



TOWN AND COUNTRY PLANNING ACT 1990 (as amended)

PROOF OF EVIDENCE

of Kate Mackay BE (Hons), MICE CEng, MCIWEM C.WEM

on behalf of Shared Greater Cambridge Planning Services

land at Teversham Road Fulbourn

LPA Reference: S/3290/19/RM

PINS Reference: APP/W0530/W/22/3291523

1 Introduction

- 1.0 This proof of evidence has been prepared by Kate Mackay of WSP to support South Cambridgeshire District Council with the Appeal by Castlefield International Limited Against refusal of Planning Permission for reserved matters S/3290/19/RM pursuant to outline planning permission S/0202/17/OL for Land at Teversham Road, Fulbourn.
- 1.1 I was invited to provide proof of evidence by SCDC on 28th February 2022.
- 1.2 My evidence will concentrate on the issue highlighted in the Council statement of case paras 5.9-5.15 Reason for refusal 02 (RfR2) that refers to the fact insufficient information was submitted to demonstrate that the reserved matters scheme can provide a satisfactory scheme of surface water drainage and prevent the increased risk of flooding. It should be noted that further information regarding RfR2 has been provided by the Appellant subsequent to the reserved matter decision notice.
- 1.3 I have 18 years' experience as a Professional Water Resources Engineer. I am a Chartered Member of the Institution of Water and Environmental Management, as well as the Institution of Civil Engineers. I am currently an Associate Director at WSP where I am the national lead for flood risk and drainage within Development Infrastructure, and lead a team of modelling experts based in Cambridge, London and Birmingham. For the last 10 years I have worked mainly in the area of flood risk and sustainable drainage systems for proposed development in the UK.
- 1.4 I support the Council statement of case para 5.9-5.15 that despite further information having been provided, a satisfactory surface water drainage scheme has not been demonstrated or the increased risk of flooding mitigated, and reason for refusal 02 RfR2 was justified.

2 Issues with level of information provided to demonstrate site surface water scheme

- 2.0 The surface water drainage strategy for the site has been updated however no updated Microdrainage modelling has been provided for the amended scheme.
- 2.1 The introductory note states that sufficient attenuation volumes have been provided, but there is no summary of volumes required or provided by the amended strategy drawing.
- 2.2 On the surface water strategy drawing invert levels for key elements and pipework are not provided.

2.3 Flow control for Catchment B appears to be done by one device, it is not clear at what level the crates are or how surface water will be restricted from these or surcharge back to them. The crates on the road adjacent to the bridge structure in particular appear to be at a higher level than the cover level of the flow control manhole and bio-retention basins maximum water level. Catchment B is shown in Figure 2.3.1 below.

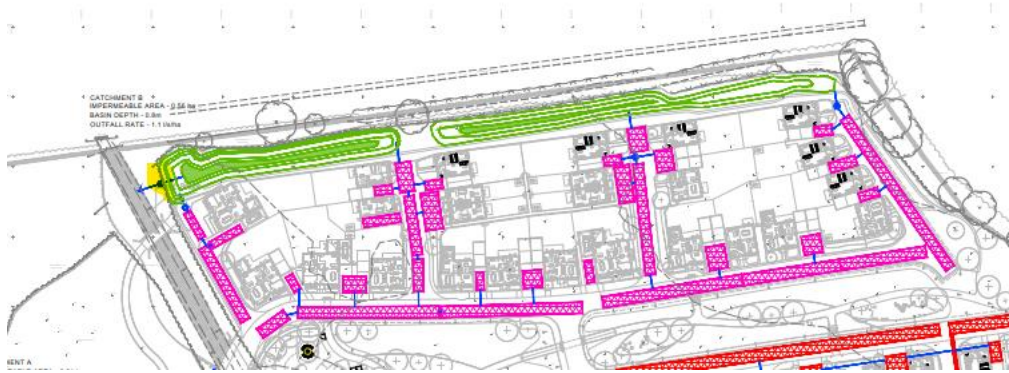


Fig 2.3.1 Proposed Attenuation Catchment B with flow control highlighted

2.4 A proposed spot level diagram has been provided, however there are not many values in some of the areas proposed for surface water storage. Given that in some of the modelling plots surface water seems to pool at a depth against a retaining structure as shown in Fig 2.4.1 below it is not clear that embankments to achieve access to lower levels of the site have been modelled.

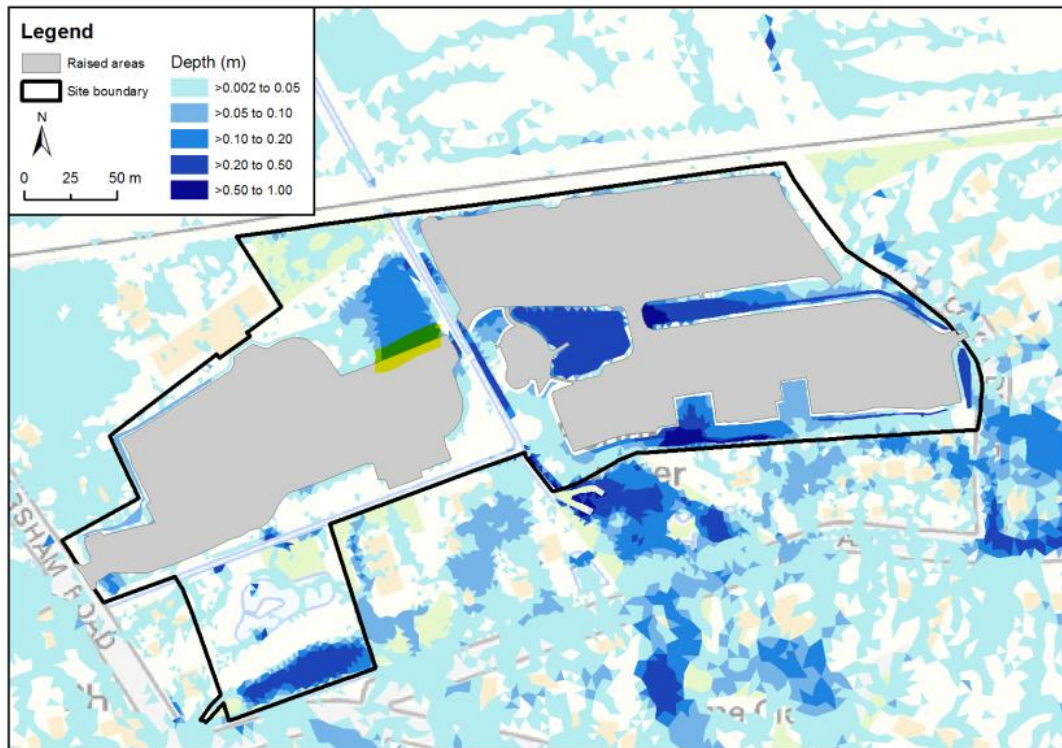


Fig 2.4.1 Design Surface water flood plot with abrupt development retaining structure highlighted

- 2.5 Therefore, insufficient information has been provided to demonstrate the proposed site attenuation strategy is suitable, and that the volumes for attenuation of site surface water are independent of those provided for surface water flood management.

3 Issues with flood modelling parameters that underestimate the risk and effect

- 3.0 Subsequent to the reserved matters decision notice and RfR2 Flood modelling has been provided that appears to show no increase in flood risk off site for the 100 year plus climate change surface water design event.
- 3.1 That design event has also been used to set FFLs for the houses.
- 3.2 The modelling makes a judgement on percentage runoff for the catchment of 6.1% for most of the catchment, and 70% for impermeable areas, which have been measured and appear to correspond to roofs and roads.
- 3.3 This may underestimate runoff from the catchment in two ways.
- 3.4 6.1% is a low percentage runoff for chalk soils. Report No. 126 Hydrology of soil types: a hydrologically based classification of the soils of the United Kingdom, which classifies host soils, recommends a standard percentage runoff (SPR) of 14.5 for chalk soils (HOST 3).
- 3.5 Given that there is established grass cover and top soil for the majority of the permeable areas and shallow groundwater has been encountered and boreholes indicate chalk marl is present (less permeable than chalk due to the presence of clay), it is unlikely that only 6.1% of the runoff in an intense storm would runoff, especially if the soils were wet already.
- 3.6 The calculation of impermeable area within the modelling appears only to include roofs and roads, not paved or car parking areas. This appears to be an under representation of impermeable areas as lots of properties in the catchment have paved areas between the street and the house that are not represented as impermeable in the model.

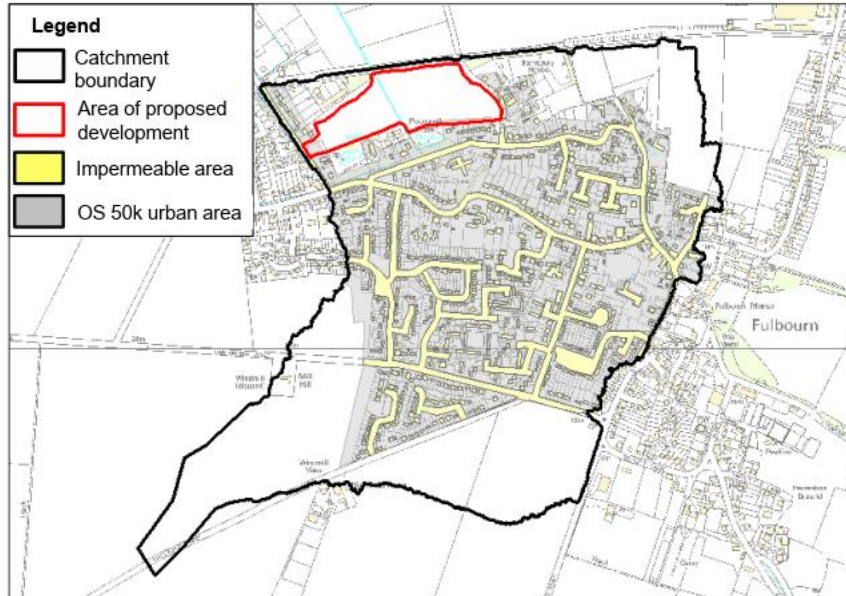


Fig 3.6.1 Impermeable area plot provided with hydraulic modelling.

- 3.7 The percentage runoff from a catchment is directly correlated to peak flow.
- 3.8 The weighted SPR of the total catchment assumed in the modelling provided is 18.0%. If the SPR of the chalk/chalk marl is raised to 14.5% in line with Report No. 126 and observed ground conditions, and the impermeable area within the urban extent is raised from 30% to 35% to account for paved areas within properties, the weighted SPR of the total catchment becomes 27.1%, an increase of 50%.
- 3.9 An increase of 50% runoff for the design storm, would be greater than the effect of applying the 1000 year average return interval rainfall, the sensitivity event provided within the modelling report, that resulted in increased flood risk off site to the South.
- 3.10 An increase of 50% runoff for the design storm would also raise surface water flood risk to the Site, driving proposed FFLs higher to ensure the development itself is safe from flooding.
- 3.11 Surface water flooding reports for this area have been received by the LLFA and are noted in the Surface water management plan. These reports give an indication that surface water is an issue for the catchment.
- 3.12 I believe the application of more appropriate design parameters to the surface water flood modelling provided would result in an increased flood risk off site, in contradiction to Policy CC/9 Managing Flood Risk that states it should be demonstrated that *“There would be no increase to flood risk elsewhere, and opportunities to reduce flood risk elsewhere have been explored and taken*

(where appropriate), including limiting discharge of surface water (post development volume and peak rate) to natural greenfield rates or lower”.

4 Issue with altered surface water strategy for reserved matters scheme not providing sufficient water quality treatment or volume control

- 4.0 The surface water drainage strategy provided 4th April 2022 has changed from the approved drainage strategy.
- 4.1 Attenuation for the site is now proposed to be provided predominantly by plastic crates under permeable paving, whereas previously bio-retention areas were proposed. Crates do not provide removal of contaminants through filtration, settling and bio uptake that bio-retention areas can, or contribute to amenity and biodiversity.
- 4.2 The changes to the approved drainage strategy are not in line with Policy CC/8 Sustainable Drainage Systems that states it should be demonstrated that;
- “Opportunities have been taken to integrate sustainable drainage with the development, create amenity, enhance biodiversity, and contribute to a network of green (and blue) open space; and*
- Appropriate pollution control measures have been incorporated, including multiple component treatment trains”.*
- 4.3 Neither are the changes to the approved drainage strategy in line with Policy CC/7 Water Quality that states it should be demonstrated that;
- “The quality of ground, surface or water bodies will not be harmed, and opportunities have been explored and taken for improvements to water quality, including renaturalisation of river morphology, and ecology; and*
- Appropriate consideration is given to sources of pollution, and appropriate Sustainable Drainage Systems (SuDS) measures incorporated to protect water quality from polluted surface water runoff.”*
- 4.4 The reduction in water quality benefits of the proposed SuDS strategy is of particular concern given the Site falls within an Inner Source Protection Zone for groundwater.
- 4.5 The changes to the approved surface water strategy also reduce the potential for surface water volume control. Bio-retention areas provide opportunities for evaporation as well as evapotranspiration of surface water runoff. Plastic crates do not provide these opportunities, and therefore the changes are in contravention to Policy CC/9 Managing Flood Risk that states it should be demonstrated that;

There would be no increase to flood risk elsewhere, and opportunities to reduce flood risk elsewhere have been explored and taken (where appropriate), including limiting discharge of surface water (post development volume and peak rate) to natural greenfield rates or lower.

5 Appendix

5.0 CV attached providing overview of qualifications and experience.



Kate Mackay

BE (Hons) C.Eng MICE, MCIWEM



CAREER SUMMARY

Kate is a chartered, professional Associate Director with a broad range of knowledge and expertise, specialising in Flood Risk, Water Resources and Sustainable Drainage. Kate provides leadership and technical expertise on a wide range of development infrastructure projects. Her strengths include risk analysis, technical writing, management, design, problem solving and collaboration. Kate is leading the drainage and flood risk aspects for WSP at the Lewisham Shopping Centre, Liverpool Street Station redevelopment and Smithfields Birmingham redevelopment, as well as large developments at Rackheath, and Brampton Cross. Kate has been called as an expert witness to a hearing of the Greater London Assembly and acted as a technical expert at multiple public consultation events. Kate is the National practice lead for Flood Risk and Drainage at WSP.

Joined WSP 2021

17 years of experience

Area of expertise

- Flood risk and drainage management
- Flood Risk, Water Resources and Sustainable Drainage Expertise
- Project Management
- Water Resources

Language

English

EDUCATION & PROFESSIONAL MEMBERSHIPS

Chartered member of Institute of Civil Engineers, C.Eng MICE

Chartered with the Institute of Water and Environmental Management, C.Eng MICE

Bachelor of Engineering (Hons) Civil - University of Auckland, Auckland, New Zealand 2002-2005

Woolf Fisher Scholarship 2002-2004

Auckland University School of Engineering Scholarship 2002

Epsom Girls Grammar School, Auckland, New Zealand 1997-2001

PROFESSIONAL HISTORY

WSP - Associate Director 2021 - present

Walsh Associates - Associate Infrastructure Engineer 2013 – 2021

Tonkin & Taylor - Water Resources Engineer 2006-2013

Fletcher Construction Ltd - Site Engineer 2004-2005



Kate Mackay

BE (Hons) C.Eng MICE, MCIWEM

PROFESSIONAL EXPERIENCE

WSP- Associate Director, Flood Risk and Drainage 2021-Present

Berkeley Group, North Southwater, UK. 2021 – 2022. Flood Risk and Drainage Lead

Kate is the Flood Risk and Drainage lead for this large development with an accompanying allocation in the local plan. There's 1800 homes proposed with sport fields and other ancillary uses. The area is subject to a water neutrality moratorium that is informing the principles of the drainage strategy and the EIA process.

LandSec, Lewisham Shopping Centre, U.K. 2021 – 2022. Lead Civil Engineer

A multi-disciplinary WSP project, Kate is the lead Civil Engineer on the project overseeing all Civil Engineering requirements to support the Masterplan development, enabling works and Phase 1 design. Technical work includes Drainage Strategy and Design, Utilities planning, Attenuation strategy and Sustainability documentation. project description.

LendLease, Smithfield Birmingham, UK. 2021 – 2022. Flood Risk and SuDS Lead

Kate is the lead flood risk and drainage engineer for the masterplan for the 14 ha city centre redevelopment. Kate is leading the consultation with the EA and LLFA and production of Outline Drainage Strategy She is also leading preparation of the Flood Risk Assessment and Water Resources Chapter of the EIA for the site.

Homes England, Hurst Farm, Country. 2021– 2022. Development Infrastructure Lead

Responsible for leading the Civil engineering components including the FRA & ODS report for the mixed-use development of a greenfield site on the boundary of Haywards Heath. Constraints plans were initially produced showing all restrictions within the vicinity of the proposed Site, including tree lines & boundaries, existing drainage systems & watercourses. An evaluation of the potential flood risks within the vicinity of the Site were then established and associated hazards assessed. Based on these & calculated greenfield runoff rates, appropriate SuDS features for each plot were proposed to landscape architects.

Walsh Associates - Associate Infrastructure Engineer 2013-2021

- Pre-planning Lead for Infrastructure team, resourcing, planning, reviewing projects pre-planning
- Company specialist in Flood Risk and SuDS, producing & reviewing detailed Flood Risk Assessments for planning, BREEAM, or CfSH requirements.
- Managing a team, allocating resource, checking design, providing feedback
- Project lead on civil design for projects, focusing on drainage and paving design
- Client and Project team interface, collaboration and communication with clients, design team members, contractors, and regulators
- Fee bid preparation, financial tracking, project management for Flood Risk Assessment and civil projects
- Design of drainage, pavement and earthworks infrastructure systems and elements including pipelines, culverts, Sustainable Urban Drainage elements, land drains, pumped systems, attenuation devices, flood protection features and erosion protection systems
- Hydrological and hydraulic analysis, network and attenuation modelling using Windes Micro drainage
- Producing tender documents, design reports, philosophy statements, technical specifications, and operation & maintenance manuals for civil aspects of projects.



Kate Mackay

BE (Hons) C.Eng MICE, MCIWEM

Projects

- Kew Bridge Gate Development, Civil Design Team Leader, large multi-site residential project, utilities co-ordination, stadium design interface, planning support, design to Stage 4 and construction support.
- Halswell Quarter 3, Civil Design team leader to Stage 4 design.
- Hawkins Road Colchester, Civil Design Team Lead to Stage 4 and construction queries.
- Westferry Printworks redevelopment to Tender Stage. Extensive use of SuDS, open water storage, discharges to dock. Expert Witness at hearing, called in by Mayor of London.
- The Hyde, Hendon detailed Flood Risk Assessment, overland flow path maintenance and provision, flood protection and mitigation measures, detailed drainage design.
- Bernard Morgan House, detailed Flood Risk Assessment and detailed drainage & civil design and specification. Basement pumping, separate gravity and pumped system, pressure rated to discharge to sewers and prevent sewer flooding back to the site.
- Green Lanes Detailed Flood Risk Assessment, Haringey. Surface water flooding mitigation and SUDs assessment.
- The Oshwal Centre, Welwyn Hatfield, detailed Flood Risk Assessment. Large site discharging surface and foul water directly to tributary, wetland, swale and filter strip design.
- Twelvetrees, Lea River Park Detailed Flood Risk Assessment. Works within the River Lea flood walls, mitigation for loss of storage.
- Pegasus Project, Temple detailed Flood Risk Assessment. Historic Building. SuDS assessment, negotiation of Conditions of Consent.
- Abbey Road Detailed Flood Risk Assessment, Barking & Dagenham. Adjacent to River Roding, Flood Zone 3a, Breach Modelling interpretation.
- Greycoat St, London detailed design and specification of drainage through to construction, gravity and pumped systems.
- Camberwell School Redevelopment, drainage and civil design through to construction. Shallow attenuation, basement cavity drainage, small site constraints.
- Victoria Drive, Southfields residential development, sewer diversion, drainage co-ordination with beam and block foundations.
- Napier Park, Luton, Masterplanning, drainage, road design and largescale earthworks design and cut/fill exercise, design review role during construction.
- Miles St, Vauxhall, student accommodation, innovative drainage with false floor, bespoke manhole construction, steep outlet, nominated for the Ground Engineering awards 2017.
- Island Point, Tower Hamlets, drainage design development and tender documents, SuDS landscaping build ups and detailed design.
- Brighton Marina, Brighton options assessment, surface water and foul water strategy for residential development in the marina seaward of the sea wall.



Kate Mackay

BE (Hons) C.Eng MICE, MCIWEM

- Commercial Road, detailed design and specification of drainage through to construction, pumped systems within raft basement foundation.
- Paul St, London detailed Flood Risk Assessment and Drainage Impact Assessment for BREEAM, surface water flooding impacts.

Professional Development

- Chartership review and attainment for ICE and CIWEM 2019.
- Presented Training Courses to the company on SuDS, and Flood Risk Assessment and to the civil team on Advance SuDS design.
- CIRIA Advance SuDS course 2018, XP Microdrainage training courses – Greenfield Runoff, Unit Hydrographs and Flood Risk
- Management Tools 2016, Checking and Auditing Models, 2016• Profitable Customer Relationships Margaret Faulkner 2016, Management Training module, Margaret Faulkner 2016, 2017
- Expert Witness for Drainage & SuDS, Westferry Printworks, called in by the Mayor of London

Tonkin & Taylor - Water Resources Engineer 2006-2013

- Project management of various sized design and analytical projects
- Design Package Manager within a large alliance structure
- Collaboration and communication with clients, design team members, constructors, estimators, and regulators
- Design of drainage infrastructure systems and elements including pipelines, culverts, stormwater treatment devices, channels, dams, spillways, attenuation devices, flood banks, outfalls, and erosion protection systems
- Hydrological and hydraulic analysis using programs including DHI Mouse Mike 11 and Mike 21, US Army Corps HEC-HMS and HEC-RAS, 12d, EPA SWMM, Flowmaster
- Risk assessment of cost implications and natural hazards, Assessment of effects on the environment for consent applications to regulators, Construction supervision and contract management
- Delivery of documents including design reports, construction drawings, risk assessment, bill of quantities, contract documentation
- Part of a team for safety assessment, monitoring, and reporting for large dams in New Zealand, Australia and The Philippines

Projects

- Waterview Connection Project Design and Construct Phase; Design Package Manager for drainage design packages (budget allocation)

Kate Mackay

BE (Hons) C.Eng MICE, MCIWEM

- 80,000 NZD), managing stormwater treatment and temporary works packages for detailed design and construction, stormwater treatment devices, pavement catch pit spacing, hydraulic design of surface drains and pipe networks, aquaplaning checks and TP108 small catchment analysis. Design for consent, stormwater and stream works for application to the Environmental Protection Agency.
- Rotowaro Water Management; Site assessment, risk analysis, design, options selection and specification of water management system upgrade at Rotowaro Opencast coal mine (technical paper for 2010 Stormwater Conference New Zealand).
- Golden Bay Cement stormwater assessment; Assessment and stormwater treatment design for Golden Bay Cement Portland Quarry.
- Lake Aniwhenua Sediment Study; Sediment mobilisation and lateral weir simulation upstream of Aniwhenua Hydro Dam, analysis of system flushing, option presentation and development.
- Clevedon Integrated Catchment Management Plan and stormwater catchment management areas identification; Research, analysis and scripting of the Integrated Catchment Management Plan, stormwater system design for Clevedon District Plan Change.
- Northern Gateway Toll Road; Drainage design engineer as part of a large alliance structure.
- Matata Regeneration Project; Flood and boulder flow modelling, flood mitigation and lagoon design.
- Onetangi Coastal Hazard Management Strategy; Hydraulic modelling of stormwater network, and design of coastal outfall structures.
- Dam Design, Monitoring, Flood attenuation; Monitoring assessments and reporting for irrigation dams of various sizes (Delta dam, Opuha Dam, Wai-iti Dam). Member of Dams Safety Assessment team for earthquake-damaged high dams in the Philippines, Kaorarau Dams rehabilitation design team.
- Maddren Town Centre Development; Channel and flood plain modelling, hazard mapping for urban centre development project.
- Haldons Dam Concept Design; Catchment Assessment, location optimization, concept design of storage, embankment and spillway.
- Construction and Contracts Management; Design check, contract management, construction supervision - Waiake Coastal Boardwalk.
- King Edward Parade Seawall Steps. Northcote Seawall repairs.

Professional Development

- Wrote and co-presented a technical paper titled "Risk based water management at the Rotowaro Open cast mine" at the 2010
- Stormwater Conference New Zealand in Rotorua. Attended the conference in 2008, 2009, 2010, and 2012.



Kate Mackay

BE (Hons) C.Eng MICE, MCIWEM

- Presentation of Internal Training courses; Motorway runoff stormwater treatment and Low Impact Design for stormwater (SuDS)
- Graduate Membership of the Institute of Professional Engineers New Zealand 2006-2013, attended events, seminars and training courses.
- Completion of technical and professional development training courses; Topics included Hydraulic Design, Design for Constructability, Dam Safety assessment, Low Impact Design. Design using 12d, Project Management, Technical Writing, Giving and Receiving Feedback, Time Management and influencing others.
- Appointed Project Manager at Tonkin and Taylor in 2008.

Fletcher Construction Ltd - Site Engineer 2004-2005

- On site engineer at the Mangere Wastewater Treatment Upgrade.