|---------------------------------------|-------------------|-------------------|------------------|----------------|-------------------|--|------------------|---------------------------------|
| River Ravensbourne at (BPP) | In Process | In Process | X | X | X | X | X | X |
| River Ravensbourne at Ladywell Fields | 2008 | 400,000 | | X | X | X | X | X |
| River Brent | 2003 | 1,400,000 | X | X | X | X | X | |
| River Quaggy | 2004 | 14,700,000 | X | X | | X | X | |
| River Skerne | 1995 | 1,758,621 | X | X | | X | X | |
| River Wandle | 2012 | N/A | X | X | X | | X | |
| Maysbrook River | 2012 | 5,000,000 | X | X | X | X | X | |

6.2.1 River Ravensbourne at Ladywell Fields

Restoration projects on the River Ravensbourne have been pursued in the past at other locations aside from Beckenham Place Park, with goals of re-meandering, embankment regrading, river bedding improvement, biodiversity enhancement, and flood relief management. Many of these goals match those the Lewisham Council is trying to achieve within Beckenham Place Park. A case study outlines a project in Ladywell Fields, where the River Ravensbourne flowed along its edge. This project took approximately two years to complete and cost £400,000. Park visitors were unsatisfied with park quality; thus 200 meters of the river was reworked through the center of the park to create a more open and inviting space. The River Ravensbourne at Ladywell Fields ran through the edge of the park and was hidden by railings and dense plant life. The park was unused and lacked features and facilities, entrances were not welcoming, and there was poor visibility and sight lines through the park. The Lewisham Council worked with the Building Design Partnership, Environment Agency, and Fergal Contracting to complete this

project. To address the key concerns, the river was redirected through the center of the park to divert some of its flow. New footpaths, as well as a footbridge, a new public entrance, and other aesthetic amenities were added to enhance the user experience around the river (Figure 21).



© BDP

Figure 21. Plan for Ladywell Field restoration (River Restoration Case Study, 2016)

The river, which originally flowed around the perimeter of the park, provided “little benefit, had poor WFD status and was largely ignored” (Haigh, N., & Chapman, P., 2015). The Waterwork Framework Directive or WFD is a European Union water quality classification that includes five classes: high, good, moderate, poor, and bad (Table 8). The “reference conditions” are type-specific for different waterways (Environmental Protection Agency, 2020).

Table 8. WFD classification

| | |
|----------|---|
| High | The biological, chemical, and morphological conditions associated with no or very low human pressure. This is also called the 'reference condition' as it is the best status achievable - the benchmark |
| Good | Slight deviation |
| Moderate | Moderate deviation |
| Poor | Poor deviation |
| Bad | Bad deviation |

The restoration improved the morphology and aesthetic appeal of the River Ravensbourne as well as the water quality and WFD classification (Figure 22). Flood storage for the River Ravensbourne was able to be improved downstream as a direct result of realigning the river. Material that was excavated was used to configure the land surrounding the river to decrease the possibility of flooding.

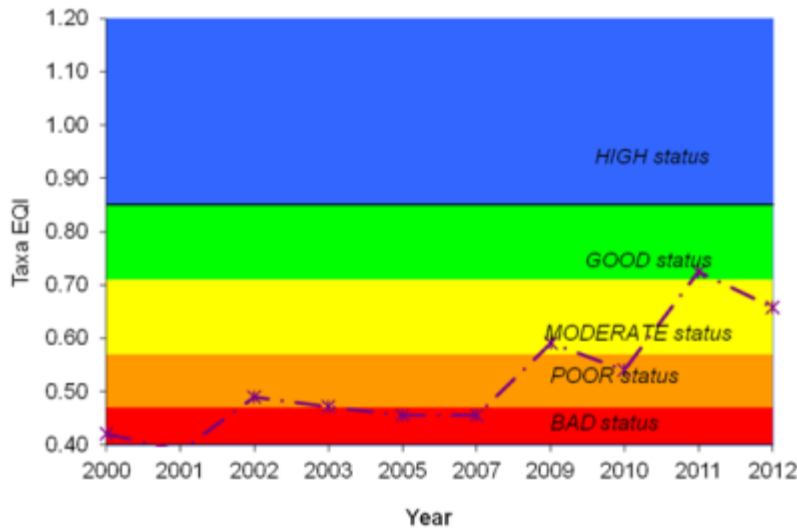


Figure 22. Ladywell Fields improvement in WFD status (Haigh, N., & Chapman, P., 2015)

To improve one of the less welcoming entrances, the swing gate was removed and replaced with stainless steel bollards. Trees were also removed in front of the entrance to increase views into the park, and finger and identity signs were installed to allow for easier user

navigation. To improve visibility and sight lines through the park, select trees and shrubs were removed or trimmed, lighting was added across the park, and new bridges were implemented that were wide and low with slatted sides to not create a pinch point. Finally, to improve usage, a new feature was created for visitors to explore and enjoy, as well as a new park cafe. The former station ticket office was turned into an environmental education classroom, thereby providing a resource for schools in the borough (River Restoration Case Study, 2016).

This project involved members of the public to dig a side channel that connected the river and pond. Also, surveys of the public's perception of the park were conducted before and after the project, and results were compared. This implementation helped to increase public awareness of the park and get people involved. The River Restoration Commission concluded that the restoration effort was successful based on several criteria: "Now 78% visitors feel safe and use of the park has increased over 2 and a half times. The creation of a new gravel-bedded river channel through the center of the park has also brought about significant improvements in biodiversity, with survey results indicating a near 100% increase in the number of species present in the park (in particular, fishing birds), which are benefiting from the greater range of habitat types now present following the restoration works" (RRC Staff, 2008).

Figures 23 and 24 below show before and after images of the new backwater that was created for the park, along with several public features including a platform and benches. A backwater provides a non-moving area of water where fish can take refuge during flooding. Below are images showing stages of the restoration of Ladywell Fields. Figure 23 shows the initial view of this space, while Figure 24 shows the final landscape. Figure 25 is an example of the park before the meandering of the river, Figure 26 shows the V-shaped meandering channel dug through the park, and Figure 27 shows the re-landscaped park with the finished river channel.



Figure 23. Initial space for backwater (Case study: Ladywell Fields QUERCUS, 2017)



Figure 24. Finished backwater with platform and seating (Case study: Ladywell Fields QUERCUS, 2017)



Figure 25. Ladywell Fields before restoration (RRC Staff, 2008)



Figure 26. River meandering through the middle of the park (RRC Staff, 2008)



Figure 27. Ladywell Fields after restoration completion (RRC Staff, 2008)

6.2.2 River Brent at Tokyngton Park

The River Brent has seemingly always been under construction since the 1940's. Many previous restoration efforts on the river involved the installation of concrete walls. These barriers were located within the Tokyngton Park, which blocked the area around the river for any recreational use. The revitalization of the River Brent began in 1999.

The main goal of the project was to remove the river from its concrete shell and make it a focal point of the park. It was essential that the river become more integrated into the park because of how it ran through the middle of the park as seen in Figure 28. The Borough of Brent and Environment Agency collaborated on the restoration effort. Re-meandering, backwater creation, and de-culverting were the three primary restoration techniques. These three techniques could be adopted by the Borough of Lewisham for the River Ravensbourne. The overall cost of the project was £1,400,000. The first action taken was determining what the visitors of the park wanted to do. Before the restoration began, the Borough of Brent conducted a public consultation called "Planning for Real Exercise" to gauge the public's preferences. The restoration work began with re-stabilizing some of the banks of the river so the concrete walls could be removed, thus allowing the banks to naturalize and better integrate with the surrounding landscape. This allowed for parts of the river to be re-meandered beyond its concrete barriers to allow for easier access for the park visitors. Figure 29 shows the widening of a section of the river where it was once channeled by concrete walls. Removing the walls improved aesthetics and accessibility for the public and created new habitat for aquatic life in the backwater pools.



Figure 28. River Brent running through Tokyngton Park (Google Earth, 2020)



Figure 29. River Brent at Tokyngton Park (RRC Staff, 2008)

The creation of natural slopes and vegetation along this portion of the river also improved flood mitigation. The wet woodlands around the river act as a second line of defense for flood mitigation. Figure 30 shows the footbridge that was built to connect the new walking paths on either side of the river to enhance public access.



Figure 30. River Brent footbridge (RRC Staff, 2008)

The footbridge and removal of the concrete walls also increased public engagement, and the park can now connect two communities that were not connected previously. Before the restoration of the park, the eastern side of the park was excluded from any entrance to the park. The accessible space and footbridge spanning over the river now allows everyone from both communities to come together within the park.

6.2.3 River Skerne

The concept of river restoration is still relatively new. One of the earliest projects showcasing this concept, shown in Figure 31, was the restoration project performed on the River Skerne in 1995 by EU-LIFE. This project was started as a demonstration to showcase new techniques for river restoration, specifically within urban environments. The River Skerne was chosen due to its lack of management and the increase in the surrounding population. In addition to showcasing new techniques, the other main goals of the project were to restore the river's physical features, improve water quality, increase the diversity of the ecosystem, improve flood management and allow better access to the river by the community.

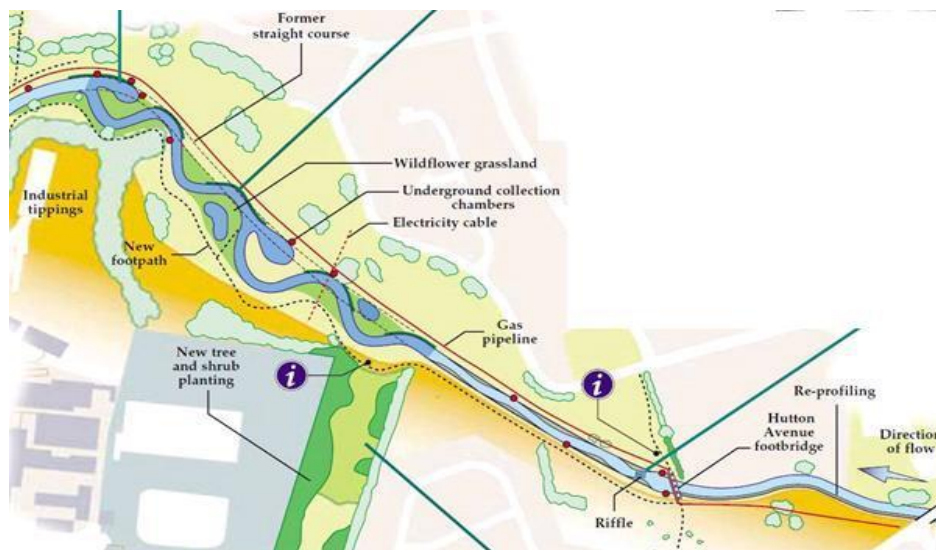


Figure 31. Map of River Skerne restoration area (Reform, 2013)

To achieve these goals, EU-LIFE implemented several new features to both the river and the area surrounding it. New footpaths were constructed along the riverbank alongside new recreational facilities to improve the community value and aesthetics of the river, which can be seen in Figure 32. In addition, new flora was planted to cover up unappealing elements of the river. One such element included a metal fence, which lined the perimeter of the area being restored. Figure 33 shows the region containing the fence before and after the restoration efforts.



Figure 32. Walking path built around river (Prior, 2016)



Figure 33. (a) Fence before restoration, (b) Fence after restoration (Prior, 2016)

Another major alteration performed on the river was lowering the river's floodplains. Lowering the floodplains allowed for the creation of a new natural flooding regime, by connecting the river to adjacent floodplains and creating new meanders downstream. This addition also led to a new shallow wetland habitat, most notably due to the installation of deflectors and riffles within the river. To promote additional diversity in the ecosystem, EU-LIFE planted new vegetation surrounding the river. The vegetation, both original and newly planted, were then controlled and maintained by cutting, mowing, and pruning. Chemicals, such as Roundup, were also applied. The effects of these efforts also impacted many other goals within the project including improving aesthetic appeal, flood control, and human mobility.

With a project over two decades old, multiple studies have been performed to see how the restoration has had an impact on the surrounding community. An initial survey was done in 1995 before the restoration was complete to gather the public's opinion on the river and nearby park. Once the restoration concluded two additional surveys, one in 1997 and one in 2008, to gauge

the impact the changes have had on the community. Since the project was completed, public approval of the renovations done to the river totaled 90%. The community also demonstrated significant approval of the visual changes made to the park as by 2008, 87% of respondents signified that the river was more attractive after the restoration occurred. The increase in the positive perception of the river has also resulted in an increase of visitation as 43% of visitors say that they visit the park more frequently since the restoration concluded.

6.2.4 River Wandle restoration project: Butter Hill Phase 3

Of all the case studies we reviewed, the River Wandle was the largest scale, encompassing three separate projects under its umbrella. The project in focus for our purposes is phase 3. The scale of phase 3 is the most like the River Ravensbourne in Beckenham Place Park. Completed in 2012 in partnership with Environment Agency, Defra, Thames Water, and the National Lottery's Heritage Lottery Fund, the Wandle Trust aimed to assess flood risk, re-grade the banks for improved habitats, and create aesthetic improvements over the span of the project. Figure 35 provides an image of the before and after of the Butter Hill river restoration. Significant improvements were made in both river quality and natural aesthetics.

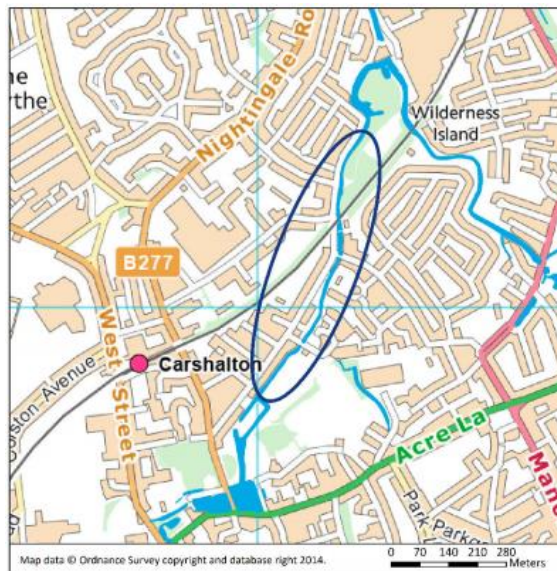


Figure 34. Map of River Wandle - Butter Hill restoration (South East Rivers Trust, 2014)

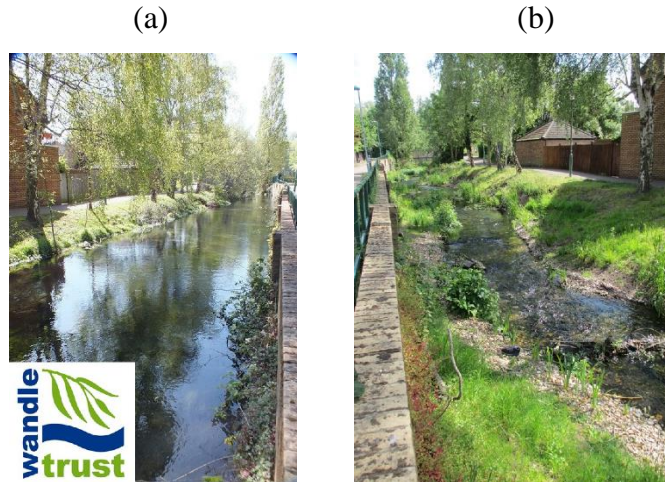


Figure 35. (a) before and (b) after Butter Hill restoration (Case Study: River WANDLE: BUTTER hill Phase 3, 2019).

Before the start of the project, the River Wandle was failing to meet the required WFD status so the Butter Hill project was put in place to improve the ecological status. Issues at the Butter Hill location involved the weir and the water quality. The weir was not effective in allowing fish to pass. A weir is defined as a low dam built across a river to raise the level of water upstream or regulate its flow. “The weir causes the river to become slow flowing resulting in sediment to drop out of suspension and smother the gravel riverbed” (Longstaff, N.D). This clogs the gravel and destroys habitats for wildlife and plant life (Longstaff, N.D). In addition, “the water quality is reduced due to the warming effect and loss of oxygen caused by the slow-moving shallow water and the silt can reduce water quality further if it becomes anoxic” (Longstaff, N.D). Anoxic means that there is a low amount of oxygen in the water.

The parent project for the River Wandle restoration aimed to reestablish the brown trout population that had degraded significantly over 80 years. The weir at the Butter Hill location was lowered to improve river flow and the banks re-graded to help this effort. Additionally, with the help of volunteers from the community, plant species were added to improve the naturalization of the river.

As seen in Figure 36, it is evident that the work on the weir and banks had a tremendous effect in the river quality. Before the weir removal the Wandle was overwide, silted, and pond like; after the weir removal the river channel was narrower with planted marginal wetlands and a clean gravel bed. Five hundred meters of the river were narrowed and meandered with a low flow channel. Three hundred metric tons of gravel and 2000 plants were also added.

Additionally, trees and shrubs were cut back to improve lighting around the river. These improvements create a more inviting space for community members as well as a better environment for wildlife.

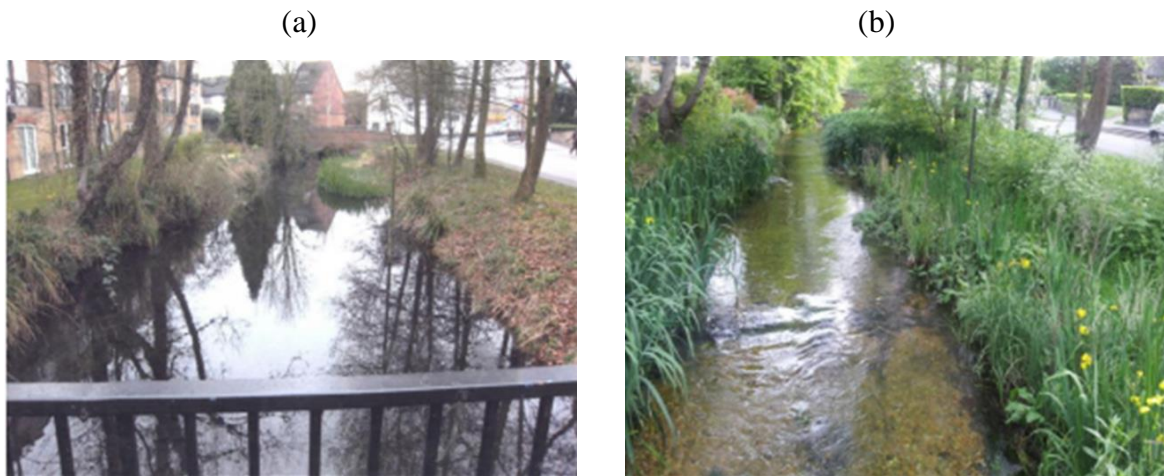


Figure 36. (a) before and (b) after weir removal (Longstaff, N.D.)

6.2.5 Mayesbrook Park restoration

The Mayesbrook Park restoration was done in conjunction with multiple authorities, including Thames Rivers Trust, Queen Mary University of London, Natural England, Design for London, Greater London Authority, London Wildlife Trust, RSA (Insurance), SITA Trust, and Mayesbrook Park Friends group. Plans for the restoration of Mayesbrook were integrated into a parkwide restoration plan (London Borough of Barking and Dagenham, 2009a) with a budget of £5 million. The Mayesbrook project steering group estimated that around £0.5 million was required for river restoration.

Figure 37 shows the masterplan for the new landscape at Mayesbrook Park, with the brook running along the northern border of the park. Originally, the brook was completely disconnected from the park and the state of the riverbanks before restoration potentially posed a flood risk to adjacent properties on the right bank. Much of the park area consisted of short mown grass, which provided poor habitat for wildlife, and the park had suffered from a lack of investment and care. The goals of the project involved increasing floodplain storage, creating numerous sustainable urban drainage areas, and adding a backwater in the middle portion of the park. These have contributed to an improvement in the wildlife and recreational value of the park. Figures 38 and 39 showcase the difference between the encapsulated portions of the brook

and the portions where there is natural floodplain storage along with sustainable urban drainage areas.



Figure 39. Mayesbrook project phase 1 landscape masterplan (Environmental Agency, 2011)



Figure 37. Open field along the brook (EA, 2011)



Figure 38. Enclosed portion of brook (Shuker, 2009)

Public engagement activities identified the various interests, expectations, and goals of stakeholders. The project was designed to maximize the delivery of desired benefits. A public consultation was carried out by the London Borough of Barking and Dagenham, or LBBD, in 2009 to provide an opportunity for residents to express their ideas and opinions. Overall, flood modelling has shown that the post construction scheme has reduced flood risk locally, with a

lifetime benefit-to-cost ratio of £7 for every £1 invested. There was also a vast improvement in plant and wildlife in the park. The creation of a river corridor and a wider ‘green network’, such as paths, parks, and gardens, dramatically improved the natural infrastructure. Additionally, social benefits such as numbers of visitors and greater feeling of safety increased significantly.

6.2.6 Quaggy River restoration

The River Quaggy had a history of flooding dating as far back as 1968 where the river’s water level rose enough to result in extensive flooding of the borough of Lewisham. Due to rising concerns, a new flood alleviation scheme was conceived and implemented between 1990 and 2005, which can be seen in Figure 40. While plans started in 1990, it took until 2002 before work on the river began in earnest, starting with a section located in Chinbrook Meadows. The first course of action was to remove a large concrete wall that was built along the perimeter of the river during a previous flood mitigation effort. The walls were intended to channelize the river, making it artificially wider, which, in theory, would allow more water to flow through the river quicker and away from residential areas. This theory, however, resulted in more flooding. Figure 41 shows one such set of walls below a bridge which contributed to the channelization. Once the walls were removed, the river was excavated to shape the river into a more natural meandering channel. Additional store drains and a flood storage pond were constructed to help contain any additional flood discharge.

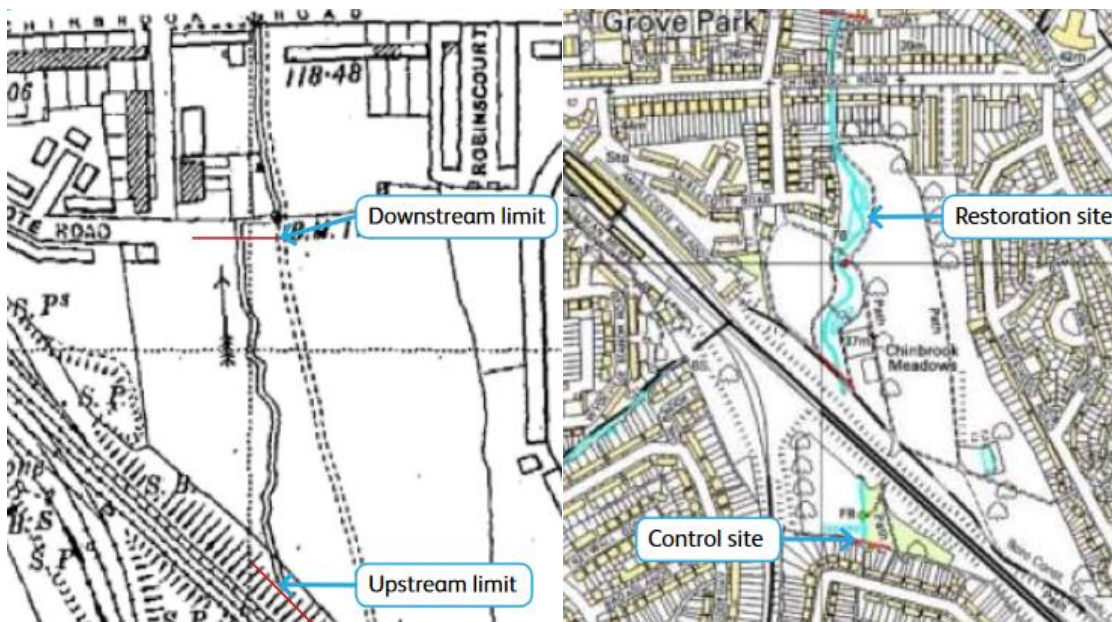


Figure 40. Map of Quaggy River (ECRR, 2013)



Figure 41. Concrete bridge created during the 1950 channelization (ECRR, 2013)

These new additions and changes have resulted in a significant impact on the local ecosystem and environmental diversity. The change in flow of the river has allowed for the natural processes to work, resulting in new natural features such as the formation of natural gravel bars. The higher flow allows the river to supply more water ponds which help maintain wetland habitats.

Originally, the plan for the restoration was to build upon and raise concrete walls that surrounded the river. This approach was vehemently opposed by the public since it would have required the removal of a small grove of trees. This backlash caused the organizers to turn the focus of the project upstream, which allowed for more flexibility in the project and led to its current implementation. This was not the only instance in which the public's perspective was taking heavily into account. A full-time public engagement officer was hired from the start to keep the local community engaged during the project. After the project, the restoration efforts help give back to the community what they help put in. The restoration led to a 73% increase in the number of visitors to the local park, and visitors generally stay longer than previously.

Chapter 7. Conclusions and recommendations

Throughout the project, we developed tools and gathered useful findings relating to each of the three primary objectives. The following summarizes our conclusions regarding the data analysis, observational tool, and case study research, as well as our recommendations for the future.

7.1 Data analysis

The tools developed for Microsoft Office will streamline the data analysis process in the future for the Lewisham Council. Once the tools are installed in Microsoft Office, they can be used on any future spreadsheet. Furthermore, the Data Analysis Tools User Guide should be followed to prevent any issues with the functions of each tool. The tool, in the future, should be used to compare the 2018 survey and observational data with new data that is collected. Park volunteers, when collecting observational data in the future, should be liberal with what they include in the “Other” category under activities. If visitors are doing an activity that does not fall under one of the main categories, the volunteers should not note it directly in the questions on the survey. Rather it should be a note at the end of the submission. This will eliminate any potential issues with overlapping categories with different names.

7.2 Observational tool

The web observational tool provides a very effective way of collecting data. Anyone with knowledge of the data collection protocols can use their phone or tablet to collect data. Create the tool as a website made fulfilling a lot of the design criteria very easy. A website can be accessed by multiple people at the same time and on any device, irrespective whether it is an Apple device or an Android device. Even with the devices that do not have internet connection, the website can be opened at a place with WIFI access and then just not refreshed. By using radio buttons, most of the manual input or typing is taken away, effectively vanishing any typing errors and making it fast to fill out the survey. The map is a very effective way of collecting the location of the observed activities. The map is detailed enough that the observers can localize themselves and pin down a suitable location for the activities being conducted. Since the goal is not to collect the exact location of the activities, the location guessed will be with the reasonable

estimates for this task. Once all the data is collected, the Google Sheet can be downloaded as an Excel file. This, combined with the macros developed (Chapter 4), can be used to analyze the data with relative ease.

7.3 River restoration case studies

From the case studies we reviewed, we found that the most prominent aspects throughout were public involvement, aesthetic enhancement, and naturalization improvements. In cases such as Ladywell Fields and the River Skerne, we saw the difference in how people perceived the park purely from its look and welcoming features. In Ladywell Fields, the river was moved to the park's center, old railings were removed, and sightlines from outside the park were improved, resulting in the public's feeling of safety boosting to 78% from 44% (Lewisham Council, 2012). At the River Skerne, new flora was introduced to improve the aesthetics of the area, as well as cover other aspects deemed unappealing to the eye. This simple addition has raised visitation rates by over 40% as well as increased the visual appeal of the scenery by the public by nearly 90%. Public engagement is a key feature for the restoration at BPP.

Regarding the River Brent that runs through Tokyngton Park, the Borough of Brent did a great job on focusing on community engagement. They surveyed the public on what they would like to see done within the park and, they were physically able to connect two disconnected communities before the restoration of the river.

To achieve a successful river restoration, it is crucial to learn from similar past urban river restoration projects. From our research, we have found that in a successful restoration project, there are certain objectives that should be considered, including site assessments, planning, design creation and implementation, and monitoring after project completion. These objectives are organized into a cycle, shown in Figure 42.

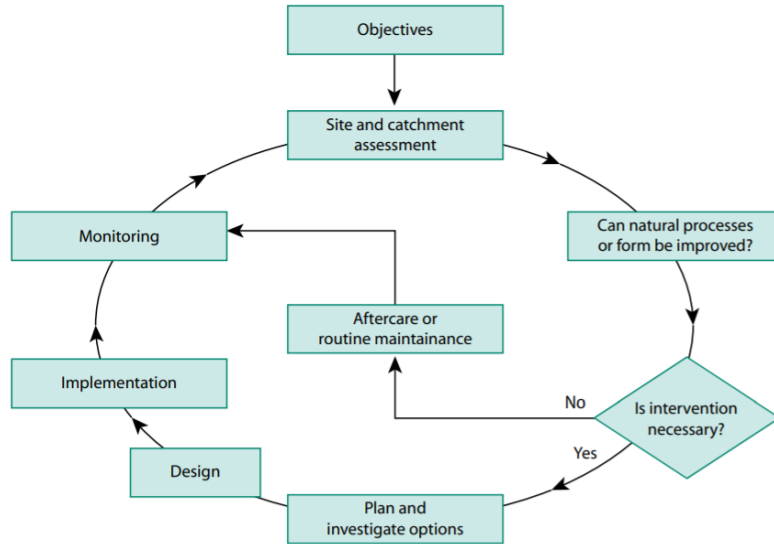


Figure 42. Cycle of a restoration project (The River Restoration Centre, N.D.)

When beginning a project, an initial assessment is most often completed. The assessment can review previous projects, determine successes and shortcomings, and incorporate the best practices into the new project. The Lewisham Council staff has already begun contacting the community to gauge their opinions on what would be an ideal restoration for BPP.

It is important to review all desired outcomes before the project has begun. Desired outcomes include developing effective flood mitigation, preserving natural scenery and biodiversity, creating a visually appealing and functional space for the public, etc. Additionally, project managers must consider how the project will be monitored after completion. Implementing a monitoring system helps to evaluate the outcomes of the project for comparison against the desired outcome and is usually done through the help of volunteers.

Overall, all the case studies we reviewed have qualities that we believe could prove useful to the Lewisham council and aid them with ideas to help create the best social environment for their park visitors in the future.

References

Beckenham Place Park Regeneration. (2019, April). Retrieved 2020, from <http://councilmeetings.lewisham.gov.uk/documents/s64440/Beckenham%20Place%20Park%20Update.pdf>

Beckenham place Park to be restored AND REVITALISED. (2016). Retrieved February 16, 2020, from <https://www.heritagefund.org.uk/news/beckenham-place-park-be-restored-and-revitalised>

Benefits of Green Infrastructure. (2010, October). Retrieved February 16, 2020, from https://www.forestresearch.gov.uk/documents/2515/urgp_benefits_of_green_infrastructure.pdf

Case Study: Ladywell Fields (QUERCUS). (2017, April). Retrieved April 20, 2020, from [https://restorerivers.eu/wiki/index.php?title=Case_study%3ALadywell_Fields_\(QUERCUS\)](https://restorerivers.eu/wiki/index.php?title=Case_study%3ALadywell_Fields_(QUERCUS))

Case study: river WANDLE: BUTTER hill Phase 3. (2019, January). Retrieved April 21, 2020, from https://restorerivers.eu/wiki/index.php?title=Case_study%3ARiver_Wandle%3A_Butter_Hill_Phase_3

CHI-squared test. (2003, May 14). Wikipedia, the free encyclopedia. Retrieved April 29, 2020, from https://en.wikipedia.org/wiki/Chi-squared_test

Czamara, Dunne, Pierce III, & Sturgis. (n.d.). Lewisham: Beckenham Place Park Regeneration. Retrieved January 19, 2020, from <https://wp.wpi.edu/london/projects/2016-projects-spring/lewisham-d16/>

De-culverting London. (2013). Retrieved April 21, 2020, from http://nwrn.eu/sites/default/files/case_studies_ressources/cs-uk-02-final_version.pdf

Environment Agency. (2011, April).

Http://catalog.ipbes.net/system/assessment/193/references/files/568/original/The_Mayes_Brook_restoration_in_Mayesbrook_Park_East_London_-_an_ecosystem_service_assessment.pdf?1364316259. Retrieved April 19, 2020, from

http://catalog.ipbes.net/system/assessment/193/references/files/568/original/The_Mayes_Brook_restoration_in_Mayesbrook_Park_East_London_-_an_ecosystem_service_assessment.pdf?1364316259

Environmental Protection Agency. (2020). Water Framework Directive: Classification. Retrieved April 27, 2020, from <https://www.epa.ie/water/watmg/wfd/classification/>

Fisk, R. (2011, July 02). Firefighters battling CLOCK house fire in Beckenham Place park. Retrieved February 01, 2020, from <https://www.thisislocallondon.co.uk/news/9118859.firefighters-battling-clock-house-fire-in-beckenham-place-park/>

Glendale managed PARKS best in LONDON: NEWS. (2019, April 26). Retrieved February 17, 2020, from <https://www.glendale-services.co.uk/latest-news/glendale-managed-parks-among-best-london/>

Greener City Fund. (2020, January 31). Retrieved February 17, 2020, from <https://www.london.gov.uk/what-we-do/environment/parks-green-spaces-and-biodiversity/london-national-park-city>

Haigh, N., & Chapman, P. (2015). WATER QUALITY GOVERNANCE. Retrieved April 24, 2020, from [oecd.org/environment/resources/England-case-study-water-quality-governance-diffuse-pollution.pdf](https://www.oecd.org/environment/resources/England-case-study-water-quality-governance-diffuse-pollution.pdf)

Kruskal–Wallis one-way analysis of variance. (2004, November 22). Wikipedia, the free encyclopedia. Retrieved April 29, 2020, from https://en.wikipedia.org/wiki/Kruskal%E2%80%93Wallis_one-way_analysis_of_variance

Lewisham Council. (2012, January). Ladywell Fields, Lewisham. Retrieved April 23, 2020, from https://restorerivers.eu/wiki/images/c/c7/CIWEM_Living_Wetlands_Award_-_Ladywell_Fields.pdf

Local parks. (2020). Retrieved February 17, 2020, from <https://lewisham.gov.uk/inmyarea/openspaces/parks>

London National Park City. (2020, January 31). Retrieved February 04, 2020, from <https://www.london.gov.uk/what-we-do/environment/parks-green-spaces-and-biodiversity/london-national-park-city>

Longstaff (N.D). River Restoration: Butter Hill weir modification and river naturalization project. Retrieved April 27, 2020, from https://www.wandletrust.org/wp-content/uploads/2014/08/Butter_Hill_info_for_Website.pdf

Making Lewisham Greener. (2020). Retrieved February 17, 2020, from <https://lewisham.gov.uk/mayorandcouncil/corporate-strategy/our-priorities/making-lewisham-greener>

MAYOR AND CABINET: Beckenham Place Park Regeneration Update Paper. (2017, July 19). Retrieved January 31, 2020, from <http://councilmeetings.lewisham.gov.uk/documents/s51420/Beckenham%20Place%20Park%20update.pdf>

Mayow Park Masterplan Final Draft. (2009, November). Retrieved February 16, 2020, from <http://www.aroundtheblockltd.co.uk/lib/file/4.pdf>

McCulloch. (2019, July 19). Beckenham place Park: London's Newest green space. Retrieved February 03, 2020, from <https://www.theguardian.com/travel/2019/jul/19/beckenham-place-park-lewisham-london-lake-woods-rewilding>

Mitchell, M. (2018, May). The History of Beckenham Place Park. Retrieved January 31, 2020, from <http://www.beckenhamplaceparkfriends.org.uk/BPPhistoryfullv1.pdf>

Mitchell, M. (2020). The History of Beckenham Place Park and Environs. Retrieved February 02, 2020, from <http://www.beckenhamplaceparkfriends.org.uk/history.html>

Natural Capital accounts for public green spaces in London. (2017, October). Retrieved February 2020, from https://www.london.gov.uk/sites/default/files/11015viv_natural_capital_account_for_london_v7_full_vis.pdf

Open Space Strategy 2012 - 2017. (2017). Retrieved February 16, 2020, from <https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=13&cad=rja&uact=8&ved=2ahUKEwi5oKTG09bnAhWBYTUKHW4RB5AQFjAMegQIAhAB&url=https%3A%2F%2Fflewisham.gov.uk%2F-%2Fmedia%2Ffiles%2Fimported%2Fopenspacestrategy2012.ashx&usg=AOvVaw09491nFPWFfsvPkGssXyVf>

Prior, J. (2016). Urban River design AND Aesthetics: A River restoration case study from the UK. Retrieved April 22, 2020, from https://www.tandfonline.com/doi/full/10.1080/13574809.2016.1187557?casa_token=qfmZeakKLyAAAAAA%3AP-5WdhZAKhc7tBZD2BeDqP9ZD3d3LtSdSETpYjL1s8z8KAhN93OYiyntvRI6VVvCpU5N5yjnBriBXw

Public Health England. (2014, September). Local action on health inequalities: Improving access to green spaces. Retrieved May 5, 2020, from https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/357411/Review8_Green_spaces_health_inequalities.pdf

Quaggy Waterways. (2013). Improve channel geomorphology to create habitat. Retrieved April 27, 2020, from <http://www.ecrr.org/Portals/27/River%20Quaggy,%20London.pdf>

Raven-Ellison. (2017, August 17). Greenspace information for Greater London. Retrieved February 17, 2020, from <https://www.gigl.org.uk/reimagining-london/>

River restoration case study. (2016, January 11). Retrieved April 27, 2020, from <https://landscapeiskingston.wordpress.com/2016/01/11/river-restoration-case-study/>

River Skerne EU-LIFE project. (2013, July 30). Retrieved 2020, from http://wiki.reformrivers.eu/index.php/River_Skerne_EU-LIFE_project

RRC Staff. (2008, September). River Ravensbourne, Ladywell Fields (QUERCUS). Retrieved April 19, 2020, from <https://www.therrc.co.uk/sites/default/files/projects/p1514.pdf>

RRC Staff. (2008). River Brent at Tokyngton Park. Retrieved April 21, 2020, from https://www.therrc.co.uk/case_studies/tokyngton%20park.pdf

South East Rivers Trust. (2014). Butter Hill Phase 3. Retrieved April 20, 2020, from <https://wandlevalleypark.co.uk/wp-content/uploads/2015/10/H.-Butter-Hill-Restoration-Case-Study.pdf>

The River Restoration Centre. (n.d.). Manual of River Restoration Techniques. Retrieved April 20, 2020, from https://www.therrc.co.uk/MOT/MOT_Introduction_Part4.pdf

Vivid Economics - Lewisham. (2017). Retrieved February 16, 2020, from <https://maps.london.gov.uk/NatCapReport/reports/Lewisham.pdf>

Wandle River restoration project. (2015, March). Retrieved April 19, 2020, from https://www.therrc.co.uk/sites/default/files/projects/crf_wandle.pdf

Appendices

Appendix A: Influence of various factors on observational data

| Statistically Significant Relationship | | Nature of Difference/ Conclusions |
|--|----------------------|--|
| Factor of Interest | Affected Observation | |
| Day of Week | Gender of Visitors | Less females tend to visit the park on Saturdays. Conversely, more males tend to visit the park on Saturdays. |
| | Age of Visitors | Older visitors, aged 50-69, tend to visit the park at the beginning and end of the work week and far less on weekends, particularly Sundays. In contrast, far younger visitors, aged 5-16 visit the park far more on Sundays than they do with during the rest of the week. This is supported by the fact that there was a greater percentage of families observed during the weekends than during the middle of the week. A significant portion of visitors aged 17-24 visited the park on Thursdays. |
| | State | A large percentage of families were observed to visit the park on the weekends, particularly Sunday. Likewise, there were more people in the park during the middle of the week who were alone. |
| | Ethnicity | A significant portion of black visitors were observed to visit the park on Thursdays. |
| | Dogs | Visitors tend to visit the park on Sundays with no dogs. Likewise, the data showed that the greatest percentage of visitors with four or fewer dogs visited the park on Fridays. |
| | Activities | Visitors on Sundays tended to engage in more physical activities such as biking (Off-road and BMX biking) and sports. Visitors of the Mansion tended to visit on Thursdays. Likewise, visitors tend to visit the Cafe more on Fridays. On Mondays, visitors tend to sit in the park more and walk less. |
| Time of Day | Age | Younger visitors (aged 5-16) visited the park more in the mid/late afternoon. In contrast, older visitors (aged 25 and older) visited the park more in the early/late morning. |
| | State | People who visit the park alone or with a group tend to visit the park in the morning, while families tend to visit the park in the mid/late afternoon. |
| | Ethnicity | Black visitors tend to visit the park in the late afternoon, while White British visitors tend to visit the park less at the same time. |
| | Dogs | Visitors with no dogs tend to visit more in the afternoon, while visitors with dogs tend to visit more in the mid/late morning. |

Appendix A: Continued

| Statistically Significant Relationship | | Nature of Difference/ Conclusions |
|--|----------------------|--|
| Factor of Interest | Affected Observation | |
| Time of Day | Activities | Visitors tend to do leisure physical activities, such as dog walking, leisure cycling, and running in the morning. Visitors also tend to do more physical activities such as sports and non-leisure cycling (BMX and Off-road) in the early/midafternoon. Most of the visitors who visited the mansion did so in the early afternoon (1-2 pm). |
| Weather | Gender | Males tend to visit the park more than females when the weather is cloudy. |
| | Age | Younger visitors (aged 0-24) tend to visit the park when it is cloudy/windy than older visitors (aged 50-69). |
| | State | More people visited the park in groups (families and other groups) when it was windy and cloudy/rainy, while those who visited the park alone did more so when it was sunny. |
| | Ethnicity | White British and Black visitors tend to visit the park more when the weather is sunny. |
| | Dogs | Visitors tended to bring their dogs to the park more when the weather was sunny. |
| | Activities | Further confirms that visitors walk their dogs in the park more when the weather is sunny. Visitors also sat in the park more when it was sunny. |
| Location | Age | Younger visitors (aged 5-16) were observed more in zone 1 (playground). Most visitors aged 70 and older tend to visit zone 4 (Woods) and zone 5 (Mansion). |
| | State | Families tend to visit zone 1 (Playground). People who visit the park alone tend to visit zone 2 (East Fields) and zone 3 (West Fields) more. Visitors in other groups tend to visit the mansion more. |
| | Ethnicity | Black visitors tend to visit zone 1 (Playground) and zone 2 (East Fields). White British visitors tend to visit zone 3 (Woods) and zone 5 (West Fields). |
| | Dogs | Visitors tend to walk dogs more in zone 3 (Woods). Visitors with no dogs tend to visit zone 1 (Playground) and zone 2 (East Fields). |

Appendix A: Continued

| Statistically Significant Relationship | | Nature of Difference/ Conclusions |
|---|-----------------------------|--|
| Factor of Interest | Affected Observation | |
| Location | Activities | Visitors tend to walk more in zone 3 (Woods), whether they are dog walking or just walking. Visitors tend to do activities such as BMX or the skatepark in zone 1 (Playground), which is presumably where the skatepark and BMX course are located. Visitors tend to do leisure cycling more in zone 2 (East Fields) and zone 3 (Wests Fields) |

Appendix B: Revised survey

Disclaimer: We are students working with the Lewisham Council on the regeneration process of Beckenham Place Park. Would you mind taking approximately 10 minutes to complete this interview? You do not have to answer all the questions and you can end the interview at any point. Anonymity will be held to the best of our ability and you do not need to give any personal information or can request it is not given to the Lewisham Council. If you would like to review your answers before submission, you may do so. Thank you for your time.

Day of Week: _____ Location: _____ Weather: _____

Green = Keep and Modify yellow = unsure about relevance Red = Not applicable

Opinion Data

1. On average, how often do you visit Beckenham Place Park? (tick one)

| | |
|--------------|-----------------------|
| Everyday | Once or twice a week |
| Once a month | Once every six months |
| Once a year | Less than once a year |

2. On average, how often do you visit Beckenham Place Mansion?

| | |
|-------------|-------------|
| Every visit | Most visits |
| Some visits | Never |

3. Why do you visit Beckenham Place Park? (tick all that apply) and swimming and exercise

| | | |
|------------------------|----------------------|------------------------|
| Walking | Cycling | Dog walking |
| Play area | Wildlife | Relaxation |
| Spending time outdoors | Other sport/exercise | Other (please specify) |

4. Did you visit Beckenham Place Park before the closure of the golf course (October 2016)? Did you come to the park before the heritage lottery fun restoration project

- a. Yes - Do you visit more or less frequently now?
 - i. More
 - ii. Less
- b. No

5. How do you travel to Beckenham Place Park? (Modify layout)

| | | |
|------------------------|-------|-----------|
| Train | Bus | Car/drive |
| Walk | Cycle | Taxi |
| Other (please specify) | | |

6. Ideally, how **Sensitivity** do you want to travel to Beckenham Place Park? What would encourage people to travel in a sustainable way if they drive

| | | |
|------------------------|-------|-----------|
| Train | Bus | Car/drive |
| Walk | Cycle | Taxi |
| Other (please specify) | | |

7. If ideal travel method is different to actual travel method, what is stopping you travelling to Beckenham Place Park via your ideal travel method? (Modify layout, Clean up)

| | | |
|---|--|--|
| Lack of parking space Too far to walk from the station to the park | Lack of cycle parking Expense of public transport | Expense of taxi |
| Too far to walk from the bus stop to the park | Don't own a car / bike | Quality of roads cycling into the park |

8. How do you feel about the park as it is now?

| | | | | |
|-------------------|-----------------|---------------|------------------------------|-------------------|
| 1 | 2 | 3 | 4 | 5 |
| | V. dissatisfied | | Doesn't fulfil its potential | |
| 6 | 7 | 8 | 9 | 10 |
| Satisfied with it | | Happy with it | | Delighted with it |

9. Please rate the current condition of the park. (Modify layout)

| | | | | |
|------|---------|---------|------|-------------|
| 1 | 2 | 3 | 4 | 5 |
| | V. poor | | Poor | |
| 6 | 7 | 8 | 9 | 10 |
| Good | | V. good | | Outstanding |

10. How good is your understanding of the heritage of the park? Lucy wants to keep this question, signage and maps for the heritage of the buildings

| | | | | |
|------|---------|---------|------|-------------|
| 1 | 2 | 3 | 4 | 5 |
| | V. poor | | Poor | |
| 6 | 7 | 8 | 9 | 10 |
| Good | | V. good | | Outstanding |

11. Do you think there is a good community spirit where you live? (only ask if respondent lives in BR1, BR3, SE6, SE12, SE23, SE26, OR ask everyone then discount answers based on postcode when analysing the data.)

Yes/ No

12. Do you think Beckenham Place Park enhances your quality of life? Keep this question, How? In one sentence

Yes / No

13. Do you feel safe in this area (in the park and 1-2km from the park)? (reword this question) add **question about people on the outside of the park Part a have you been to the park and part b do you feel safe **

Yes / No

14. Which of the following outdoor activities are you/ would you be interested in doing in Beckenham Place Park?

add the pond for swimming

| | | | |
|--------------|-------------------|----------------|-------------------------|
| Walking | Running/jogging | BMX | Cycling/mountain biking |
| Table tennis | Climbing wall | Roller skating | Using skatepark |
| Pond dipping | Canoeing/kayaking | Natural play | Outdoor swimming |
| Trim trail | Observe wildlife | Geocaching | Other (please specify) |

15. Would you be interested in attending any of the following types of events and activities in Beckenham Place Park? Lucy Will get back to us on this with new stuff

| | |
|---|--|
| Activities specifically for children & young people | Classical music concerts |
| Contemporary music | Performing arts |
| Cultural festivals | Community workshops |
| Summer playschemes | Food markets |
| Christmas & winter themed events | Health and fitness |
| Nature and wildlife | Practical horticultural & gardening workdays |
| Practical natural conservation workdays | Local history and heritage |
| Guided walks and talks | Arts and crafts |
| Other (please specify) | |

16. Have you attended any of the following types of events and activities in Beckenham Place Park in the past year or so? Add ~~bm~~x club sessions Music festival add forest school

| | |
|---|--|
| Half term activities for children & young people | Film workshop for children |
| Outdoor cinema | BMX track opening or club sessions |
| Vintage fayre | Splattermake/ Know How you sew or crafts workshops |
| Fayre's eat Food market | |
| Festival of Lights | Health and fitness classes |
| Running races | Practical horticultural & gardening volunteer workdays |
| Practical natural conservation volunteer workdays | Forest school activities |
| Guided walks and talks | Cycle races |
| Yoga classes | Mindfulness sessions |
| BPP Friends visitor centre | Other (please specify) |

17. Please tell us your views on the scale and frequency of possible future events at Beckenham Place Park.

a. Small scale (Under 100 people)

| | | | | |
|-------|----------|-----------|----------|----------|
| Share | None | 1/year | 2/year | 3-4/year |
| | 5-6/year | 7-12/year | >12/year | |

b. Medium scale (Around 1000 people)

| | | | |
|----------|-----------|----------|----------|
| None | 1/year | 2/year | 3-4/year |
| 5-6/year | 7-12/year | >12/year | |

c. Large scale (5000 people+)

| | | | |
|----------|-----------|----------|----------|
| None | 1/year | 2/year | 3-4/year |
| 5-6/year | 7-12/year | >12/year | |

18. Would you be interested in taking part in any of the following volunteer activity? (keep Lucy wants it) she will get back us yes or no with a follow up email instead of asking all these options

| | |
|--|--------------------------------------|
| Assisting with school visits | Developing community arts projects |
| Discussing park management issues | Food growing and community gardening |
| Helping to deliver events and activities | Local history research |
| Oral history projects | Wildlife and habitat conservation |
| Not interested | Running sports clubs (eg Parkrun) |

19. How informed do you feel about changes in Beckenham Place Park? On a scale of 1-5 with 1 being uninform and 5 being very informed.

| | | | | |
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|

20. Which form of communication is most useful for finding out information on Beckenham Place Park?

| | | | |
|-----------------|----------|------------------------|-------|
| Twitter | Facebook | Posters in park | Email |
| Council website | Leaflets | Other (please specify) | |

Monitoring Data

21. Please tell us your full postcode so that we can better understand where respondents live in relation to Beckenham Place Park. _____ (6 digit letter or code)

22. How old are you?

| | | | |
|-------|-------|-------------|-------------------|
| 18-29 | 30-39 | 40-49 | 50-59 |
| 60-69 | 70-74 | 75 or older | Rather not answer |

23. Are you

- a. Male
- b. Female
- c. Rather not answer

24. Do you consider yourself to have a disability or longterm illness?

- a.) Yes
- b.) no

25. What is your ethnicity?

| |
|---------------------------------------|
| White British |
| White Other |
| Black/African/Caribbean/Black British |
| Asian/Asian British |
| Other (specify is applicable): |

Appendix C: Observational study sheet

Day of Week: _____ Time: _____ Weather: _____

| Gender | Age | Ethnicity | State | With dog | Location | Activities | |
|--------|-------|-----------|---------------|------------------------|----------------|------------------------------------|-----------------------|
| MALE | 0-4 | White | Alone | Yes (4 or more dogs) | Zone 1 | Walking | Children's Playground |
| | 5-16 | | | | Zone 2 | Dog walking | BMX Course |
| | 17-24 | Black | Family | Yes (less than 4 dogs) | Zone 3 | Buggy/pram | Running |
| FEMALE | 25-49 | | | | Zone 4 | Off road cycling / Leisure Cycling | Standing |
| | 50-69 | Asian | Another group | No | Zone 5 | Wheelchair / mobility scooter | Sitting |
| | 70+ | | | | | Sports | Skatepark |
| | | Other | | | Mansion / cafe | Other (specify) | |

Appendix D: Observational tool user guide

Introduction

The tool is designed to aid the Lewisham council in collecting data for observational studies in the Beckenham Place Park. The tool is designed to port over the data collection process from paper to electronic. This document will serve as a user guide to help new users get familiar with the tool. Step by step instructions are provided on how to collect data using this tool.

About the Tool

- Open the Observational Tool in **Safari** or **Google Chrome**.
- Do not open the tab in **Incognito Mode**. When the web tool is opened in a regular window, the data saved will persist even if the tab is closed and opened again. Data will be erased if the tool is being used in Incognito Mode and is refreshed.

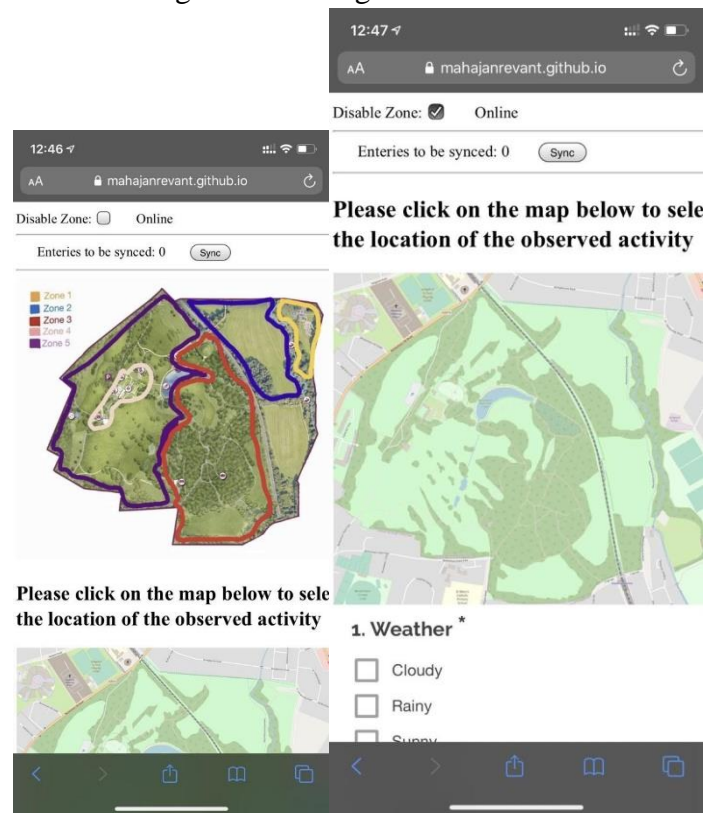


Figure 1: Disable and Enabling the Zone Image

- The toolbar at the top includes:
 - Disable Zone:** By pressing the checkbox, the image illustrating the zones (the first image) is hidden. The purpose of the image is so that the users can refer to it when answering the question about the zones. (Figure 1)
 - Online:** Makes the user aware whether the device is online (connected to the internet) or offline (not connected to the internet).

- c. **Entries to be synced:** Number of entries that are saved to user’s local device and still need to be synced to the main database.
- d. **Sync:** By pressing the button, users can sync the data saved on their devices to the main database. It is disabled when the device is offline
- Multiple options can be selected for the questions with squared checkboxes and only one option can be selected for the questions with circular checkboxes.
- All the questions that require responses have an asterisk in front of them
- Clicking on the “**Complete**” button only saves the data locally in the browser. The “**Sync**” button must be pressed to transfer the data to the master database.

How to Record Data

- Load the website where there is good internet connectivity and keep the website open in the browser. Even if the website reloads by accident, any previously saved data is going to persist.
- **Click** on the map below the zone map to pinpoint the location of the observed activity within the park. You can zoom in to better place the marker. In figure 2, the red dot indicates the clicked location on the map.



Figure 2: Interactive Map of Beckenham Place Park

- Fill out the **weather** (Question 1) and the **state** (Question 2) questions before proceeding further. If “**Alone**” is chosen for Question 2, you can only record data for one park user in Question 3. If either “**Family Group**” or “**Other Group**” is chosen, then an “**Add More Participant**” button becomes available after Question 3 to record data for more than one park user (Figure 3).

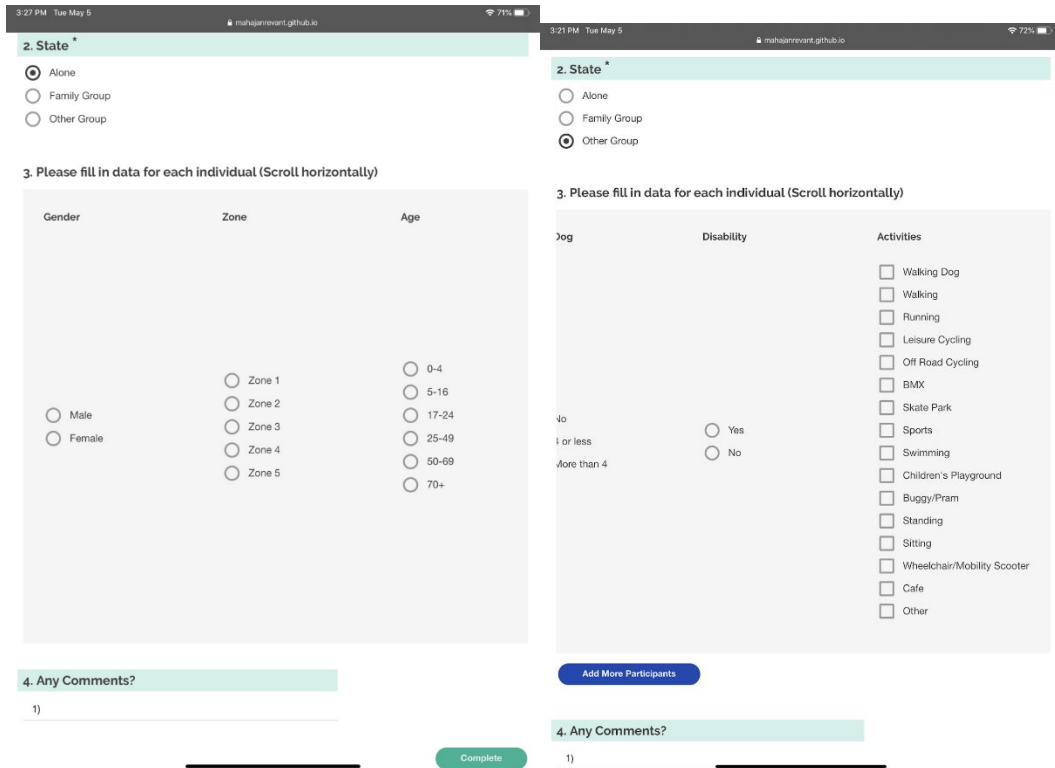


Figure 3: Changes in the visibility of “Add More Participants” based on Question 2

- To fill out Question 3, **scroll horizontally** on the grey area to see all required fields. (Figure 4)

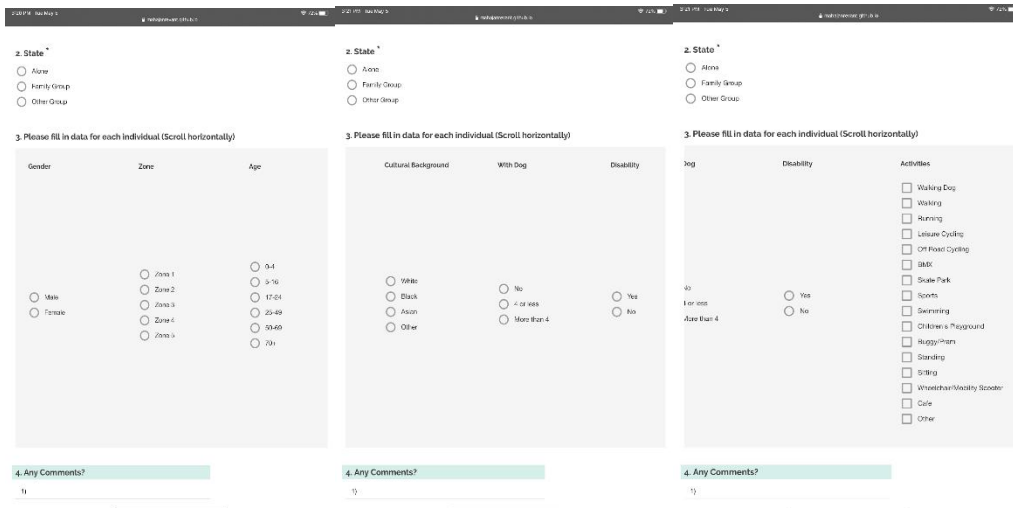


Figure 4: All the questions under Question 3

- Any interesting anomalies or any activities observed that do not fit the existing categories can be recorded in Question 4 as comments.

- Press the “**Complete**” button to save the data. If all the required questions are answered, there will be a pop-up notifying the user that the data has been saved. If all the required questions were not answered, the survey is going to take you to the incomplete question(s) which will either be highlighted by red color (Question 1 and 2) (Figure 5) or will have red text written right next to it (Question 3).

2. Weather *

Please answer the question.

Cloudy

Rainy

Sunny

Windy

Overcast

3. State *

Alone

Family Group

Other Group

Figure 5: Error displayed for incomplete observation

- Once the data is saved successfully, the counter “**Entries to be synced**” will be incremented by the number of observations recorded. For example, if only one person is observed, the counter will increase by 1 (Figure 6). If a family group of 5 people are observed, the counter will increase by 5. A pop-up will confirm the successful saving of data (Figure 7-a).

Disable Zone: Online

Entries to be synced: 1



Please click on the map below to select the location of the observed activity

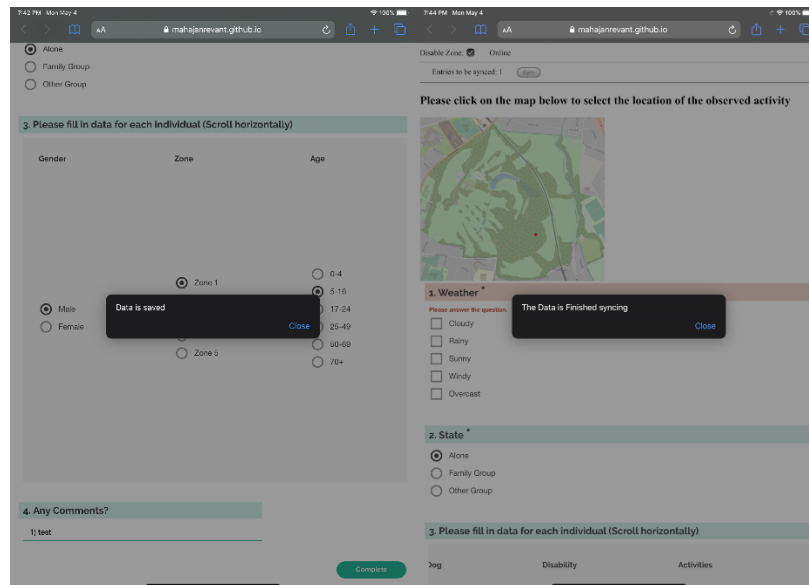


1. Weather *

- Cloudy
- Rainy
- Sunny
- Windy
- Overcast

Figure 6: Counter is updated after pressing the Complete

- The data can then be synced to the master database by pressing “**Sync**”. This functionality will only be available when there is an internet connection.
- If the sync is successful, a pop-up will confirm (Figure 7-b) and the “**Entries to be synced**” will return to 0. On the other hand, if the data is not synced, a pop-up will ask the user to try again. In this case, the counter will only be decreased for the entries successfully synced. The pop-up indicating a sync failure will appear for every data entry that fails to be synced. The user will need to click on “close” to close the pop-up. The locally saved data will not have to be re-entered. The “sync” option can be tried again right away or when the internet connection is more stable.



(a)

(b)

Figure 7: The alerts displayed after saving(a) and syncing(b)

- If the user has a good internet connection, it would be a smart idea to sync each time 3-5 entries are recorded. If there is no internet connection whilst collecting data in the park, do not worry, the device (phone or tablet) will be able to store hundreds of observations until a good connection is available for syncing.

Appendix E: River expert interview questions

River expert interview preamble

“We are students from Worcester Polytechnic Institute in Worcester, Massachusetts, United States. We are working with the Lewisham Council on the regeneration process of Beckenham Place Park and the River Ravensbourne. Would you mind participating in an interview to help us gather information regarding river restoration? Keep in mind, you can opt out of answering any question and can end the interview at any point in time. At your request, your identity and/or responses can remain anonymous, and can request no information is given to the Lewisham Council. If you would like to review your answers before publication, you may do so. Thank you for your time.”

| Questions for Experts |
|---|
| 1. How long have you been involved in river restoration projects? |
| 2. What is a typical timeline when planning a restoration project? What process do you follow to stay on track/on schedule? |
| 3. How long did the project take? |
| 4. Why was this project initially created? |
| 5. Was there any surveying done beforehand? |
| 6. What authorities were contacted in preparation for the project? |
| 7. What are some common difficulties associated with river restoration projects? Before? During? After? |
| 8. How do you deal with unforeseen issues/costs that arise late in the planning phase or during the execution process? |
| 9. What are good practices to be aware of? Based on our research we have identified several restoration methods that cover all major parts of the project from start to finish. How do these methods compare to those employed by you and/or your organization? What methods proved useful and which did not? |
| 10. What environmental factors were assessed? |
| 11. What maintenance was implemented post-project? |
| 12. Is there anybody who you would suggest we contact for further information? Could you provide us with their contact information? |