MONDAY, 24 SEPTEMBER 2018

SUBMISSION ON PROPOSED WAIKATO DISTRICT PLAN (STAGE 1)

To: Planning Department
Waikato District Council
Private Bag 544
Ngaruawahia, 3742

Submitter: Birch Surveyors Limited (on behalf of CSL Trust & Top End Properties Limited)

CSL Trust and Top End Properties Limited could not gain an advantage in trade competition through this submission.

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APPENDICES:

APPENDIX A: URBAN DESIGN REPORT & MASTER PLAN (ARCHITECTURO LIMITED)
APPENDIX B: ECOLOGY REPORT (JS ECOLOGY LIMITED)
APPENDIX C: GEOTECHNICAL FEASIBILITY ASSESSMENT (GROUND CONSULTING LIMITED)
APPENDIX D: INTEGRATED TRANSPORT ASSESSMENT (COMMUTE TRANSPORTATION CONSULTANTS)
APPENDIX E: ENGINEERING REPORT (MAVEN ASSOCIATES)

1 EXECUTIVE SUMMARY

1.1. Thank you for the opportunity to submit on the Proposed Waikato District Plan (Stage 1) (PWDP).

1.2. Birch Surveyors Limited (BSL) has been engaged by, and is acting on the collective behalf of CSL Trust and Top End Properties Limited to make a submission on the PWDP.

1.3. The submission is made pursuant to Schedule 1 (Part 1, Clause 6) of the Resource Management Act 1991 (RMA) which allows for any person to submit on a publicly notified plan with the submission required to be in the prescribed form as per Form 5 (Schedule 1) of the Resource Management (Forms, Fees, and Procedure) Regulations 2003.

1.4. CSL Trust and Top End Properties Limited are the proprietors of 179 and 205 Helenslee, Pokeno respectively (the 'submission area') (see Figure 1).

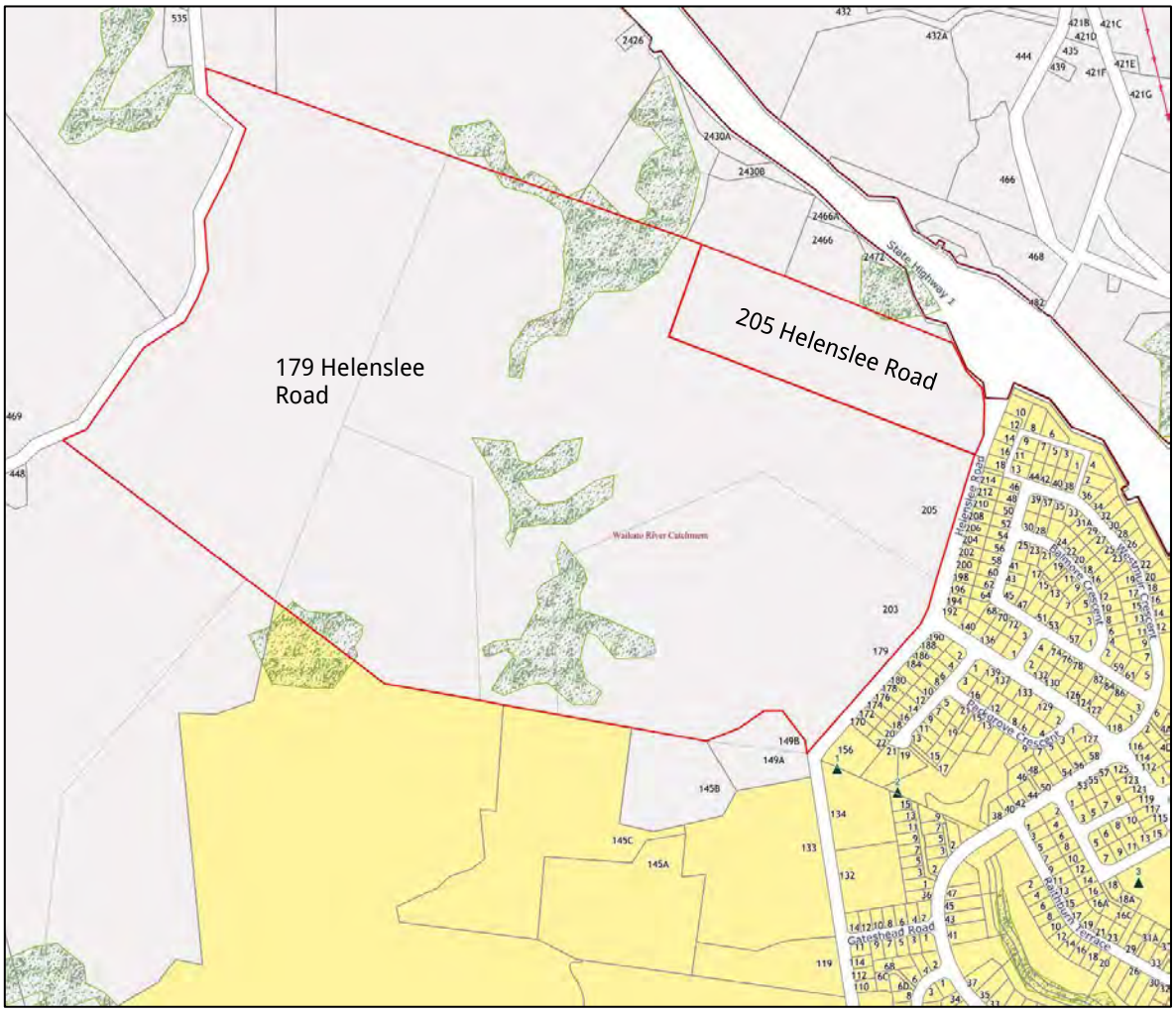

Figure 1. Submission Area (red boundaries) and Significant Natural Areas

(Source: Waikato District IntraMaps – Proposed District Plan)

1.5. Upon the submission area our clients are seeking to undertake significant residential development as an extension of areas that are currently developed or to be developed in the future. These areas include the existing urban core of Pokeno and the Pokeno West Plan Change (PWPC) area (see Figure 2). Essentially, the proposed residential development associated with this submission is part of the same catchment area as the PWPC. These properties are a natural extension of the PWPC and have been integrated with the PWPC Master Plan. The land west of Helenslee Road is capable of being serviced by the extension the existing infrastructure in Helenslee Road and the balance of the proposed residential land will be serviced by the extension of infrastructure required for the PWPC area.

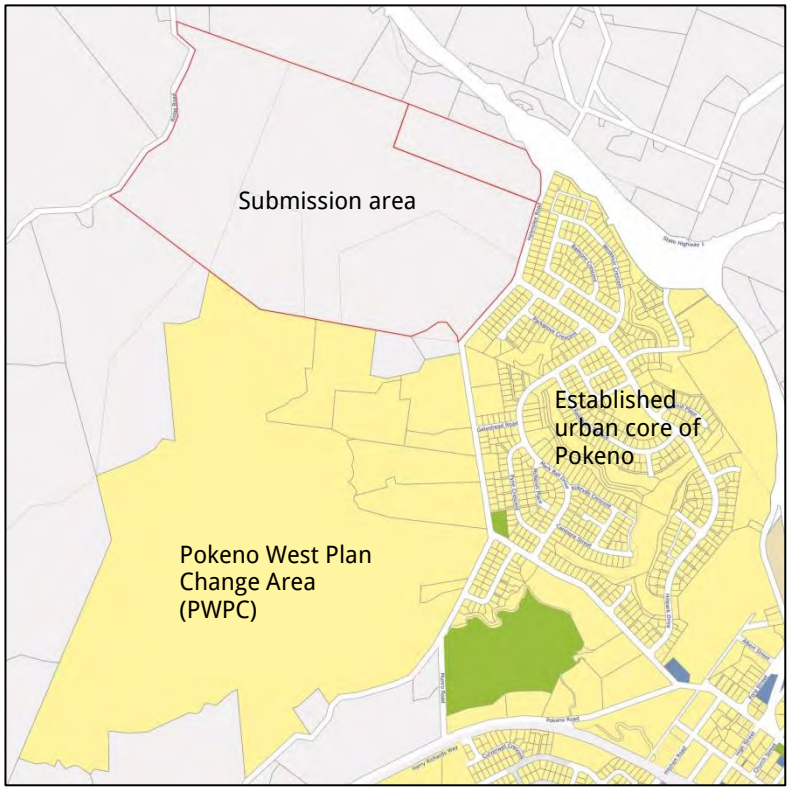

Figure 2. Map showing submission area in context of existing Residential-zoned land (Source: Waikato District IntraMaps – Proposed District Plan)

1.6. The redevelopment of the submission area will deliver significant benefits to the long-term and sustainable growth of Pokeno. Containing a large portion of Pokeno's future growth within the same catchment will assist in the Waikato District Council's (WDC) high-level strategic planning. The residential development of the submission area is – in our view – a logical expansion of the current residential core, with the area perfectly located to accommodate the additional capacity needed to accommodate the WDC population projections. Services can be easily extended within the same catchment, reducing costs and providing long-term certainty.

1.7. Preliminary discussions have been held with the WDC and other stakeholders including the New Zealand Transport Agency (NZTA) and the Ministry of Education. Feedback from these initial consultations has helped guide the development of the Master Plan.

1.8. The proposed development will also help to ensure the growth projections for Pokeno can be accommodated. The proposed development will provide increased residential capacity and diversity for Pokeno, in-line with the broad statutory framework overseeing Pokeno's development.

1.9. To justify the relief sought and the associated residential development of the submission area, this submission consists of two (2) primary submission points. These points are linked and together provide a robust case for approval of this submission and the relief sought.

1.10. The points are summarised as follows:

1.11. SUBMISSION POINT 1 – INSUFFICIENT RESIDENTIAL-ZONED LAND TO MEET GROWTH

1.12. The foreseeable growth of Pokeno is a common theme amongst all strategic planning documents and policies either adopted or currently under consideration by the WDC. Despite the relatively wide-spread assertion that Pokeno is set to grow immensely in the future, whether or not this growth has been adequately accounted for within the PWDP is still under question.

1.13. An analysis of a selection of notable Waikato District strategic documents is provided within this submission to highlight the future growth projections for Pokeno. In turn, this reinforces the need for Council to provide additional residential-zoned land to cater to this growth.

1.14. The statutory requirement to 'have regard to' or 'give effect to' these specific documents is also stressed to reiterate the level of consideration that should be given by Council in the District Plan Review. Given the lifespan of a District Plan is 10 years, it is integral that the Waikato District Plan sufficiently provides for the next decade of growth.

1.15. SUBMISSION POINT 2 – LACK OF A HIGH-DENSITY RESIDENTIAL ZONE

1.16. The entirety of the submission area is zoned 'Rural' under the PWDP which does not provide for the comprehensive residential development that is sought. Assessment of the other spatial planning tools within the PWDP has also indicated that these are insufficient to achieve the expected objectives and policies of Council. A clear example being the provision of only a single Residential Zone with a minimum lot size requirement of 450m^2. We submit therefore that the PWDP could better provide for higher density development.

1.17. In response to the absence of higher-density residential zone, an additional residential zone providing for a minimum lot size of 300m^2 is offered. As a Neighbourhood Centre is proposed for the submission area, higher density development is sought for the surrounds. This will enable access of the centre within a walking catchment for a greater number of households than if the lots were required to be a minimum of 450m^2.

1.18. APPENDICES – TECHNICAL REPORTS

1.19. Enclosed within the submission are a number of technical reports produced by suitably qualified and experienced personnel (SQEP). These reports have been produced by consulting firms whom have undertaken previous work within Pokeno and as such, are familiar with the existing context and character. Summaries of these reports are provided below:

1.20. An urban design report and Master Plan (Architecturo Limited) provides a thorough assessment of the submission area from an urban design perspective. This includes information such as site analysis and an outline of the design process. The Master Plan is also in this appendix and provides a 'road map' for the future development of the area.

1.21. The Master Plan identifies the developable areas of the submission area. Through a detailed assessment of these areas, indicative zoning has been identified. The residential areas are located within the moderately sloped portions of the area, on the eastern side of the primary gully and stream. The Country Living Zone is proposed for the steeper areas to the west of the stream, where the creation of larger sections can be accommodated without requiring wide-spread recontouring.

1.22. The Master Plan also identifies key road corridors, and a network of walking and cycling trails. The placement of these roads has been ground-proofed, with the alignments following existing farm tracks and stream crossings where possible. The roading layout provides connections to the PWPC area, Ridge Road to the west, and Helenslee Road to the east. The overall layout seeks to provide a high-level of connectivity, and safeguards the ability for the area to be serviced by a future public transport network.

1.23. An ecology report (JS Ecology Limited) provides an assessment of the ecological features present on the submission area. Recommendations are provided in the report which has been incorporated into the design process.

1.24. A geotechnical feasibility assessment (Ground Consulting Limited) provides an assessment of geotechnical suitability and stability with a focus on the intention for the submission area to be used for residential development. Given the varied topography of the submission area, the geotechnical information has underpinned the design approach.

1.25. An integrated transport assessment (Commute Transportation Consultants) provides information regarding accessibility by various modes of transport and the ability of the surrounding road network to support additional traffic generated by the proposed residential development.

1.26. An engineering report (Maven Associates) is attached which provides an assessment of the infrastructural considerations for ensuring the residential development can be appropriately serviced. It is noted that the report is the same report provided in support of the PWPC. Given the location of the submission area in the Upper Helenslee Catchment, services can be designed to accommodate the entire upstream catchment, with the networks extended up the valley in a cost effective and logical way. This approach removes concern around fragmented development, and ensures that there will be no duplication of public services. Furthermore, the discharges from this Upper Catchment have been taken into consideration in the infrastructure calculations by Maven Associates.

2 BACKGROUND ON SUBMISSION AREA

2.1. The submission area is located in North-West Pokeno bounded by Helenslee Road to the east, the PWPC area to the south, Ridge Road to the west and Rural-zoned allotments adjoining State Highway 1 to the north.

2.2. CURRENT USE & BUILT FEATURES

2.3. The submission area is primarily used for stock grazing.

2.4. There are a number of rural-purpose buildings present, none of which will be retained due to their low value.

2.5. NATURAL FEATURES

2.6. The submission area contains a number of natural features that will be protected and restored as part of the proposed development. The primary features include:

2.7. Multiple tributaries that traverse from north-south down the submission area; and

2.8. An approximately two hectare stand of mature kahikatea forest which has been identified as having important ecological values.

2.9. The proposed development has been designed around these (and other) natural features, with these areas to be protected to enable them to support off-road walking and biking trails. This green network will provide an attractive environment for future and existing residents, whilst delivering substantial environmental and ecological benefits.

2.10. TOPOGRAPHY

2.11. The topography of the submission area is variable and consists of three different types of landforms, these are:

2.12. Low lying slopes and flats which are contained within the south-east;

2.13. Gently rolling slopes in the east; and

2.14. Moderately steep to steep slopes in the west.

2.15. Given the varied landforms of the submission area, the information contained within the geotechnical feasibility assessment has guided the identification of developable areas. As a result, the portion of land adjoining Helenslee Road will be subject to a higher residential density. The favourable topography and the absence of instability features mean this is a logical design decision. Further westward in the proposed Country Living Zone, there will be lower density development due to the moderately steep – steep slopes.

2.16. In support of the geotechnical assessment, BSL have undertaken an extensive walk-over of the submission area, and can confirm that safe and stable building platforms can be provided. In our professional opinion, no technical reasons exist which would prevent the residential development of the submission area.

3 PWDP PROVISION SUBJECT TO THE SUBMISSION

3.1. The specific plan provision of the PWDP that this submission relates to is the zoning (Rural Zone) of 179 and 205 Helenslee Road, Pokeno. This is partially indicated on PWDP Planning Map 'Pokeno West 7.5' and on the Waikato District IntraMaps service (Proposed District Plan).

4 STANCE OF SUBMISSION

4.1. As per the direction of the clients, this submission *opposes* the proposed 'Rural Zone' that has been applied to the entirety of the submission area.

4.2. The basis for this stance is outlined in Section 5.

4.3. The relief sought is outlined in Section 6.

5 BASIS OF SUBMISSION

5.1. This section forms the rationale or reasoning behind the opposition to the proposed Rural Zone for the submission area.

5.2. The two (2) submission points are addressed in turn:

5.3. SUBMISSION POINT 1 – INSUFFICIENT RESIDENTIAL-ZONED LAND TO MEET GROWTH

5.4. DRIVERS OF GROWTH IN POKENO

5.5. Pokeno is currently experiencing rapid and sustained residential and commercial growth. Pokeno's rapid development as a town is testament to the strong underlying drivers to growth. Such key factors include:

5.6. The strategic location of Pokeno between Auckland, Tauranga and Hamilton;

5.7. Pokeno's proximity to key transport infrastructure such as State Highway 1, State Highway 2 and the North Island Main Trunk railway line (NIMT);

5.8. The presence of public wastewater and water services, which are able to be economically scaled and treated;

5.9. Pokeno's interesting topography, rich cultural history and the strong sense of community;

5.10. The affordability of land and houses and the commutable distance from Auckland; and

5.11. Public amenities such as the Pokeno Town Centre, Pokeno School and the ease of access to Tuakau College.

5.12. Collectively, we believe these factors will ensure the sustained growth of Pokeno. Critically, given the strategic location of Pokeno – and connectivity with the State Highway network – we are of the belief that Pokeno will continue to see strong commercial development. This business growth will help underpin Pokeno's development and ensure the creation of a true satellite town, whereby residents are able to live and work.

5.13. These factors differentiate the possible growth of Pokeno from the other towns within northern Waikato, including: Tuakau, Huntly and Te Kauwhata.

5.14. PROJECTED GROWTH OF POKENO – STRATEGIC CONTEXT

5.15. The rapid growth of Pokeno has outstripped the population projections of the former Franklin District Growth Strategy (FDGS, 2007). The FDGS identified Pokeno as having the potential to accommodate a population of approximately 5,200 by 2051. Today, most of the operative residential-zoned land has been developed, or is currently under development. Pokeno is now facing a shortfall of residential-zoned land.

5.16. The following paragraphs address a selection of strategic documents providing a summary of the strategic policy direction for Pokeno.

5.17. The documents addressed are the North Waikato Integrated Growth Management Programme Business Case, Future Proof Strategy and the National Policy Statement on Urban Development Capacity.

5.18. NORTH WAIKATO INTEGRATED GROWTH MANAGEMENT PROGRAMME BUSINESS CASE (2017)

5.19. The North Waikato Integrated Growth Management Programme Business Case (NWPBC) is a programme business case the purpose of which is to "identify the planning options in the North Waikato to cater for future urban growth over the next 30 years" (p. 31 of s 32 Report – Part 2 Strategic Direction and Management of Growth).

5.20. As shown in Table 1, Pokeno is forecast to experience a significant growth in population in the following decades. This is indicated by the growth expected to occur by 2035 whereby Pokeno is projected to be the second biggest town in the Waikato sub-region. As such, sufficient capacity to accommodate this growth will need to be provided.

TABLE 1: PROJECTED POPULATION GROWTH (BY TOWN) FOR THE WAIKATO SUB-REGION

TOWN	2016	2025	2035	2045
Tuakau	4,639	8,000	15,000	20,000
Pokeno	2,132	4,868	9,674	11,954
Meremere	564	708	734	711
Te Kauwhata	1,769	4,000	6,000	8,000
Huntly	7,491	8,014	8,310	9,000

Note: Data reproduced from the s 32 Report – Part 2 Strategic Direction and Management of Growth (p. 32)

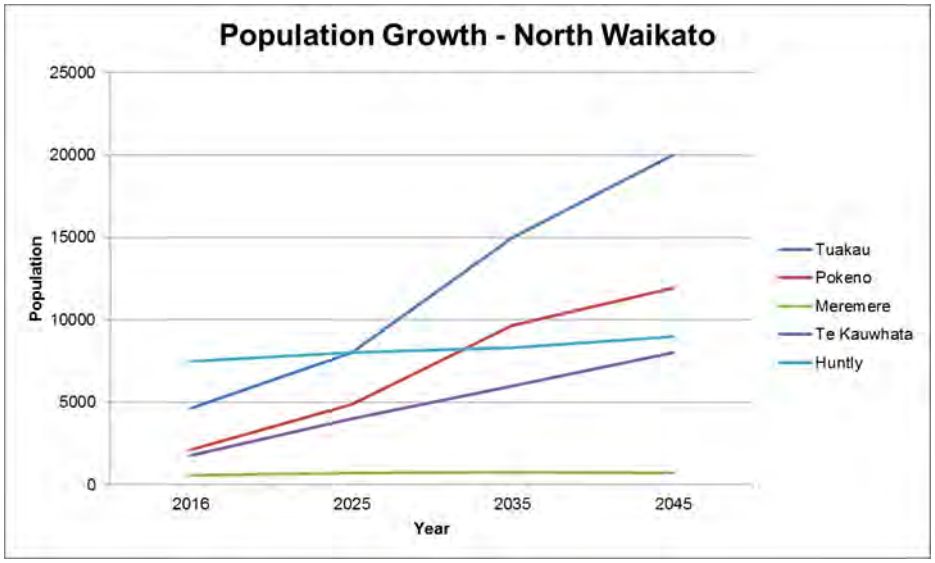

Figure 3. Graph showing projected population growth for the North Waikato.

(Source: NWPBC)

5.21. FUTURE PROOF STRATEGY – PLANNING FOR GROWTH (2017)

5.22. The Future Proof Strategy (FPS) is a "30 year growth management and implementation plan specific to the Hamilton, Waipa and Waikato sub-region" (p. 27).

5.23. Within the FPS, Pokeno is frequently referenced as an area in which there will be a growth emphasis. Specifically, the FPS identifies Pokeno as a growth management area.

5.24. Table 2 supports the notion of Pokeno as a growth management area identifying both the projected population and the household growth until 2045. The significant growth Pokeno will experience is clearly identified in the two periods from 2026 – 2045 where household demand is not being met by household supply resulting in a projected deficit of 846 households at 2045.

TABLE 2: PROJECTED RESIDENTIAL GROWTH (POPULATION & HOUSEHOLD) IN POKENO

YEAR/TIME PERIOD	POPULATION GROWTH (TOTAL)	HOUSEHOLD GROWTH	
2016	Total Population: 2,132	N/A	
2016 – 2025	+2,736 (4,868)	Demand: 1,110	Supply: 1,200 **(+90)**
2026 – 2035	+4,806 (9,674)	Demand: 1,945	Supply: 1,090 **(-855)**
2036 – 2045	+2,045 (11,954)	Demand: 991	Supply: 1,000 **(-846)**

Note: UoW Data (Medium Projections) Future Proof Strategy – Planning for Growth (p. 93 – 95)

5.25. The proposed rezoning and development will help to offset these projected deficits by bolstering the supply of households in Pokeno to meet the high demand between now and 2045.

5.26. NATIONAL POLICY STATEMENT ON URBAN DEVELOPMENT CAPACITY (2016)

5.27. The National Policy Statement on Urban Development Capacity (NPS–UDC) "directs local authorities to provide sufficient development capacity in their district plans to ensure that demand can be met. This includes both the total aggregate demand for housing and business land, and also the demand for different types, sizes and locations." (p. 16).

5.28. In the s 32 report (Strategic Direction and Management of Growth – Part 2), the Waikato District is identified as a "high-growth area" (p. 16). The implications of this recognition are noteworthy as it means that the implementation of all of the objectives and policies of the NPS–UDC is required to ensure immediate effect to the NPS is given. For the purposes of the district plan review and this submission, the key points are identified in the s 32 report. These include providing a range of housing choices, efficient land use, efficient infrastructure use and providing for current and future people/communities.

5.29. The sought relief fulfils a lot of these key points providing additional residential variability to balance out the existing suburban character. This will ensure a range of potential lifestyles are available. It is also a more efficient use of the land as the allotments comprising the submission area are strategically located in relation to the Pokeno Town Centre.

5.30. WDC'S ROLE IN PLANNING FOR AND ENABLING POKENOS'S GROWTH

5.31. With WDC's strategic documents identifying the need for additional residential land in Pokeno, WDC – as the consenting authority – has two options; 1) plan for and enable the structure growth and development of Pokeno, or 2) allow the segmented development of Pokeno

5.32. Through the strategic use of various spatial planning tools, Council can ensure a pipeline of residential capacity, aligned with their predicted population projections. This will provide long-term planning certainty for residents, service providers and developers alike. This approach also removes the need for addition plan changes, resulting in significant time, cost and resource savings for Council.

5.33. Through the District Wide Review, WDC has an opportunity to create the statutory framework to facilitate the identified population growth. It is our position that additional residential-zoning is required in Pokeno, to ensure sufficient capacity exists over the first 10 years, once the plan becomes operative. Equally, we feel that it is important to identify the land suitable to accommodate the long-term (10 - 30+ years) population growth of Pokeno.

5.34. It is our position that any additional development areas should be located in such a way that they build upon the urban framework and core of Pokeno. Ideally, these areas will represent a logical expansion of the current Pokeno Structure Plan, helping to promote the growth and connectivity with the town centre. It is demonstrated in the urban design report (**Appendix A**) that the submission can be successfully integrated with the Structure Plan.

5.35. We also believe that the Council has an opportunity to identify and designate the location of a future railway station in Pokeno. Consideration is also needed with respect to future bus routes, and enhanced walking and cycling facilities. Any expansion of the currently operative zones should be required to demonstrate how this integration can be achieved.

5.36. A combination of residential zonings will also be needed to ensure housing diversity and affordability. We agree with WDC's approach with respect to the draft Village, Country Living and Residential zones, but believe more nuanced Residential zoning and Country Living is needed. Through the combined use of these zones, we are confident that the WDC can plan for, and successfully administer the predicted growth of Pokeno for the next 30 years.

5.37. SUBMISSION POINT 2 – LACK OF RESIDENTIAL ZONES

5.38. As previously highlighted, there is no residential zone that exists to enable varied residential development below the notified 'Residential Zone' minimum lot size of 450m^2.

5.39. In this instance, higher density residential development is sought around the proposed Neighbourhood Centre whereby lots would be approximately 300m^2 which is not provided for in the PWDP.

5.40. Parallels can be drawn between the 'Mixed Housing Suburban Zone (MHS)' and 'Mixed Housing Urban Zone' (MHU) in the Auckland Unitary Plan (Operative in Part) (AUP – OP). These two zones provide for residential development with slight differences in the scale permitted. A comparison of these two zones with the 'Residential Zone' of the PWDP is provided in Table 3.

TABLE 3: COMPARISON OF RESIDENTIAL/MIXED HOUSING SUBURBAN AND MIXED HOUSING URBAN ZONES

BULK & LOCATION STANDARD	RESIDENTIAL	MIXED HOUSING SUBURBAN	MIXED HOUSING URBAN
Minimum Lot Size	450m^2	400m^2	300m^2
Maximum Building Height	7.5m	8m	11m
Maximum Building Coverage	40%	40%	45%
Height in Relation to Boundary	2.5m: 37°	2.5m: 45°	3m: 45°
Yards	3m from road boundary 1.5m from every other boundary	Front: 3m Side/Rear: 1m	Front: 2.5m Side/Rear: 1m

Source: PWDP & AUP – OP

5.41. As shown in Table 3, clear similarities exist between the 'Residential Zone' and the MHS Zone. However, the MHU Zone provides for a slightly increased level of intensified residential development.

5.42. Therefore, a similar zone is being sought from this submission and is considered justifiable given the well-established practice of providing higher-density residential development around valuable amenity features such as parks/centres and transport nodes.

5.43. As such, the application of this higher-density residential zone would be invaluable and appropriate for many areas in the Waikato District. Pokeno will experience significant population growth and has been touted as a location for a train station which would require higher-density residential in the walking catchment. The walking catchment of the Pokeno Town Centre is also a logical area for high-density residential zoning to allow for the amenity and services to be readily accessible.

5.44. POSITIVE LOCAL EFFECTS

5.45. This submission has demonstrated (with reference to key strategic growth documents) that Pokeno is set to undergo a significant transformation in the future.

5.46. Whilst it is clear that approval of the relief sought will assist in accommodating future residential growth, it is important to highlight the specific local positive effects that can be produced through residential development of the submission area. The positive effects are highlighted in the Urban Design Report (**Appendix A**) and summarised below:

5.47. The relief sought and the associated development has a yield of approximately 415 dwellings. This would greatly boost the future housing stock of Pokeno helping to offset the projected deficit in household supply.

5.48. A mixed lot size and housing typology is proposed to better cater to future residents. These range from single-storey dwellings on large lots (3000m^2) to multi-storey dwellings on small (300m^2) lots.

5.49. The key natural areas are proposed to be retained and also protected/enhanced to ensure that their ecological value is not further degraded. The recommendations from the Ecology Report (**Appendix B**) have been recognised in the development of the Master Plan. As such, this has allowed for an environmentally sensitive approach to be implemented.

5.50. The proposed retention and protection of key natural areas (e.g., the kahikatea stand and the multiple tributaries) has allowed for the creation of a green network consisting of walking trails throughout the submission area. These trails are complemented by the green spaces that are proposed, providing accessible open spaces for the enjoyment of future residents.

5.51. Accessibility and connectivity have been recognised as important from the outset to ensure the proposed development is appropriately linked to the surrounds. It is considered that this has been achieved in principle, as connections have been established between Helenslee Road and Ridge Road and down to the PWPC area. The movement network is safe and feasible with a clear road hierarchy established with cross-section drawings (**Appendix A**) designed in accordance with the PWDP standards.

6 RELIEF SOUGHT & SUPPORTING RATIONALE

6.1. RELIEF SOUGHT

6.2. On behalf of CSL Trust/Top End Properties Ltd, the following decision from the Waikato District Council (or such other relief, provisions, or consequential amendments as considered appropriate or necessary to address the purpose of this submission) is sought:

6.3. Rezoning of the submission area in accordance with the enclosed Master Plan (**Appendix A**).

6.4. Specifically, this will involve rezoning of portions of the submission area from the 'Rural Zone' to a mixture of the 'Country Living Zone' and 'Residential Zone'. Recognition of the identified 'Neighbourhood Centre' is also necessary subject to the approval of the Master Plan. Finally, the creation of an additional residential zone to enable higher-density development (minimum lot size 300m^2) is also sought.

6.5. ALTERNATIVE RELIEF

6.6. As indicated by the statement in Paragraph 6.2, our client is amenable to alternative relief.

6.7. A clear rationale has been established behind the pursuit of more nuanced high-density Residential zone. However, if this will not be realised by Council, blanket zoning of the sole 'Residential Zone' proposed by the PWDP across all residential areas proposed within the Master Plan will be considered.

6.8. Any alternative offered by Council resembling what is initially being sought will be considered.

6.9. SUPPORTING RATIONALE

6.10. Additional residential-zoned land is needed to meet the current demand, and projected growth of Pokeno. A combination of standard residential and large lots is needed to provide diversity within Pokeno's future housing stock.

6.11. The residential redevelopment of the submission area is an obvious and logical expansion of the existing residential area, located on the eastern side of Helenslee Road, which is now largely developed.

6.12. Additional residential-zoned land is required to ensure WDC achieve their legal obligations under the NPS–UDC. Additional residential land is also required, to ensure the density targets and future directions of the identified policy documents are achieved.

6.13. Residential development within the submission area will help to contain the growth of Pokeno around the Town Centre, with the extent of proposed zoning clearly defendable, and consistent with best planning practice. This will ensure a compact urban form, and avoid ribbon-style development from occurring.

6.14. The first stage of the development can be serviced by the existing wastewater and water networks, enabling additional residential capacity without relying upon network upgrades. This expedited development follows the alignment of Helenslee Road, which would be upgraded and provided with indented parking and a shared walking/cycling path. This will strengthen Helenslee Road's role and appearance as a key road corridor.

6.15. Through the use of suitable stormwater controls – on-site detention/retention and public stormwater attenuation ponds – the submission area, and Helenslee Catchment can be enabled, without increasing downstream flooding.

6.16. Whilst the area features moderate to steep terrain, suitable areas for development have been identified. The residential development will respect the natural landscape and topography, through the retention of the natural features and contour where possible.

6.17. The residential development will protect and restore a significant network of streams, wetlands and areas of bush. The creation of this significant greenspace network will build upon the pockets of mature vegetation which exist within the area, delivering significant amenity, environment and ecological benefits. When combined with the network of riparian areas within the lower catchment, significant catchment-wide benefits will be achieved.

6.18. The Master Plan is underpinned by a connected road network which allows for easy movement within the area, to the west (Ridge Road), to the east (Helenslee Road) and to the PWDPC area in the south. The road layout has been designed so that it could support a future public transport network, inclusive of a connecting service back to the future Pokeno Train Station.

6.19. The network of riparian margin trails will provide ease of access and community amenity. These trails will also help to remove reliance upon private vehicle trips, creating a pedestrian friendly environment and resilient development.

6.20. The proposed residential areas are sufficiently setback from the nearby quarries. The consents for these quarries have been reviewed, and we can confirm that the proposed residential development will not impede or restrict their continued operations.

6.21. IMPLEMENTATION & STAGING

6.22. A staging plan provided in the Urban Design report (**Appendix A**) is indicative only and is summarised in the following sections. It is not proposed that the stages referred to need any specific differentiation in the Proposed Plan as they will be driven by the timing of the extension of infrastructure.

6.23. Development will take place in four stages starting with the easily serviceable land adjoining Helenslee Road to the Country Living Zone land on the less favourable terrain that is not reliant upon services.

6.24. As the bulk of the submission area is not able to be serviced from the existing three waters network, once development in the lower catchment (PWPC area) has been completed and the required services have been extended to the boundary of the submission area, development can be undertaken. As previously mentioned, services can be easily extended up the catchment, and the networks designed to accommodate the full development of the area.

7 SUMMARY

7.1. The proposed residential development of the submission area represents an obvious expansion of the current residential area of Pokeno. Development of the area as part of the wider Helenslee Catchment will provide significant planning and servicing benefits, and will ensure Pokeno grows in a compact sustainable and affordable manner.

7.2. The proposed rezoning of the land and the associated staged development will ensure long-term certainty for residents and developers. The staging will ensure sufficient residential land is provided for Pokeno, in-line with the predicted population growth forecasts.

7.3. The rezoning will also help WDC – in part – to achieve their legislative requirements under the NPS–UDC, by ensuring sufficient residential land is provided to support the projected growth of Pokeno.

7.4. Any opportunity to discuss this submission further with Council is welcomed. Preliminary discussions with Council officials have been positive, so it is hoped that a collaborative working relationship can be established between both parties moving forward. It is noted that any additional technical documents not already enclosed can be provided as required.

7.5. Birch Surveyors Limited wish to be heard in support of this submission.

7.6. If others make a similar submission, Birch Surveyors Limited will consider presenting a joint case with them at a hearing.

Yours sincerely,

James Oakley

Graduate Resource Planner

BA, MUrbPlan (Prof.) (UrbDes) (Grad. NZPI, RMLA, UDF)

Sir William Birch

Registered Professional Surveyor

RPS, FNZIS. MNZInstD

APPENDIX A
URBAN DESIGN REPORT & MASTER PLAN
ARCHITECTURO LTD

179 & 205 Helenslee Road

POKENO WESTERN EXPANSION
URBAN DESIGN REPORT

Prepared by Architecturo Ltd.

Issue date: 20 September 2018
Job ref. 1811 & 1812

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109A Ti Rakau Drive, Pakuranga
Auckland, New Zealand 2010

CONTENTS

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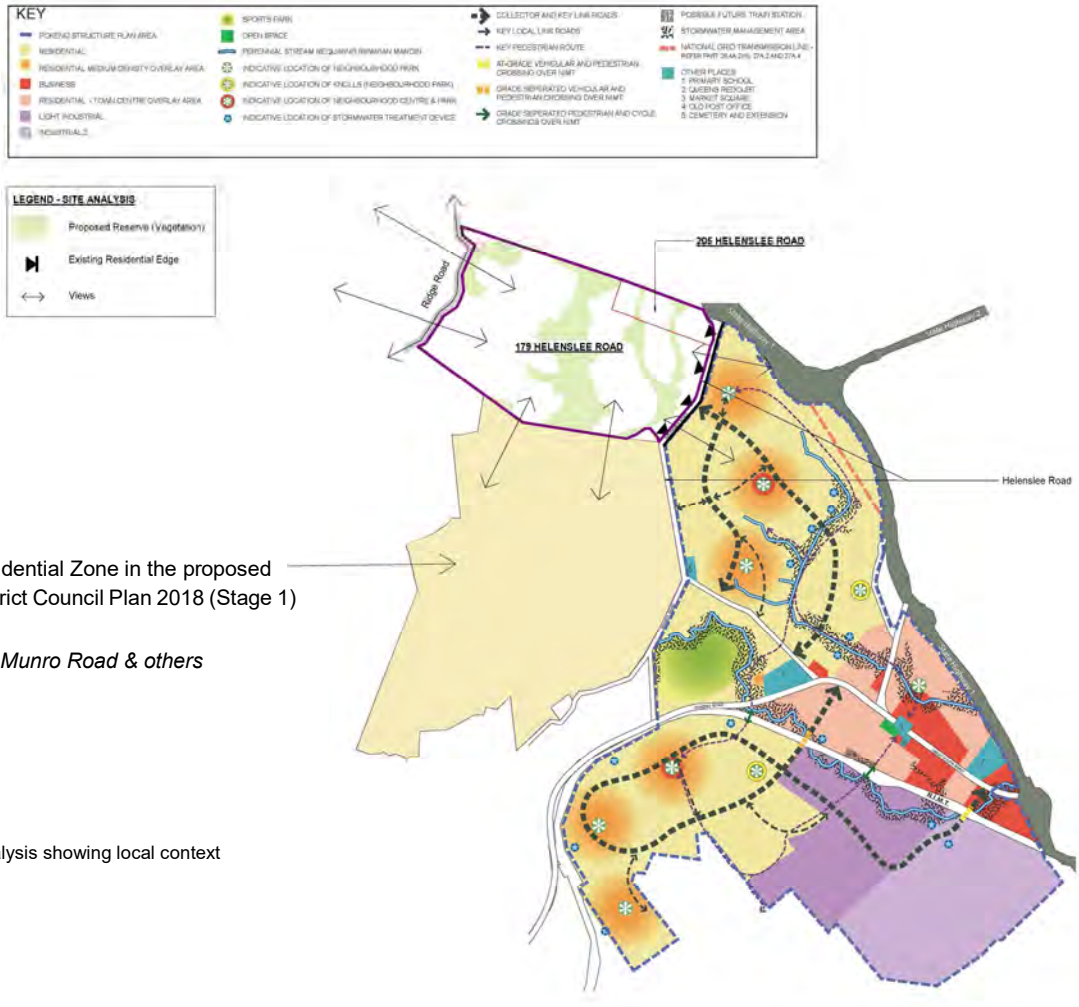
INTRODUCTION

Application Summary

The subject sites, 179 & 205 Helenslee Road, is located North-west of the existing Pokeno Township and adjoin to the properties in the lower catchment on the Western side of Helenslee Road which are in the notified Residential Zone in the proposed Waikato District Plan 2018.

The sites cover an area of approximately 95 hectares of both levelled and contoured land and stretch between Helenslee Road and Ridge Road. Both sites located within the Rural Zone of the current and proposed Waikato District Council (WDC)'s plans and comprise of vacant agricultural fields and unused land with vegetation.

This report supports the intended rezoning of the site to expand the Pokeno Township and provide more houses for the increasing population. The report should be read in conjunction with the submission report prepared by Birch Surveyors as it is based on their provided information. It is aiming to explain the proposed plan in respect to the context from an urban design perspective.



Notified Residential Zone in the proposed Waikato District Council Plan 2018 (Stage 1)

Address: 53 Munro Road & others

Fig. 1 Site analysis showing local context

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SITE ANALYSIS

Fig. 2 Key features of the site

Existing Features

Location

Pokeno is in close proximity to SH1, SH2, and the North Island Main Trunk (NIMT) railway line, which makes it very accessible from major cities or town centres of the North Island. The site is at the outskirt of Pokeno spanning between two major roads with direct access to motorway up/off ramp to SH1.

The proposed development comprises of affordable land and houses similar to the existing development on the opposite side of Helenslee Road, and is within a commutable distance from Auckland and Hamilton in particular.

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Existing Vegetation

It is acknowledged that there are Significant Natural Areas (SNA) that should be retained and protected for wildlife. The trees are an important asset to this proposed development scheme.

Views

The Northern, Western and Eastern boundaries are at the apex of the site. Significant views from these high grounds encompass the SNA at the centre of the site, which creates a strong visual amenity.

Movement

The site is located within 2km to existing facilities and amenities at Pokeno. This would encourage the new residents to walk and/or cycle to their destination. Most of the areas of the site are located within walking distance of 20-30 minutes to Pokeno Town Centre where there is a bus stop for regional buses. There are currently no public transport networks that serve the Pokeno area other than the regional buses. However, there are studies in developing public transport networks connecting Pokeno to Pukekohe and other parts within Auckland, Hamilton and wider Waikato areas.

Buildings

There are few existing buildings on the subject site, which none of them will be retained as they are old farm houses that are lack of maintenance for many years.

Ecology

The primary feature of the site is the mature Kahikatea forest. It is an outstanding natural habitat that has been untouched. As seen on Fig. 2 & 3, approximately 20-30% of the site is covered with vegetation. Most of the vegetation will be retained to preserve existing ecosystem and minimize environmental impact. The overland flow paths form the land separation and defines the locations for potentially developable areas.

Opportunities

Gateways

New vehicular access points connecting Helenslee Road and Ridge Road create gateways into the proposed development. As some of the access points are at the apex of the site, they give people positive picturesque first impression of the development on Ridge Road with lifestyle properties. The vehicular network is not only just connecting the two major existing roads, but also link with the two new access points in the Southern end of the site that connect to the proposed lower catchment residential area; combining the two communities together with new public transport where possible.

Views

The existing street views along Helenslee Road are considered during the design process of the development. It creates a visual amenity for the residents across the road which community has already been established.

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Existing Developments

The development represents a logical expansion to the current and proposed residential zone. It fits well and in line with the WDC's vision as a continuation of the expanding community and growth for Pokeno.

DESIGN PROCESS

Design Principles

Vision

The aim is to create a pleasant and safe environment for the residents to raise families as well as to provide comfortable, suburban living spaces with attractive public areas for the local community. The expansion is also a great opportunity for population growth just outside the Auckland region. By developing this site in Pokeno alongside with the adjacent future residential zoned areas, it encourages the existing facilities and public amenities to be further developed and increases the quality of living for all residents in developing a stronger community. Furthermore, it would help ease the increasing housing demand for the greater Pokeno area.

Key Considerations

The following are the key considerations to designing the western expansion to Pokeno:

- Connections to Pokeno township and its existing facilities
- Provide comfortable, suburban living spaces
- Conserve and respect existing vegetation and natural areas
- Create sustainable infrastructure i.e. drainage systems
- Encourage residents to use sustainable means of transport when it becomes available

Aerial Site Plan from WDC's GIS portal
Not to scale

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Fig. 3 Greenery on site

Open Green Spaces

By conserving the SNA, it provides a natural picturesque backdrop and can support off-road walking and leisure biking trails. The green spaces create a foundation for accessible and adequate recreational spaces that can be inter-connected by pedestrian path network.

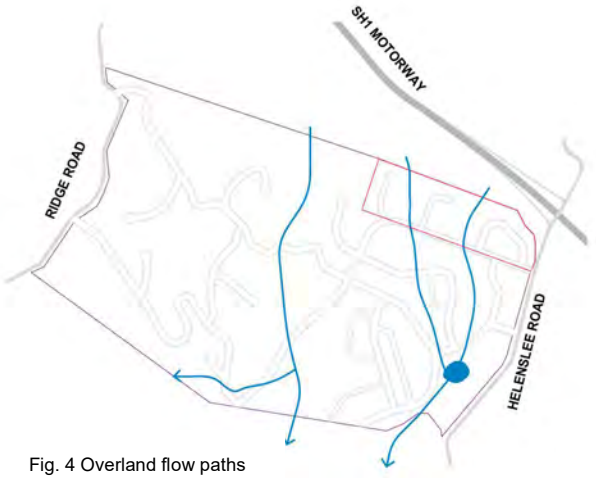

Fig. 4 Overland flow paths

Sustainable Drainage

The topography of the land creates an opportunity for sustainable stormwater drainage systems. Rainwater garden can be integrated into the design as part of the planning for eco-living environment as required. The overland flow paths are connected to the new stormwater drainage system in the lower catchment area.

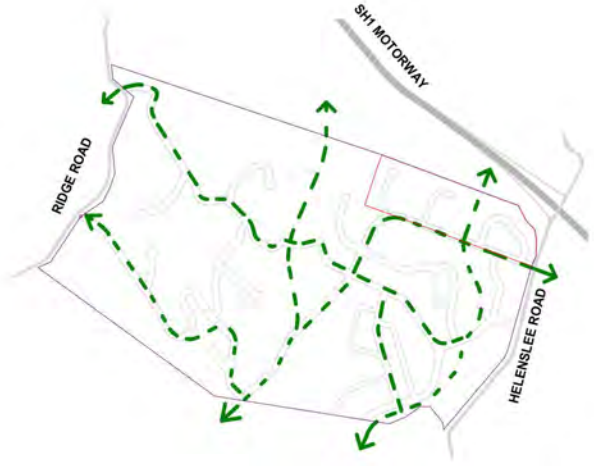

Fig. 5 Pedestrian link

Pedestrian Link

The Pokeno town centre is approximately 20-30 minutes walk from the site. With pedestrian links running through the entire site, they provide safe and attractive means of transport for all residents to existing amenities within Pokeno as well as new local shops, community services and recreational spaces.

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Fig. 6 Active frontages

Active Frontages

The proposal will ensure that buildings facing the key public spaces and main roads will be emphasized through a careful use of materials, landscaping and building forms to provide an attractive streetscape.

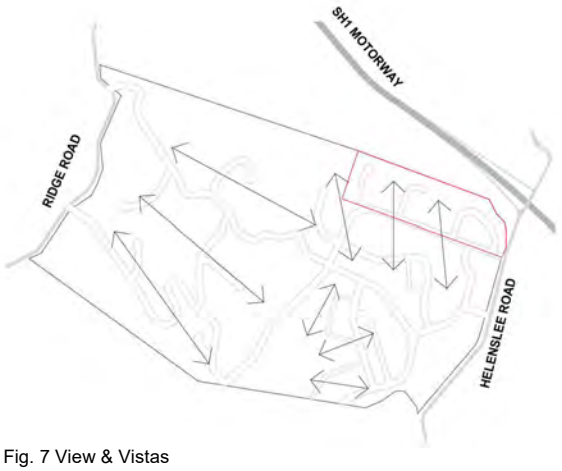

Fig. 7 View & Vistas

View & Vistas

With the intention to create a pleasant, suburban environment, the proposed design captures the local views and significant natural and cultural elements. Landmarks can be used to provide a form of familiarity to help residents navigate throughout the site and surrounding neighbourhood.

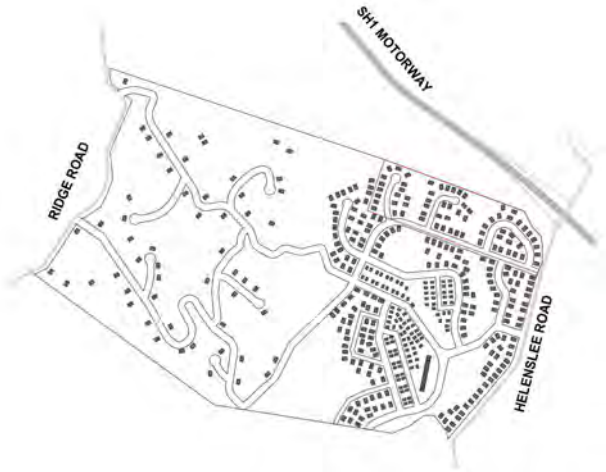

Fig. 8 Density

Density

The site is split into mainly two residential sections with different densities. This is used to attract a variety of residents who prefer different lifestyles and outdoor spaces. The Eastern side of the site is proposed to be of low to medium density zones with local shops, whereas the Western side of the site is proposed to be developed for countryside living. Currently Pokeno is still considered as a new emerging suburban local town centre. As some residents would not prefer the suburban lifestyle, the proposed countryside living zone is best targeted for those people.

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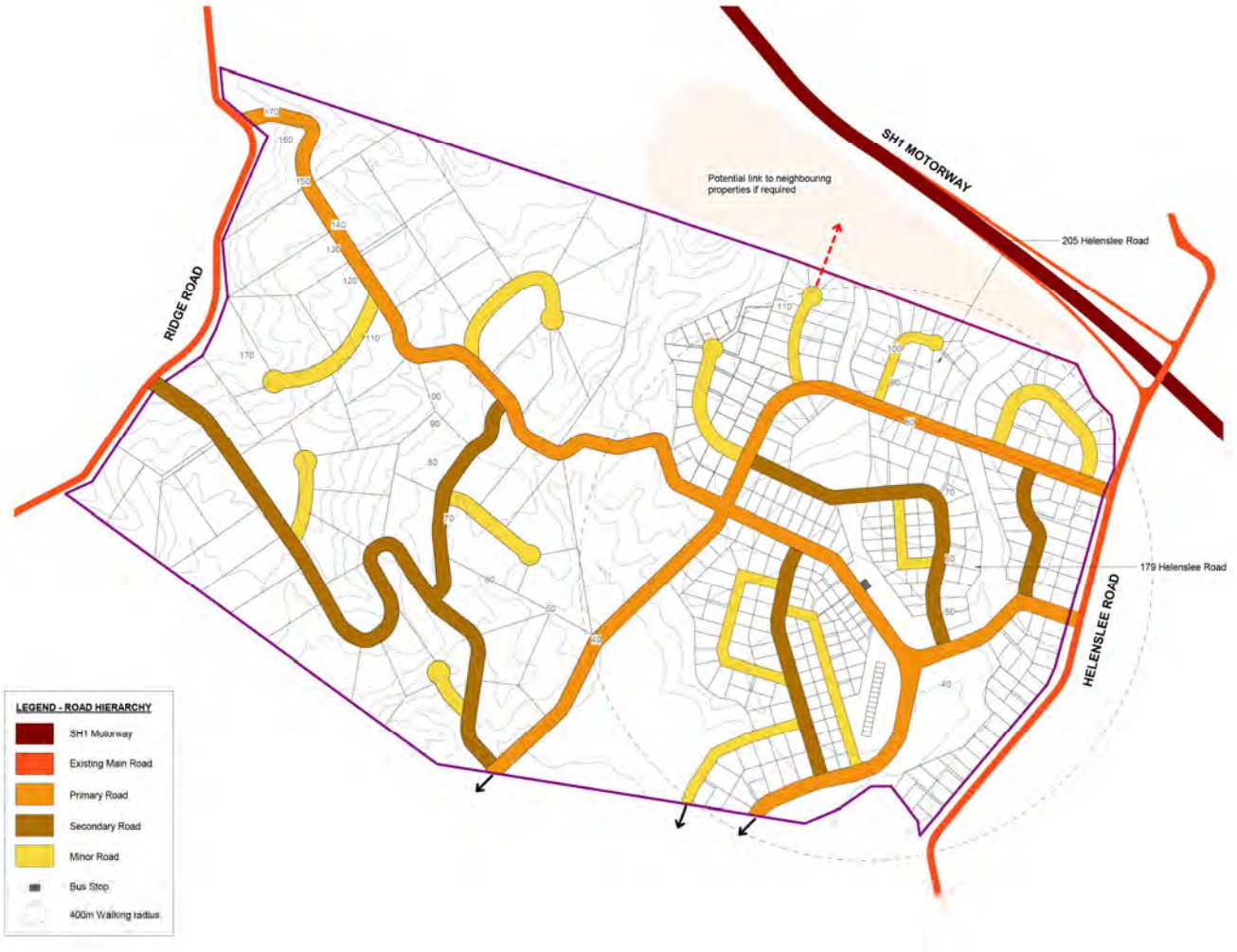

Fig. 9 Street hierarchy

Street Hierarchy

The main accesses to the site are the two intersections on Helenslee Road and connection with the lower catchment area. The primary roads will lead directly to the core of the site, which is the location of the proposed local shops. The primary street can also be used as a shortcut to crossover to Ridge Road from Helenslee Road, or vice versa. Currently, there is no connection between Helenslee Road and Ridge Road within 2km of Pokeno other than the motorway. The primary roads will provide a useful shortcut or even a possible detour for residents in the neighbourhood through the new development as required.

Most of the secondary and minor roads are inter-connected except where access is required to specific housing locations due to natural landform.

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Fig. 10 Master site plan with contours

Master Plan

Green Infrastructure

The master site plan above illustrates that majority of the existing vegetation will be retained. The vegetation sets a foundation for the proposed public spaces and pedestrian links. The site contains a mixture of open spaces, parks and the greenery that connects all areas together. The greenery in this development enriches the various spaces that have been proposed in line with the surrounding environment towards the lower catchment area.

There are altogether three major overland flow paths that run through the entire site. The overland flow paths also locate within the linked greenery areas that helps with nurturing the existing vegetation on site.

The vegetation defines the proposed green spaces in this development, it divides the site into various small pockets of communities as well as providing the necessary privacy between houses and the nearby residential areas that follows the natural contour.

Stormwater Management

The proposed stormwater management system on the lower catchment area at 53 Munro Road and others, is a sustainable drainage system that collects the water run-off from impermeable areas and discharges at a restricted rate to the water course along Huia Road. The drainage system comprises of a series of both underground and above ground networks and channels, as well as stormwater pond facilities and rain gardens. The stormwater discharges for the subject site is proposed to be an extension of that stormwater management system which has the required capacity for the entire catchment area.

Streets & Connections

The road hierarchy diagram on Fig. 9 shows the network that connects all the different zones and spaces together. It is acknowledged that the proposed development at the lower catchment areas has established future connections which conveniently, subject site can be an extension of that and can easily be linked to the proposed road networks altogether. The road layout has been designed so that it could support a future public transport network system.

Residential Lots

The master site plan with dwellings (Fig. 15) demonstrates how residential lots could be laid out on the site. It is essential that all individual lots have public frontages onto the street especially when they are facing a primary road. Each lot also has private and secure back yards for outdoor living space.

The plan also shows how different densities of development areas could work. The Western end of the site is proposed to be for countryside living in larger lots and as it gets closer to the town centre, the lot sizes become smaller. Even though majority of the proposed blocks are residential, there is a row of local shops being proposed at the hub of the town centre. These shops would be approximately 10-15 minutes walk from the furthest point of the site.

Movement Network

The main goal is to provide a new connected network to the proposed residential area in the lower catchment, as well as an expansion to the existing surrounding movement network.

Road Hierarchy & Character

By providing multiple access points to the site and a fully connected road network system with pedestrian links, it encourages residents to choose the most sustainable means of transport. Access to and from the motorway is readily available on Helenslee Road and Ridge Road.

Collector Road

The collector roads serve approximately 100 dwellings of the proposed development and offers direct route in and out of the site (Fig. 9). It provides a minimum 2.0m footpaths to both sides of the carriageway. A 1.3m berm is left for planting of trees to add more greenery at the threshold between the road and the footpath. The roads will be expanded to meet the minimum 22m width to comply with the access and road conditions on Table 14.12.5.14 of the WDC Plan 2018. Because these will be the primary roads, they would need to be well designed and landscaped to create a safe and attractive gateway for the proposed development.

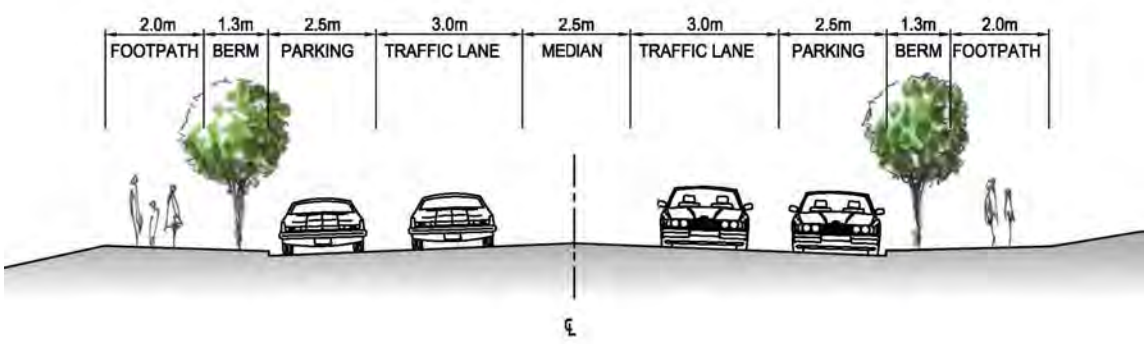

Fig. 11 Typical collector road cross-section

Local Road

The local road is smaller than the collector road. It gives direct access to houses as well as minor local roads leading to more dwellings. It provides a minimum 2.0m footpath to both sides of the desirable 10.4m carriageway. The roads will be expanded to meet the minimum 20m width to comply with the access and road conditions on Table 14.12.5.14 of the WDC Plan 2018.

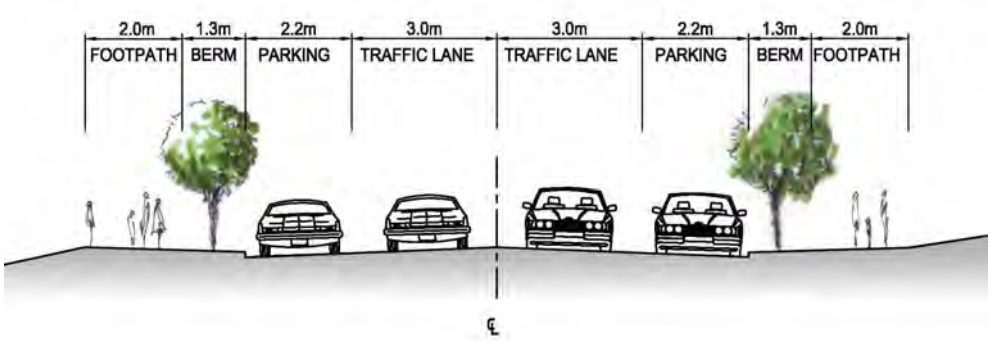

Fig. 12 Typical local road cross-section

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Local Road (Minor)

These are roads that connect collector and local roads together. It has the minimum 2.0m footpath and parking variations where needed. Provision of public carparking is planned for high density residential precinct as more than one off-street carpark may not be able to provide on site at each lot. Like the local road, the roads will be expanded to meet the minimum 20m width to comply with the access and road conditions on Table 14.12.5.14 of the WDC Plan 2018.

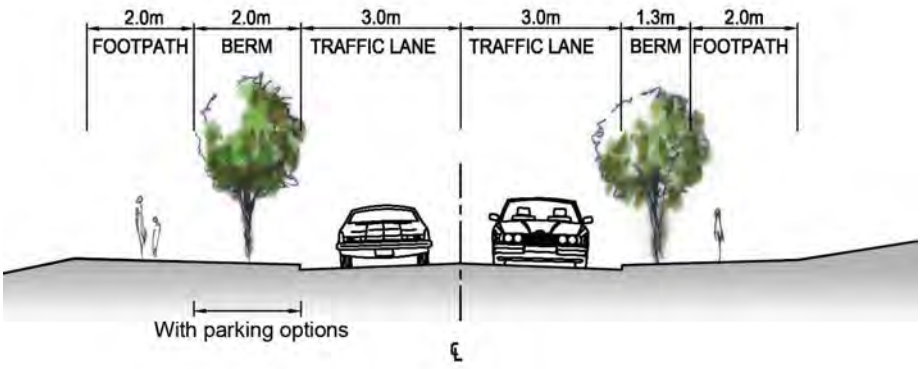

Fig. 13 Typical local road (minor) cross-section

Aerial photo of Helenslee Road – Sourced from Birch Surveyors Ltd.

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Green Network

The greenery that runs through the entire site is an important asset that can be taken as advantage in order to create better public open spaces. Since majority of the vegetation will be retained therefore it helps to layout the location of the proposed public spaces. The residential development serves as an opportunity to protect and restore a significant network of streams and bush areas resulting in an essential natural amenity with lots of environment and ecological benefits.

Fig. 14 Pedestrian and vehicular links

Recreational Parks

Accessible, public recreational spaces are crucial for the residents. It is important to develop a masterplan that includes adequate and flexible, shared leisure spaces for the neighbourhood.

Pedestrian Amenities

Because the site is mostly covered with greenery, there is an opportunity to use the green infrastructure for making extensions to the existing pedestrian paths and creating new links.

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Land Use

The residential development comprised of approximately 56ha (59.0%) of land for residential use. The expected roading infrastructure takes up approximately 14ha (14.7%) of land area. Landscaping and open spaces are proposed to be approximately 25ha (26.3%) which is more than one quarter of the total site area. Furthermore, the countryside living zone has a high percentage of reserved green area for onsite drainage etc, hence the overall natural landscape area would be over 50% of the entire site.

Fig. 15 Master site plan with dwellings

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Countryside Living (Low Density Precinct)

These areas of low density development are the furthest away from the local town centre. Due to the land being steep and uneven, it is impractical to form this area with higher density housing as it would require an unnecessary amount of land cutting/filling to achieve the desired contour suitable for such development.

Countryside Living House – Sourced from Saunders Robinson Brown

Countryside Living House – Sourced from Booking.com

Residential Medium Density Precinct

These areas of medium density development surround the outer region of the local town centre. They mainly comprise of detached houses on 500-600 square metre sized lots.

Medium Density Housing – Sourced from Newhomes

Medium Density Housing – Sourced from LJ Hooker

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Residential High Density Precinct

This precinct primarily surrounds the town centre to allow for a higher number of people to live as near as possible to the local hub within a short walking distance. It is also used to create a strong and attractive streetscape with active frontage. These areas should comprise of a mixture of semi-detached and standalone 2-storey houses.

High Density Housing – Sourced from McLennan Housing

High Density Housing – Sourced from Hargrave

Local Centre (Shops)

The shops are located at the town centre and is the local hub of the residential development. It serves as a focal point within the neighbourhood with all local amenities in one convenient location and establishes a meeting place with proposed public transportation nearby.

Shop Lots – Sourced from Yelp

Shop Lots – Sourced from Waterford Press

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The expected number of new homes that this site can accommodate would be approximately 415 which helps to meet the increasing housing demand as per the WDC's long-term housing plan requirement for the wider Pokeno township.

Fig. 16 Architect's impression of the completed development at 179 & 205 Helenslee Road, Pokeno

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Development Stages

It is proposed that the site will be splitted into four stages for development.

Stage One being the first pocket of residential houses. They will be facing Helenslee Road with active frontage therefore the houses will need to be well-designed with reference to the existing neighbourhood across the road to create an attractive streetscape.

Stage Two will be the two pockets of area that comprises of medium to high density housing and local shops.

Stage Three will be consisting of mainly medium density housing near the centre of the site where SNA is located.

Fig. 17 Eastern section showing Stages 1-3 of the proposed residential development (Medium to High Density Precinct)

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Fig. 18 Architect's impression of the proposed residential development (Medium to High Density Precinct)

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Lastly, Stage Four will be the Countryside Living Zone on the uneven and steep terrain on the upper part of the site beyond the proposed green reserves.

Fig. 19 Western section showing Stage 4 of the proposed residential development (Countryside Living Zone)

From an urban design perspective, a variety of different housing types can be achieved to create a pleasant and safe environment that benefits all residents. The four development stages suggested for this site have been carefully planned around the proposed new residential development on the lower catchment area at 53 Munro Road and others of which the master planning is prepared on a similar basis with the mindset of shared infrastructure could be made available.

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Fig. 20 Architect's impression of the proposed residential development (Countryside Living Zone)

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SUMMARY

This urban design report for the Western expansion of Pokeno aimed to explain how the proposed subject site is to be developed from a simple concept to a refined masterplan. The final proposal has considered the factors of the local and wider site context and features, the Waikato District Council's policies, and fundamental urban design principles.

Herewith some keypoints as noted in the report:

Housing

- Approximately 415 new homes to ease the increasing housing demand to meet Council's long-term housing plan requirement for Pokeno.
- A variety of different housing types can be achieved to create a pleasant environment for its residents.

A new, well-designed and attractive extension to an existing community

- Create accessible, recreational public spaces
- Sustainable drainage systems
- Improved pedestrian links within the site and connecting to the surrounding countryside areas
- Safe and linked road network, with attractive streetscapes, to encourage sustainable means of transport

New community facilities

- New recreational public spaces bring people together that serve not only its residents but also the wider Pokeno area as well using good urban design principles
- New flexible, shared leisure spaces to serve the desired function of the community
- Local shops may provide all necessary amenity and services to the neighbourhood

A development that is responsive to the site and local context

- Retention of existing greenery including a large number of native trees to act as buffer zone to create a sense of privacy within the community
- Sustainable drainage that takes advantage of the existing natural features of the site
- Residential development will protect and restore a significant network of streams and bush areas

Wider social and economic benefits

- New road network through the site includes connections to both Ridge Road and Helenslee Road, will attract more visitors and local residents to the proposed development
- Provide the required housing to meet the growing population of Pokeno
- Increase employment opportunities during and post construction that help creating a positive impact to the future of Pokeno township

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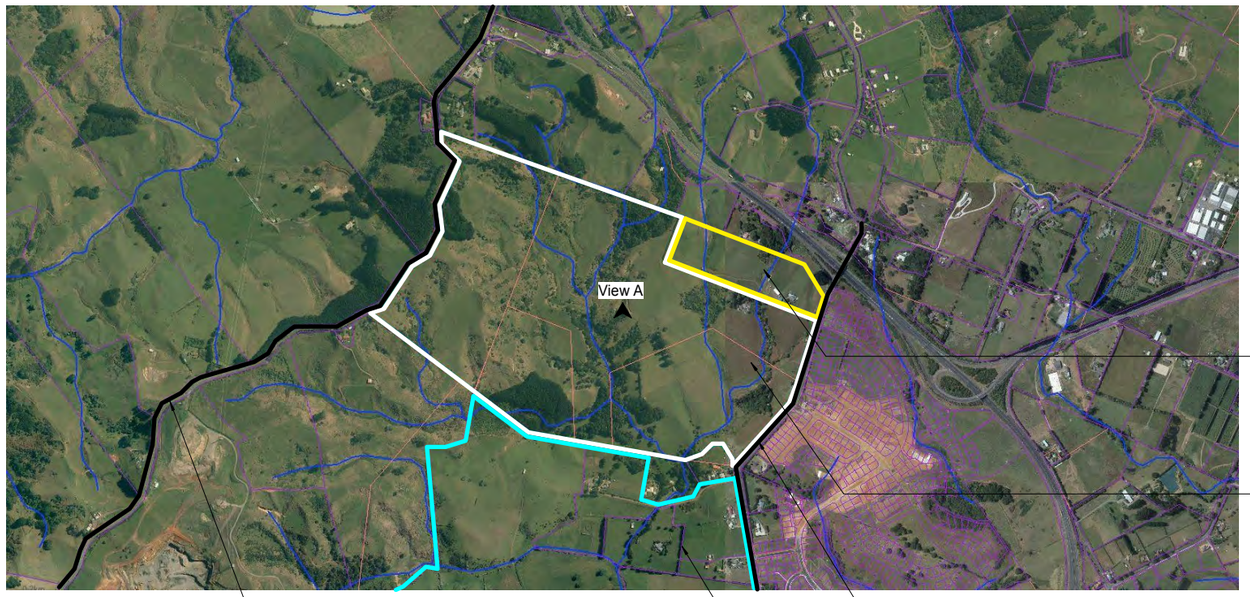
APPENDIX

Architectural Master Planning (A3 Drawings)

1812 – A001	Cover Sheet	Revision PD
1812 – A002	Site Analysis	Revision PD
1812 – A003	Key Site Features	Revision PD
1812 – A004	Study Diagrams	Revision PD
1812 – A005	Site Development	Revision PD
1812 – A006	Road Hierarchy	Revision PD
1812 – A111	Master Site Plan	Revision PD
1812 – A112	Master Site Plan (with Contours)	Revision PD
1812 – A113	Proposed Zone Plan – Residential	Revision PD
1812 – A114	Proposed Zone Plan – Countryside Living	Revision PD
1812 – A115	Architect's Impression	Revision PD
1812 – A116	Architect's Impression – Proposed Zone Plans	Revision PD



1 Locality Plan
1 : 10000 @ A1

Number	Drawing Name	Revision
A001	Cover Sheet	PD1
A002	Site Analysis	PD1
A003	Key Site Features	PD1
A004	Study Diagrams	PD1
A005	Site Development	PD1
A006	Road Hierarchy	PD1
A111	Master Site Plan	PD1
A112	Master Site Plan (with Contours)	PD1
A113	Proposed Zone Plan - Residential	PD1
A114	Proposed Zone Plan - Countryside Living	PD1
A115	Architect's Impression - Master Site Plan	PD1
A116	Architect's Impression - Proposed Zone Plans	PD1

DRAWING REVISIONS

DESCRIPTION	DATE	REV
Master Planning	2018.08.06	PD
Revised Master Planning	2018.09.20	PD1

PROPERTY INFORMATION

Site Address: **205 Helenslee Road, Pokeno**
Legal Description: PT ALLT 11 Mangatawhiri SD
Title Reference: CT NA545/269
Total Site Area: 76,847m²

PROPERTY INFORMATION

Site Address: **179 Helenslee Road, Pokeno**
Legal Description: ALLT 311 Mangatawhiri SD ALLT 71A Mangatawhiri SD PT ALLT 11 Mangatawhiri SD PT ALLT 8 Mangatawhiri SD
Title Reference: CT NA1044/261
Total Site Area: 873,589m²

2 View A from the property looking down to Helenslee Road
NTS @ A1

MASTER PLANNING

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CLIENT / PROJECT

CSL Trust

179 & 205 Helenslee Road
Pokeno 2472

DRAWING TITLE

Cover Sheet

	DATE	INITIAL
DESIGNED	2017.11.21	B HO
DRAWN	2018.09.20	D TAN & C LOH
CHECKED	2018.09.20	B HO
APPROVED	2018.09.20	B HO

SCALE @ A1 SCALE @ A3

As indicated

JOB NUMBER	DRAWING NUMBER	REVISION
1812	A001	PD1

KEY

- POKENO STRUCTURE PLAN AREA
- RESIDENTIAL
- RESIDENTIAL MEDIUM DENSITY OVERLAY AREA
- BUSINESS
- RESIDENTIAL - TOWN CENTRE OVERLAY AREA
- LIGHT INDUSTRIAL
- INDUSTRIAL 2
- SPORTS PARK
- OPEN SPACE
- PERENNIAL STREAM REQUIRING RIPARIAN MARGIN
- INDICATIVE LOCATION OF NEIGHBOURHOOD PARK
- INDICATIVE LOCATION OF KNOLLS (NEIGHBOURHOOD PARK)
- INDICATIVE LOCATION OF NEIGHBOURHOOD CENTRE & PARK
- INDICATIVE LOCATION OF STORMWATER TREATMENT DEVICE
- COLLECTOR AND KEY LINK ROADS
- KEY LOCAL LINK ROADS
- KEY PEDESTRIAN ROUTE
- AT-GRADE VEHICULAR AND PEDESTRIAN CROSSING OVER NIMT
- GRADE SEPERATED VEHICULAR AND PEDESTRIAN CROSSING OVER NIMT
- GRADE SEPERATED PEDESTRIAN AND CYCLE CROSSINGS OVER NIMT
- POSSIBLE FUTURE TRAIN STATION
- STORMWATER MANAGEMENT AREA
- NATIONAL GRID TRANSMISSION LINE - REFER PART 26.4A.2(H), 27A.2 AND 27A.4
- OTHER PLACES
  1: PRIMARY SCHOOL
  2: QUEENS REDOUBT
  3: MARKET SQUARE
  4: OLD POST OFFICE
  5: CEMETERY AND EXTENSION

LEGEND - SITE ANALYSIS

- Proposed Reserve (Vegetation)
- Existing Residential Edge
- Views

DRAWING REVISIONS

DESCRIPTION	DATE	REV
Master Planning	2018.08.06	PD
Revised Master Planning	2018.09.20	PD1

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CLIENT / PROJECT

CSL Trust

179 & 205 Helenslee Road
Pokeno 2472

DRAWING TITLE

Site Analysis

	DATE	INITIAL
DESIGNED	2017.11.21	B HO
DRAWN	2018.09.20	C LOH
CHECKED	2018.09.20	B HO
APPROVED	2018.09.20	B HO

SCALE @ A1 SCALE @ A3

As indicated

JOB NUMBER	DRAWING NUMBER	REVISION
1812	A002	PD1

MASTER PLANNING

LEGEND - KEY FEATURES

- Steeper land
- Gentle slope
- Flat land
- Vegetation
- Significant Natural Areas (Vegetation)
- Existing Roads
- Overland flow path
- Downward Slope
- Existing Buildings

MASTER PLANNING

DRAWING REVISIONS

DESCRIPTION	DATE	REV
Master Planning	2018.08.06	PD
Revised Master Planning	2018.09.20	PD1

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DRAWING TITLE

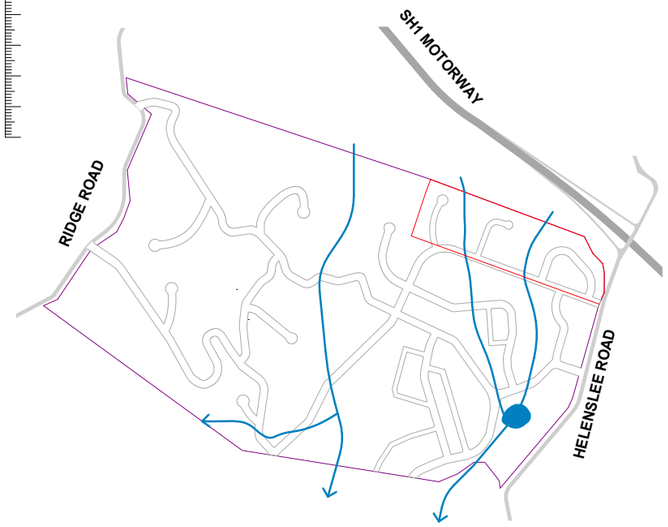
Key Site Features

	DATE	INITIAL
DESIGNED	2017.11.21	B HO
DRAWN	2018.09.20	C LOH
CHECKED	2018.09.20	B HO
APPROVED	2018.09.20	B HO

SCALE @ A1 SCALE @ A3

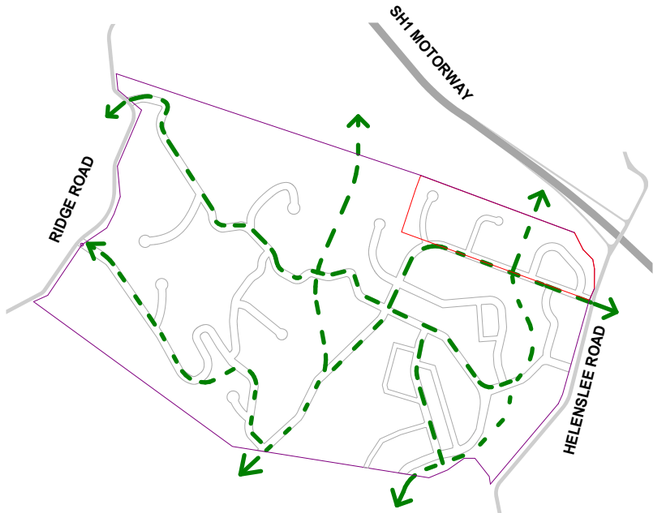
1 : 2500 1 : 5000

JOB NUMBER	DRAWING NUMBER	REVISION
1812	A003	PD1

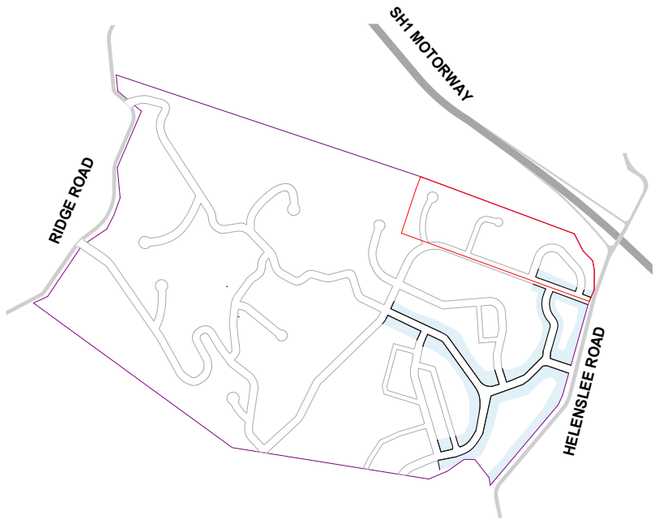


1 Potential Sustainable Drainage

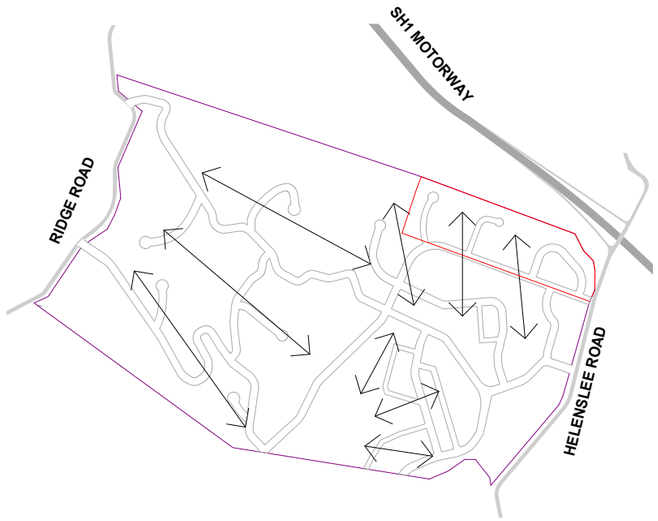
2 Open Green Spaces



3 Pedestrian Link



4 Active Frontages



5 Views & Vistas

6 Density

DRAWING REVISIONS

DESCRIPTION	DATE	REV
Master Planning	2018.08.06	PD
Revised Master Planning	2018.09.20	PD1

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DRAWING TITLE

Study Diagrams

	DATE	INITIAL
DESIGNED	2017.11.21	B HO
DRAWN	2018.09.20	C LOH
CHECKED	2018.09.20	B HO
APPROVED	2018.09.20	B HO

SCALE @ A1 SCALE @ A3

1 : 8000 1 : 16000

JOB NUMBER	DRAWING NUMBER	REVISION
1812	A004	PD1

MASTER PLANNING

LEGEND - PROPOSED SITE DEVELOPMENT

- Connected road network
- Green amenity and pedestrian trail
- Local Centre (Shops)
- Core and high density residential precinct
- Optimum utilization of the flat develop-able land for medium density residential houses

MASTER PLANNING

DRAWING REVISIONS

DESCRIPTION	DATE	REV
Master Planning	2018.08.06	PD
Revised Master Planning	2018.09.20	PD1

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179 & 205 Helenslee Road
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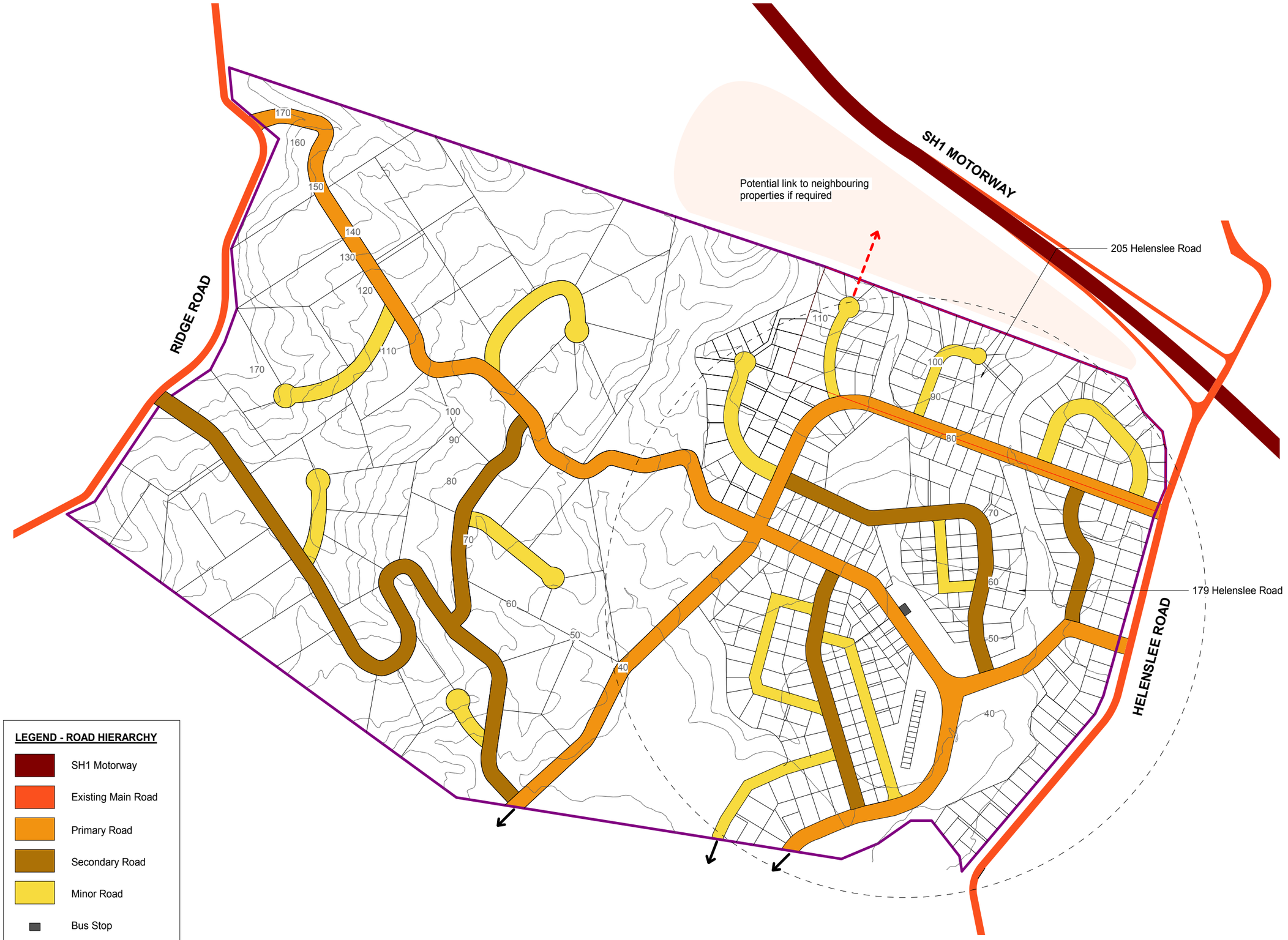
DRAWING TITLE

Site Development

	DATE	INITIAL
DESIGNED	2017.11.21	B HO
DRAWN	2018.09.20	C LOH
CHECKED	2018.09.20	B HO
APPROVED	2018.09.20	B HO

SCALE @ A1 1 : 2500 SCALE @ A3 1 : 5000

JOB NUMBER	DRAWING NUMBER	REVISION
1812	A005	PD1



LEGEND - ROAD HIERARCHY

- SH1 Motorway
- Existing Main Road
- Primary Road
- Secondary Road
- Minor Road
- Bus Stop
- 400m Walking radius

MASTER PLANNING

DRAWING REVISIONS

DESCRIPTION	DATE	REV
Master Planning	2018.08.06	PD
Revised Master Planning	2018.09.20	PD1

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179 & 205 Helenslee Road
Pokeno 2472

DRAWING TITLE

Road Hierarchy

	DATE	INITIAL
DESIGNED	2017.11.21	B HO
DRAWN	2018.09.20	C LOH
CHECKED	2018.09.20	B HO
APPROVED	2018.09.20	B HO

SCALE @ A1 1 : 2500 SCALE @ A3 1 : 5000

JOB NUMBER	DRAWING NUMBER	REVISION
1812	A006	PD1

LEGEND

- Steeper land
- Gentle slope
- Proposed Countryside Living Zone (Low Density Precinct)
  Lot Sizes: 5000m² +
- Proposed Residential Zone (Medium Density Precinct)
  Lot Sizes: 500 - 600m² +
- Proposed Residential Zone (High Density Precinct)
  Lot Sizes: 300m² +
- Proposed local centre (shops)
- Reserve / SNA
- Significant Natural Areas
  (Vegetation)
- Proposed road

MASTER PLANNING

DRAWING REVISIONS

DESCRIPTION	DATE	REV
Master Planning	2018.08.06	PD
Revised Master Planning	2018.09.20	PD1

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179 & 205 Helenslee Road
Pokeno 2472

DRAWING TITLE

Master Site Plan

	DATE	INITIAL
DESIGNED	2017.11.21	B HO
DRAWN	2018.09.20	C LOH
CHECKED	2018.09.20	B HO
APPROVED	2018.09.20	B HO

SCALE @ A1 1 : 2500 SCALE @ A3 1 : 5000

JOB NUMBER	DRAWING NUMBER	REVISION
1812	A111	PD1

LEGEND

- Steeper land
- Gentle slope
- Proposed Countryside Living Zone (Low Density Precinct) Lot Sizes: 5000m² +
- Proposed Residential Zone (Medium Density Precinct) Lot Sizes: 500 - 600m² +
- Proposed Residential Zone (High Density Precinct) Lot Sizes: 300m² +
- Proposed local centre (shops)
- Reserve / SNA
- Proposed road

MASTER PLANNING

DRAWING REVISIONS

DESCRIPTION	DATE	REV
Master Planning	2018.08.06	PD
Revised Master Planning	2018.09.20	PD1

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179 & 205 Helenslee Road
Pokeno 2472

DRAWING TITLE

Master Site Plan (with Contours)

	DATE	INITIAL
DESIGNED	2017.11.21	B HO
DRAWN	2018.09.20	D TAN
CHECKED	2018.09.20	B HO
APPROVED	2018.09.20	B HO

SCALE @ A1	SCALE @ A3
1 : 2500	1 : 5000

JOB NUMBER	DRAWING NUMBER	REVISION
1812	A112	PD1

LEGEND

- Proposed Residential Zone (Medium Density Precinct) Lot Sizes: 500 - 600m² +
- Proposed Residential Zone (High Density Precinct) Lot Sizes: 250 - 300m² +
- Proposed local centre (shops)
- Reserve / SNA
- Proposed road
- Dwellings / Building platforms

179 Helenslee Road

Dwellings (Stage 1)
- Medium Density Precinct = 59 Lots

Dwellings (Stage 2)
- Medium Density Precinct = 27 Lots
- High Density Precinct = 89 Lots

Dwellings (Stage 3)
- Medium Density Precinct = 99 Lots
- High Density Precinct = 20 Lots

Dwellings (Countryside Living)
- Low Density Precinct = 55 Lots

Shops = 15 Lots

205 Helenslee Road

Dwellings (Stage 1)
- Medium Density Precinct = 25 Lots

Dwellings (Stage 2)
- Medium Density Precinct = 24 Lots

Dwellings (Stage 3)
- Medium Density Precinct = 17 Lots

TOTAL DWELLINGS: 415 Lots

DRAWING REVISIONS

DESCRIPTION	DATE	REV
Master Planning	2018.08.06	PD
Revised Master Planning	2018.09.20	PD1

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179 & 205 Helenslee Road
Pokeno 2472

DRAWING TITLE

Proposed Zone Plan - Residential

	DATE	INITIAL
DESIGNED	2017.11.21	B HO
DRAWN	2018.09.20	D TAN
CHECKED	2018.09.20	B HO
APPROVED	2018.09.20	B HO

SCALE @ A1 SCALE @ A3

1 : 2000 1 : 4000

JOB NUMBER	DRAWING NUMBER	REVISION
1812	A113	PD1

MASTER PLANNING

LEGEND

- Steeper land
- Gentle slope
- Proposed Countryside Living Zone (Low Density Precinct) Lot Size: 5000m² +
- Reserve / SNA
- Proposed road
- Dwellings / Building platforms

No. of Countryside Living Zone lots - 55

DRAWING REVISIONS

DESCRIPTION	DATE	REV
Master Planning	2018.08.06	PD
Revised Master Planning	2018.09.20	PD1

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179 & 205 Helenslee Road
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DRAWING TITLE

Proposed Zone Plan - Countryside Living

	DATE	INITIAL
DESIGNED	2017.11.21	B HO
DRAWN	2018.09.20	D TAN
CHECKED	2018.09.20	B HO
APPROVED	2018.09.20	B HO

SCALE @ A1 SCALE @ A3

1 : 2000 1 : 4000

JOB NUMBER	DRAWING NUMBER	REVISION
1812	A114	PD1

MASTER PLANNING

MASTER PLANNING

DRAWING REVISIONS

DESCRIPTION	DATE	REV
Master Planning	2018.08.06	PD
Revised Master Planning	2018.09.20	PD1

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179 & 205 Helenslee Road
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DRAWING TITLE

Architect's Impression - Master Site Plan

	DATE	INITIAL
DESIGNED	2017.11.21	B HO
DRAWN	2018.09.20	D TAN
CHECKED	2018.09.20	B HO
APPROVED	2018.09.20	B HO

SCALE @ A1	SCALE @ A3
NTS	NTS

JOB NUMBER	DRAWING NUMBER	REVISION
1812	A115	PD1

1 Architect's Impression - Residential Zone
NTS @ A1

2 Architect's Impression - Countryside Living Zone
NTS @ A1

MASTER PLANNING

DRAWING REVISIONS

DESCRIPTION	DATE	REV
Revised Master Planning	2018.09.20	PD1

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CLIENT / PROJECT

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179 & 205 Helenslee Road
Pokeno 2472

DRAWING TITLE

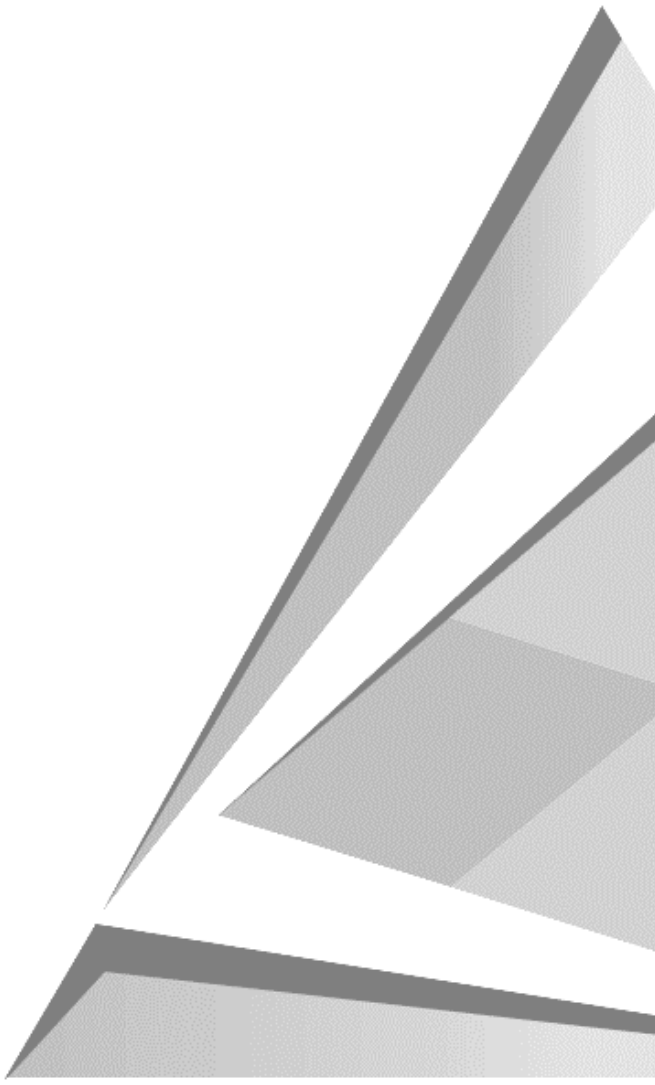
Architect's Impression - Proposed Zone Plans

	DATE	INITIAL
DESIGNED	2017.11.21	B HO
DRAWN	2018.09.20	D TAN
CHECKED	2018.09.20	B HO
APPROVED	2018.09.20	B HO

SCALE @ A1	SCALE @ A3
NTS	NTS

JOB NUMBER	DRAWING NUMBER	REVISION
1812	A116	PD1

APPENDIX B
ECOLOGY REPORT
JS ECOLOGY LTD



ECOLOGY REPORT FOR

POKENO NORTH STRUCTURE PLAN
179 HELENSLEE ROAD
POKENO

FOR: **CSL TRUST**
HELENSLEE ROAD
POKENO

BY: JS ECOLOGY LTD
Jennifer Shanks MSc. Hons

JS Ecology

Contents

EXECUTIVE SUMMARY

An area of land some 87 hectares in extent to the northwest of the Pokeno urban area is directly adjacent to an area that has been designated as “under discussion” in the Proposed Waikato District Plan. A separate ecological report entitled “Pokeno West Structure Plan Ecology Report” by JS Ecology has already been lodged with the Waikato District Council (WDC) for this “under discussion” area which lies directly to the south and west of the subject site. The site that is the subject of this report is currently used for semi-extensive agriculture with a very low density of buildings and infrastructure. This report provides an overview of the ecological values of the site and the potential effects of future development of the land for urban use on those values.

Preliminary assessment of the terrestrial and aquatic values of the site was undertaken during March 2018. Much of the property is in exotic pasture where the ecological values are low. There are significant ecological values associated with areas of remnant or regenerating native vegetation and watercourses however.

Two upper tributaries of the Pokeno stream flow across the site from north to south and the westernmost of these has an extensive network of side tributaries feeding into it from the western hill country. The boulder/cobble/gravel substrate found in most of the streams provides a range of aquatic habitats, although some of the western tributaries are mostly soft bottomed. Aquatic habitat values and water quality appear to be moderate to good in most of these watercourses although they are subject to pugging by cattle and grazing.

A two hectare stand of kahikatea swamp forest lies in the floodplain of the western watercourse near the southern boundary of the site and another small area of regenerating native podocarp broadleaved forest occupies a steep gully on the northern side of the site. The two areas are connected by regenerating totara and kanuka along the western watercourse. Cliff forest on tephra cliffs runs in a narrow band for some 200m in the northwestern corner of the property. All of these areas of native vegetation have important ecological values.

Specific constraints to the development of the site include the need to retain and protect

native vegetation and to maintain and enhance the naturalness and the aquatic habitat values of the watercourses. More detailed assessments of native fauna and baseline stream ecological values (SEV) will be required prior to detailed design. The removal of livestock would provide immediate benefits to the water quality values of the streams and allow regeneration of native understorey plants.

The effective management of stormwater and earthworks to protect the ecological values of the watercourses during construction will be pivotal to managing many of the potential negative effects of proposed development. During the operational stage management of stormwater runoff from impervious surfaces such as roofs and driveways will also be crucial to maintaining the ecological values of the site over the long term.
Stream crossings, channel alteration and culverting of watercourses needs to be kept to a minimum. The natural channels and hydrology of the watercourses should be maintained as far as possible. Facilitation of the movement of native fish through culverts or other instream structures needs to be incorporated into their design.

Negative environmental effects due to development of the catchment can be mitigated through the early recognition of environmental issues and impacts and the formulation of an environmentally sensitive design. It is essential that good environmental design supported by hydrological data modelling and appropriate mitigation for ecological effects is part of the initial planning for any development. This is likely to prove more cost effective and more satisfactory ecologically than any retrospective action.

Significant opportunities exist to provide ecological mitigation and biodiversity benefits through protection of existing native vegetation and the riparian planting of the main watercourses and their tributaries. Restoration planting of two open, grazed wetlands along the eastern watercourse would also provide significant improvements to the biodiversity values of the site through the enhancement of habitat for native wetland birds and the filtering out of nutrients. An Ecological Management Plan (EMP) should be developed for the site by a qualified ecologist in consultation with engineering and landscape designers early in the overall development process.

1 INTRODUCTION

An area of land northwest of Pokeno Village is directly to the north east of an area that has been designated as "under discussion" in the Proposed Waikato District Plan (Figure 1). The subject site lies between the area designated as "under discussion" and SH1. The bulk of the area (87ha) is held in one title for 179 Helenslee Road situated between the upper north western side of Helenslee Road and the eastern side of Ridge Road. This report provides an overview of the ecological features of this area including vegetation and the general ecological values and status of the watercourses. Detailed water quality and stream ecological value (SEV) assessments were not undertaken at this stage, however the ecological report prepared for the Pokeno catchment (Brian T. Coffey & Associates 2008) provides some additional information on the Pokeno Stream that is referenced in this report as detailed in Section 4.

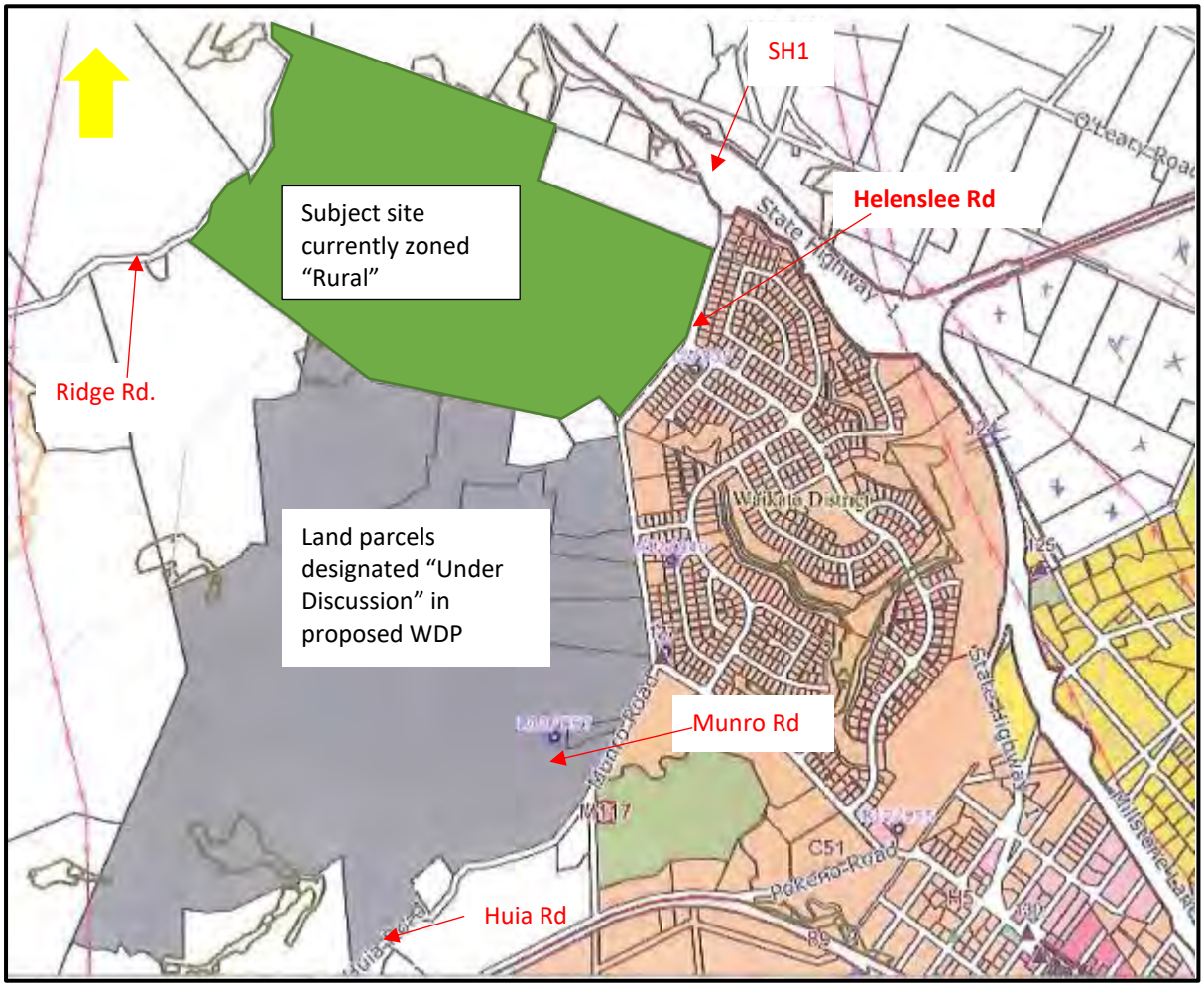


Figure 1 **Subject site (green) and area zoned "Under Discussion" in the Proposed Waikato District Plan (grey) in relation to the existing Pokeno Village (orange).**

2 LANDSCAPE AND ECOLOGICAL CONTEXT

The property lies within the Manukau Ecological District (ED) in the Auckland Ecological Region (Mc Ewen 1987). All native ecosystems in this ED are severely depleted and many remaining ecosystems are dominated by exotic species (Lindsay et al 2009). The original forests of the Manukau ED included the most southerly common occurrence of characteristic northern North Island lowland forest types containing abundant taraire and puriri. Alluvial flats and terraces throughout the ED once supported extensive stands of kahikatea swamp forest, but these have largely been drained and converted to farmland**.** Only 3% of the original area of native vegetation within the Manukau E.D. remains and only 0.4% of native freshwater wetlands remain of which very little is formally protected.
The situation is very similar in the Meremere ED which adjoins the Manukau E.D just to the south of the site. Both of these E.D.s are predominantly comprised of lowlands and consequently the conversion to agricultural use has been almost absolute.
The site forms part of the upper catchment of the Pokeno Stream which drains to the Mangatawhiri Swamp and ultimately to the Lower Waikato River and its wetlands. These are both Sites of Special Wildlife Significance (SSWS) and significant wetlands. The site itself is likely to have originally supported kahikatea floodplain forest on low-lying land close to the Pokeno Stream grading up to podocarp broadleaved forest on more elevated parts of the site.

3 SITE DESCRIPTION

The site includes 179 and 203 Helenslee Road. These properties are used primarily for dry stock grazing. Two main tributaries of the Pokeno Stream flow through the site in a generally north-south direction and associated with these are numerous side tributaries that often originate from springs. The contour is variable across the site with more gently undulating land on the eastern side sloping up to steep land on the western side at an altitude of between 40 -180m a.s.l[1]approximately. A series steep of east facing gullies and ridges fall away from Ridge Road on the western boundary. Soils are mainly deep, Typic Orthic Granular soils derived from tephra with a clay profile and moderate drainage

[1] Above sea level

properties (Landcare research SMap Online). The volcanic origins of the locality are displayed in the numerous basalt boulders and stones that are found across the site, particularly in the stream channels. On the western side of the site are steep cliffs of tephra. The grazed land is mainly conventional pasture with some areas of reed land in wetter areas and scrubby areas of woolly nightshade (*Solanum mauritianum*), gorse (*Ulex europaeus*) and barberry (*Berberis glaucocarpa*) in the steeper gullies on the western side. Native vegetation occurs in association with the main streams and particularly the larger western stream. A substantial area (c. 2ha) of tall kahikatea swamp forest occurs on the southern boundary of the property at the confluence of several side tributaries. Another area (c. 1.9ha) of broadleaved podocarp forest occurs near the northern boundary of the site on the same stream. These areas are connected via a patchy corridor of native and exotic riparian vegetation. Stands of forest dominated by totara (*Podocarpus totara*) are dotted about the site.

4 SURVEY METHODS

Aerial photographs of the site were viewed and various features were identified for investigation including watercourses and areas of vegetation. The site is part of the Tanetiwhiora catchment which is a sub catchment of the Waikato River. An assessment of the site was carried out on 2nd and 4th March 2018.

4.1 Existing ecological information for the site

A report setting out ecological considerations for the Pokeno Catchment Management Plan (Coffey & Associates 2008) provides some high level information on general terrestrial ecology of the wider catchment. The Coffey report also contains detailed aquatic ecological and water quality data for a sample site (P1) on the Pokeno Stream at the Munro Road Bridge 1km to the south of the site.

In general instream aquatic habitat values at Site P1 were found to be “poor” to “fair” based on emergent macrophyte cover, macrophyte clogging of the channel, periphyton enrichment index and accepted indices for native macroinvertebrate communities (MCI[2] , QMCI[3] and EPT[4]). Long finned eel (*Aquilla dieffenbachii*), common bully (*Gobiomorphus*

[2] Macroinvertebrate community index
[3] Quantitative Macroinvertebrate Community Index
[4] Ephemeroptera, Plecoptera & Trichoptera

cotidianus) and freshwater crayfish (*Paranephrops planifrons*) were caught at the Munro Road bridge location. Long finned eel has a national threat status of 'At Risk - Declining' in the New Zealand Threat Classification System listings (2014).

4.1 Terrestrial ecological values

All areas of terrestrial vegetation were viewed by walking through most areas and viewing any inaccessible areas through binoculars (Konus 10 x 42). The species composition and community structure were noted in all cases as were any pest plants. Vegetation features were mapped onto an aerial photograph of the site. Areas of vegetation referred to in the text (A - H) are shown in Figure 2. Main stream gullies are numbered 1 & 2 from east to west.

4.2 Watercourses and aquatic ecological values

The watercourses and their tributaries were visually checked at various points along their lengths. These were mapped using a hand held GPS unit (Garmin Dakota 20), mapped land contours (Auckland Council GIS) and Google Earth. Features noted were relative water clarity/silt loading, instream macrophytes and periphyton, bank profiles and stability, riparian vegetation and shading. No quantitative data was collected at this stage however. Streams were investigated and classified as either permanent or intermittent using the definitions set out in the Auckland Unitary Plan (AUP) and found in Appendix 1 of this report. Stream permanence was assessed at least 48 hours after rain. Culverts and crossings were investigated to determine whether they facilitated the passage of native fish such as eels and inanga or posed a significant barrier due to their being perched or overly long.

1. 4.3 Fauna

Incidental observations of birds and mammals were made in the course of the site survey. No targeted searches for lizards or bats were made although their likely presence can be inferred from the habitat that occurs at the site.

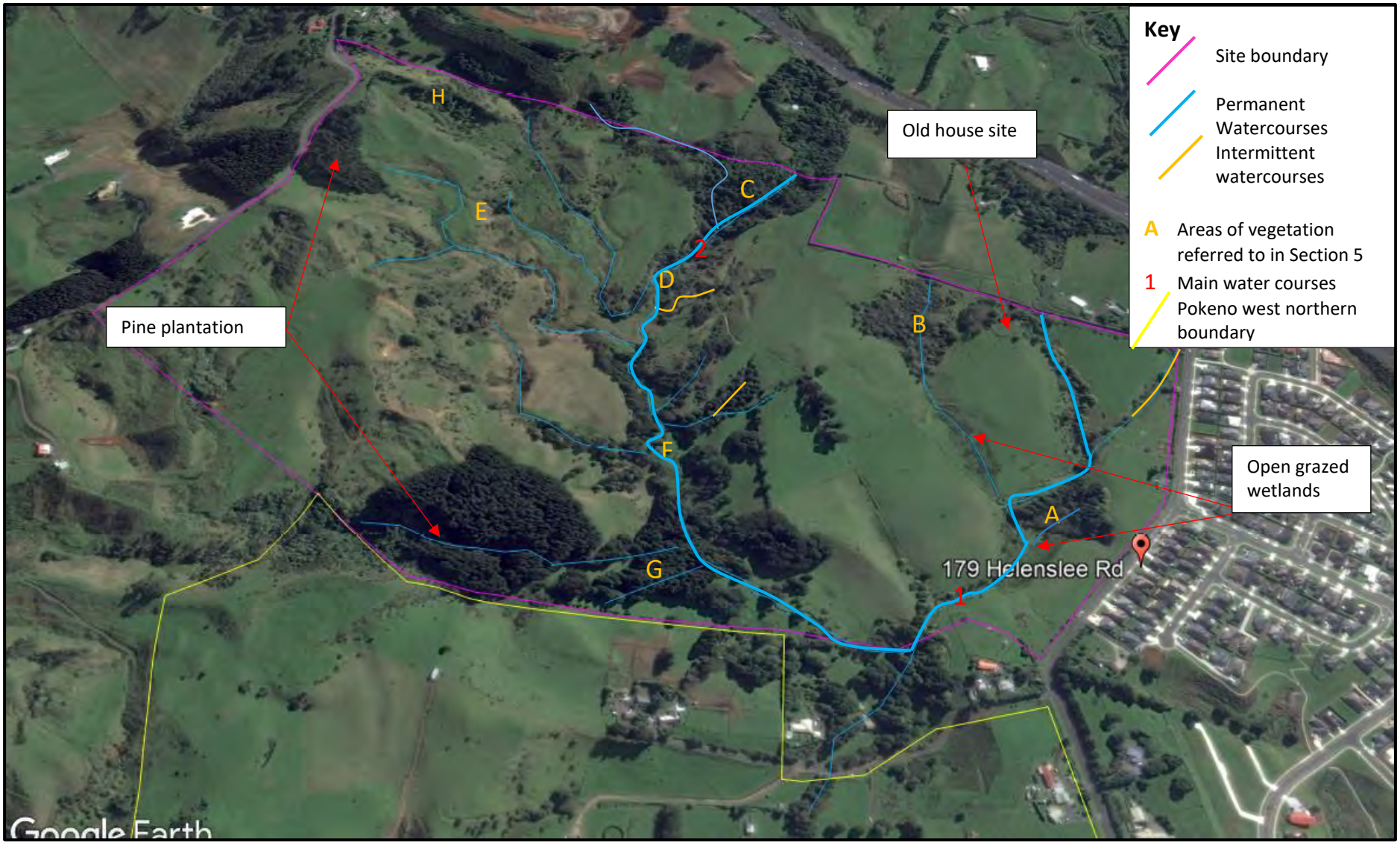


Figure 2 **Pokeno North site boundary and location of ecological features**

5 RESULTS

5.1 Terrestrial ecological values

5.1.1 Areas of woody vegetation

Please refer to Figure 2 for the locations of areas of woody vegetation discussed below. Section 9 provides photographs of the various areas referred to below and Appendix 1 contains a list of native and exotic species observed at the site.

a) **Area A**: This is the main area of native vegetation (c. 0.6ha) associated with the eastern watercourse (Watercourse 1). Although the stand appears to be partially fenced the understorey is very sparse and the canopy consists mostly of medium sized totara trees and tall kanuka (*Kunzea robusta*). A single tall kahikatea (*Dacrycarpus dacrydioides*) stands at the head of a side gully (Plate 1). Tree privet (*Ligustrum lucidum*) occurs around the eastern edge of the stand and grey willow (*Salix cinerea*) is found at the top of the wetland that lies below the trees. Patches of gorse (*Ulex europaeus*) and barberry (*Berberis glaucocarpa*) lie around the southern edges of the area. The ecological values of this area are moderate due to the maturity of the native trees. Protection from livestock would allow a native understorey to gradually re-establish provided pest plants were removed.

   The watercourse upstream of Area A as far as the northern boundary has a narrow band of relatively dense riparian vegetation composed mostly of privet with totara and kanuka downstream near Area A (Plate 2).

b) **Area B:** This area lies near the northern boundary of the site on the main western tributary of watercourse 1. It consists mostly of old barberry and hawthorn (*Crataegus monogyna*) 2 -3m in height growing on a bouldery substrate with ground ferns such as rasp fern (*Doodia australis*) and rough grass beneath (Plate 3). A few native plants including a young kahikatea are scattered through the area as are young privet trees. The watercourse itself is mainly open with common exotic macrophytes such as water pepper (*Persicaria hydropiper*) and buttercup (*Ranunculus repens*) growing in the channel with weak rush (*Juncus effusus*). The botanical values of this area are very low although the pest plants are providing some shading to the stream. Just to the east of this area the site of a former dwelling contains mostly amenity trees and shrubs including copper beech (*Fagus*

sylvatica var. *purpurea*), Coastal banksia (*Banksia integrifolia*), pohutukawa (*Metrosideros excelsa*), European oak (*Quercus robur*), honey locust (*Gleditsia triacanthos*) and others. These tree are not of particular size or age.

c) **Area C**: In this fenced area c. 1.9ha of broadleaved podocarp forest occurs near the northern boundary of the site in a very steep south-facing gully system associated with Watercourse 2 (Plate 4). A further 2.5ha of contiguous forest occurs directly to the north on the neighbouring property, giving a total area for the stand of c. 4.5ha. The regenerating forest contains a significant component of tawa (*Beilschmiedia tawa*) with tall kanuka, rimu (*Dacrydium cupressinum*), rewarewa (*Knightia excelsa*), taraire (*Beilschmiedia tarairi*), kahikatea, hinau (*Elaeocarpus dentatus*), pukatea (*Laurelia novaezelandiae*) and puriri (*Vitex lucens*). Tall mamaku (*Cyathea medullaris*), nikau (*Rhopalostylis sapida*) and a range of forest understorey shrubs, vines and epiphytes form a diverse forest community. This area of relatively mature native forest has high ecological values due to the species diversity and completeness of the plant community.

d) **Area D**: This area comprises the riparian vegetation along the mainstem of Watercourse 2 downstream of Area C (Plate 5). The steep gully is open to grazing and clumps and individual specimens of totara and tall kanuka are scattered along its sides with numerous barberry bushes and some privet amongst the natives. This vegetation provides relatively good shading to the stream although there are some more open patches, particularly near the main farm track where it crosses the stream. This vegetation is of moderate ecological value as the diversity is low and there is little to no understorey.

e) **Area E**: Vegetation along the upper western tributaries of Watercourse 2. A small stand (>0.1ha) of remnant native trees is found in Area E consisting of totara, kahikatea, mahoe (*Melicytus ramiflorus*) and nikau. It is heavily grazed and pugged with no understorey (Plate 6). There are several small stands of this type in different parts of the site and these generally have low ecological values as individual stands due to their low diversity and small size. Collectively however, they provide connectivity across the landscape and therefore they have moderate ecological values.

f) **Area F:** This vegetation lies along Watercourse 2 below the farm crossing and as far

as the eastern side of Area G. It comprises native vegetation along the mainstem of watercourse 2 and along the mid and lower reaches of the side tributaries. The canopy tends to be discontinuous with stands of totara, kanuka and the occasional kahikatea occurring in the gullies and on steeper faces. . Substantial open grassy areas occur along the main watercourse and all of this area is grazed so that there is little in the way of an understorey (Plate 7). The ecological values are moderate; and the vegetation provides important aquatic habitat values through shading of the watercourse and its tributary streams. The ecological values of this area could be further enhanced through fencing of stands of native trees and the riparian margins of the watercourse and tributary streams.

g) **Area G**: Tall kahikatea swamp forest occurs on the southern boundary of the property on a broad floodplain at the confluence of several major side tributaries with Watercourse 2. Much of the area is fenced and the understorey is recovering following historic grazing. The canopy is predominantly tall kahikatea with scattered large totara (Plate 8). Mahoe, kawakawa (*Piper excelsum*), mapou (*Myrsine australis*), pigeonwood (*Hedycarya arborea*) and thin-leaved coprosma (*Coprosma areolata*) are all found in the understorey. Numerous taraire seedlings and saplings are found in the forest edges with nikau, mamaku and silver tree fern (Cyathea dealbata) under the tree canopy. Large old vines of kohia or native passion vine (*Passiflora tetrandra*) festoon some of the tall trees. There is a significant presence of privet here with numerous seedlings to be found in the ground layer and understorey. Patches of holly (*Ilex aquifolium*) and tradescantia (Tradescantia fluminensis) were also noted. Native ground ferns and sedges are common in the ground layer. This a very healthy area of recovering kahikatea floodplain forest, although control of shade tolerant pest plants is needed.

An unfenced stand of kahikatea upstream of the fenced area are affected by grazing and pugging of the soil. These trees have no understorey apart from exotic species characteristic of wet pasture. They appear to be in significantly poorer health than the fenced trees with a much thinner canopy and a yellowish hue to the foliage (Plate 9). Several have already died. This difference is likely to be caused by damage to the fine surface roots and also by changes to the hydrological conditions caused by cattle pugging. This stand of trees would significantly benefit from the

immediate exclusion of livestock which may stop further decline and death of the trees.

Area G (c. 2ha) is of very high ecological value due to the rarity of this forest type in the ecological district and its widespread loss nationally. This area could be further enhanced ecologically through fencing of all of the kahikatea forest, repairs and maintenance to existing fences and weed eradication.

h) **Area H:** This is an area of remnant forest on steep south-facing tephra cliffs in the north western corner of the site near Ridge Road. Since the cliffs are near vertical it is difficult to say what the area of this vegetation is, however it runs from the western edge of the site eastward for some 200m in a narrow band (Plate 10). A key canopy species is mangeao (*Litsea calicaris*), a tree known for its association with volcanic ash soils and "boulder forest". Other typical cliff forest species recorded here were kohekohe (*Dysoxylem spectabile*), large old mahoe trees, rangiora (*Brachyglottis repanda*), koromiko (*Hebe stricta*), kawakawa and taurepo (*Rhabdothamnus solandri*). Ferns such as maidenhair (Adiantum cunninghamii), shining spleenwort (Asplenium oblongifolium) hen & chickens fern (*A. bulbiferum*), rasp fern, and thread fern *(Icarus filiformis*) all have a presence in the ground layer. Climbers such as kiekie *(Freycinetia banksii*), white rata (*Metrosideros perforata*) and bush lawyer (*Rubus cissoides*) cling to the cliffs. Kahikatea and totara are also found here. The native plants survive here only because the steepness of the cliffs makes access difficult for cattle, however it is clear that the livestock have grazed everything they can reach. Cliff forest on tephra is an uncommon ecosystem throughout the ecological district and the ecological values of this forest area are high. The ecological values of the vegetation in area H area high since it supports a quite unusual plant community. Native plant communities on north facing cliffs opposite Area H have been lost altogether. Protection of the remnant cliff forest would ensure the persistence of this uncommon plant community and would involve exclusion of livestock and weed management.

5.1.2 Wetlands

Small wetlands occur across the site in association with the main watercourses and their tributaries. All of these are grazed and are dominated by exotic wetland species or weedy native rushes. They chiefly occur below Area A and Area B along Watercourse 1 (Plate 11)

and in various places along the mainstem and tributaries of Watercourse 2 in Areas D, F and G. Small perched wetlands up to a few hundred square metres in area are very common on the western side of the site where small springs feed them.

Area G is the only area where wetland ecological values are high due to the presence of kahikatea swamp forest. The ecological values of other wetlands are currently low in terms of native vegetation, however a relatively natural hydrology still exists providing an opportunity for wetland restoration in the future.

5.1.4 Pest plants and exotic trees

Pest plants found at the site included gorse, woolly nightshade, barberry, privet and blackberry (*Rubus fruticosus*). Grey willow (*Salix cinere*a) is present in the wetland below Area A and in a few other places across the site. Barberry and hawthorn comprise most of Area B and they are found across the site, often on the edges of native bush patches with privet. Aquatic weedy species are common along open grassy stream banks and stream channels. These include water pepper, water celery (*Apium nodiflorum*), watercress (*Nasturtium officinale*) and water purslane (*Ludwigia palustris*).

A number of exotic trees occur at the site, notably two stands of Monterey pine (*Pinus radiata*) on the western and southern boundaries of the site of c.1.1ha and 3.5ha respectively. These are well grown and will probably be ready for harvest within the next 10 -15 years.

Exotic trees associated with the former house site include coastal banksia, copper beech, pohutukawa, Paulownia (*Paulownia tomentosa*), maple (*Acer* sp.), oak, rhododendron (*Rhododendron arboreum*), poplar (*Populus deltoides*), honey locust and various fruit trees. These are likely to be removed to allow for land contouring in the proposed residential zone and none of the trees is of any great size or maturity, warranting special protection. Some specimens such as the copper beech and pohutukawa would be worthy of retention as amenity trees if the project design allowed.

5.1.5 Summary of terrestrial ecological values

The diverse topography and hydrology of the site supports a number of different natural habitats, two of which, kahikatea floodplain forest and cliff/rock forest are uncommon. Preservation of these habitats and ecological connectivity along the watercourses should be a priority for any future management of the site. Although grazing pressure is clearly intense at times, significant areas of indigenous habitat still remain. Native vegetation along

the mainstem of Watercourse 2 provides a corridor of habitat that could be further enhanced through stock exclusion and weed and pest control. Of the indigenous terrestrial habitats identified across the site, most retain moderate ecological values, the exception being open, grazed wetlands which have low values due to grazing and their lack of native wetland plants. Areas C and G have high ecological values however and these two areas are connected via riparian vegetation along Watercourse 2. The cliff forest in Area H has high ecological values due to its rarity. These three areas hold a diversity of species with each being a distinct native plant community (Appendix 1). All areas of native vegetation at the site are relatively small, however they do provide important habitat in a lowland environment that has been largely stripped of its native vegetation and they collectively retain a good range of the native biodiversity that would have originally occupied the site. Pest plants have a presence but they currently cannot be said to be dominant. Barberry and privet are quite common along streams and around the edges of bush patches. These two species with gorse and woolly nightshade will quickly spread if the cattle are removed unless they are first aggressively controlled.

5.2 Watercourses and aquatic values

5.2.1 Stream classifications

Watercourses are shown in Figure 2. These have been mapped as accurately as possible, however the extent of upper tributaries is sometimes approximate. The stream definitions given in the Auckland Unitary Plan (Appendix 1) have been used for stream classification as they give specific criteria for the determinations of intermittent streams. Overland flow paths that only contain water during and shortly after rain and which do not meet the criteria for an intermittent stream are considered ephemeral and are not considered in this ecological report. Permanent streams generally provide better aquatic habitat than intermittent streams, however natural pools and aquatic vegetation in intermittent streams can still provide habitat and refugia for aquatic fauna even at times when the stream is not continuously flowing.

Watercourse 1 is permanent over the entire reach that crosses the site (Figure 3: Waypoints 135 & 157) and this stream continues north under SH1. Its western tributary (Figure 3 Waypoint 158) is also permanent, however the eastern tributary was not running when observed just below the northern boundary of the site.

Watercourse 2 is a permanent stream along the entire reach that crosses the site. The stream channel is generally no more than 1 – 1.5m wide and on average dome 30 -40cm deep even at the downstream end. Many tributaries feed into this stream and it has formed a broad floodplain (Figure 3: Waypoints 149 – 154) at its lower end near the southern side of the site.

Western tributaries of Watercourse 2: Most of the western tributaries (figure 2) were still running even in late summer, although the channels were often only a few centimetres wide and deep in the upper tributaries. These tributary streams extend north west for a considerable distance to the foot of the ridge on the western boundary of the site (Figure 3 Waypoints 137 – 147). The land below the steep western ridge is riven with numerous small tributaries, springs and small perched wetlands. Land slumping is common and the whole area appears to be wet for most of the year.

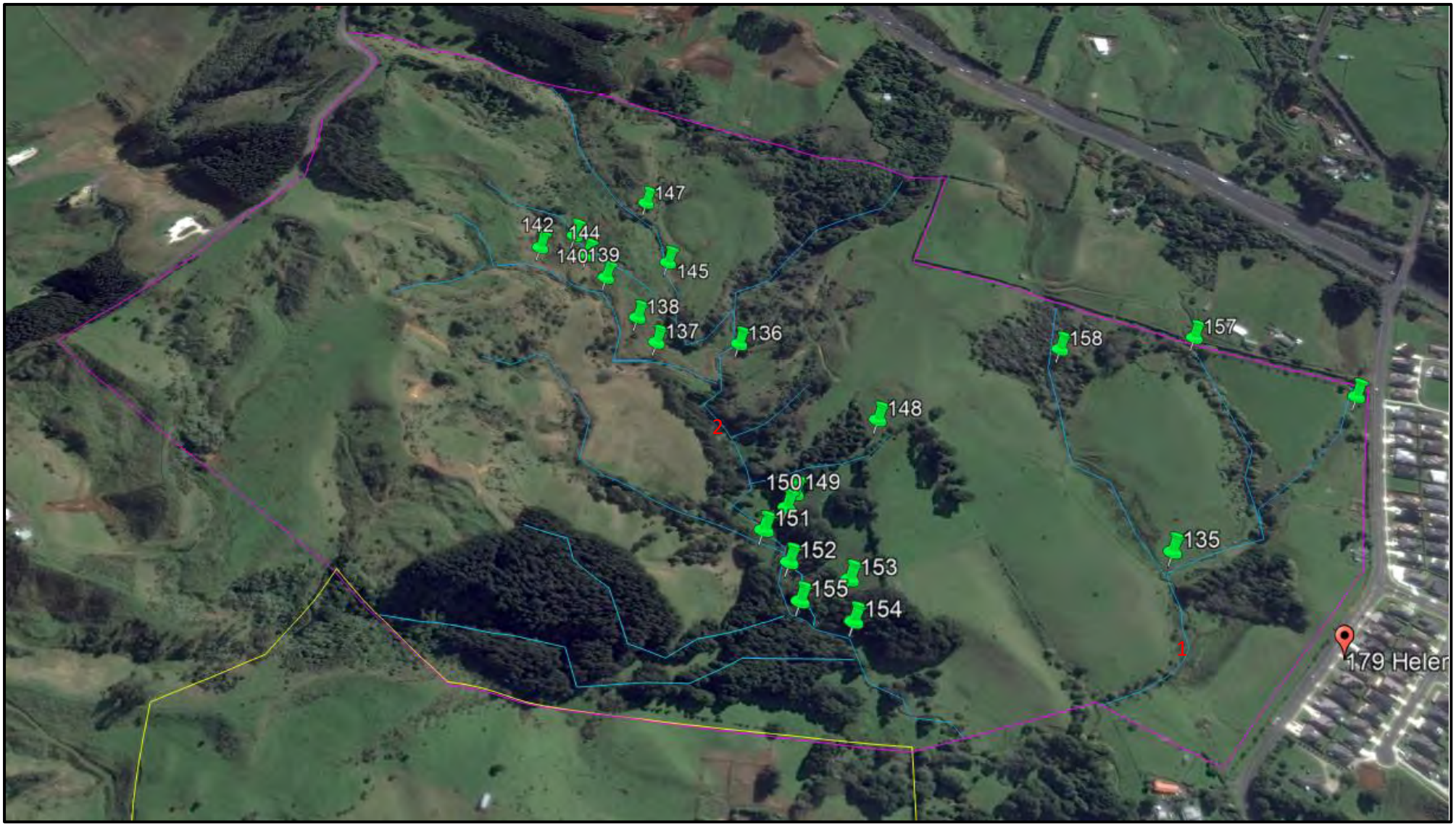


Figure 3 GPS observation points for stream aquatic habitat values.

5.2.2 Stream aquatic values

Quantitative data on stream aquatic values was not collected for the purposes of this report, however the ecological report prepared for the Pokeno catchment (Coffey & Associates 2008) gives an indication of the types of habitats and stream ecological values that occur downstream of the site. Native fish species that migrate between the sea and the upper catchments of freshwater streams will be impacted by these downstream conditions and may be prevented from accessing good quality habitat in upper catchments by poor water quality downstream and barriers to fish passage.

Water courses and tributary streams at the site were visually assessed at numerous points on the basis of the following criteria:

- Riparian vegetation: shading of the stream by riparian vegetation reduces water temperature and diurnal fluctuations in temperature which maintains oxygen saturation.
- Bank stability: Poor bank stability and erodibility reduces habitat quality by increasing sediment inputs.
- Channel alteration: results in homogenisation and straightening of the stream channel with associated loss of important aquatic habitats such as pools and riffles.
- Macrophytes: These are the plants that are adapted to living in aquatic habitats in and along stream channels. Exotic aquatic macrophytes may choke stream channels while providing limited aquatic habitat values. Excessive nutrient inputs to watercourses can result in overgrowth of exotic macrophytes. Native macrophytes can provide important aquatic habitat values for native fauna.
- Silt loading and water clarity: Silt loading and water clarity affects aquatic fauna and flora through loss of visibility for predatory species and clogging of gills and breathing mechanisms for all fauna. Deposition of silt on leaves can reduce sunlight reaching aquatic plants.
- Periphyton: is the slime and algae found on the beds of streams and rivers. It is essential for the function of healthy ecosystems, but excessive nutrient input to watercourses can cause it to proliferate, degrading aquatic habitat values.

5.2.3 Assessment of Stream Aquatic Values for Watercourses 1 & 2 and tributaries

Watercourse 1: Watercourse 1 is an upper tributary of the Pokeno Stream that continues under SH1 and up into the Bombay Hills. Two upper tributaries lie on the site above Area A, however only the western one was found to be permanent. Both the main stream and the western tributary flow through bouldery channels with a boulder/ gravel/clay substrate providing generally moderate water quality values except after heavy rain (Plate 12). The eastern intermittent stream probably flows most of the year as the stream bed was still damp in late summer.

Riparian vegetation: Shading vegetation along Watercourse 1 is patchy with minimal shading along much of the stream and its tributaries. Good shading occurs along the main stream above Area A and there is moderate shading of the western tributary in Area B. The open wetlands provide minimal shading but they do serve to filter out sediment and nutrients from the water except when they are being grazed.

Bank stability: Pugging by cattle has resulted in bank erosion in some places, however the bouldery substrate helps to maintain and support the stream banks which are not steeply incised. Bank stability is considered to be moderate.

Channel alteration: Generally there was little evidence of stream channel alteration except for a small culvert under the main farm track and another culvert under the track near the northern boundary. The aerial photographs indicate that some digging out of channels may have occurred within the two wetlands however.

Macrophytes: Exotic macrophytes were not dominant along the watercourse or its tributaries except within area B at the top of the eastern tributary and where the streams flowed through the wetlands. Here water pepper and water celery were present with buttercup and lotus (*Lotus pedunculatus*) in some places. Native macrophytes were not observed.

Silt loading and water clarity: Water clarity was observed to be moderate to good. Cattle were grazing the upper wetland on the eastern tributary at the time of the ecological survey and silt-stained water was observed to be running into the main stream from here (Plate13).

Periphyton: Minimal periphyton was observed despite the assessment being undertaken in late summer. There was no evidence of excessive algae growing on the rocks and cobbles in the stream channels.

Watercourse 2: This is the key watercourse draining the site. Watercourse 2 has its origin to the north of SH1 and flows across the middle of the site from north to south. On the western side of the main stream there are at least 6 side tributaries which run up towards the ridge along the western boundary. On the eastern side are 3 side tributaries.

Riparian vegetation: There is good riparian shading along much of the main stream and the eastern tributaries although there are several open grassy areas above and below the farm track crossing. The western tributaries tend to be poorly shaded with minimal woody riparian vegetation, while the eastern tributaries are mostly well shaded with tall kanuka and totara.

Bank stability: Bank stability along the main stream is relatively good as the stream banks are not steeply incised along most of the reach. The stream bed falls only gently to the south over the lower two thirds of the reach and meanders about as it passes through an open grassy area and into the kahikatea stand on the southern boundary. Near the lower end within the fenced kahikatea remnant there is evidence of scouring of the banks during flood events in a few places. This is near the confluence of the watercourse with a main tributary. Cattle pugging will be destabilising the banks to some degree but bank slumping and erosion is minimal. The channel is generally silty gravel above the farm track and a cobble bottom below this with boulders common.

The tributaries on the western side are steeply incised in some places and show evidence of slumping and erosion in a number of places (Plate 14). Bank stability is generally poor for these secondary watercourses and several appear to have changed course recently. The upper tributaries generally have silty banks with fine gravel and silt channels interspersed with boulders. The eastern tributaries are generally well vegetated and bank stability is relatively good.

Channel alteration: There is little evidence of channel alteration apart from the two culverts under the main farm track crossing the stream and several minor culverts on the western tributaries.

Macrophytes: Exotic macrophytes such as water pepper, water celery and weak rush are common in open areas along both the mainstream and its tributaries. These are generally not choking the watercourses however and this is attributed to grazing by livestock. In areas where riparian shading is good there are few exotic macrophytes. Native macrophytes were not observed.

Silt loading and water clarity: Water clarity was generally moderate to good within both the main stream and the tributaries. In the lower main stream a layer of silt was observed on the cobble bottom of the stream as it flowed through a large open flood plain below the main farm crossing (Plate 15). This indicates that during peak flows the water clarity would be much poorer due to mobilisation of this silt. Similarly the western tributaries would contribute a significant amount of silt during rainfall events.

Periphyton: Minor periphyton was observed on the rocks and cobbles of the main stream and in rocky parts of the tributaries. This is consistent with good water quality and does not indicate excessive nutrient enrichment.

5.2.4 Summary of Stream Aquatic Values

Stream aquatic values were generally high in areas where livestock are excluded (Areas C & G) and moderate in most other parts of the site. The western tributaries of Watercourse 2 have generally lower aquatic habitat values although there are a few pockets of moderate value amongst remnant stands of native trees. Pugging of the stream banks and channel by livestock, and lack of shading by riparian vegetation are the key contributors to loss of water quality for this site. Pugging mobilises fine sediment and lack of shading allows greater diurnal fluctuation of water temperature which results in fluctuation of dissolved oxygen values. Strongly fluctuating dissolved oxygen levels affect aquatic fauna by depriving them of adequate oxygen at certain times of the day. Riparian shading is good along Watercourse 2 and in most parts of the site channel alteration is minimal. Low levels of periphyton and exotic macrophytes indicate that nutrient inputs to the watercourses are not excessive. The cobble and boulder substrate found in many parts of both streams also helps to maintain good habitat values by reducing sediment mobilisation and providing a variety of aquatic habitats for native aquatic fauna. A casual observation of a damselfly larva in a pool along the lower reaches of watercourse 2 indicates that native macroinvertebrates are present.

5.2.5 Fish passage

Fish species potentially present

Many species of native fish move up and down freshwater streams in the natural course of their lives and two major groups, native eels (Anguilla spp.) and galaxiids or inanga (*Galaxias* spp) are diadromous completing part of their lifecycle at sea and part in inland freshwater streams and rivers. Natural barriers such as waterfalls sometimes prevent native fish from migrating up streams but a far greater problem is manmade structures such as culverts and

artificial ponds.

Native fish species recorded by Coffey & Associates (2008) for the Pokeno Stream at the Munro Road Bridge included long finned eel adults and juveniles, common bully and freshwater crayfish. Long finned eel and koura have a National Threat Status of "At Risk – declining". In addition to these species other native fish species that may be present in the headwaters of the Pokeno Stream in Watercourse 1 and Watercourse 2 and their tributaries include shortfin eel (Anguilla *australis*), and five species of galaxiids (NIWA). Four whitebait species: giant kokopu (*Galaxias argenteus*), banded kokopu (*G. fasciatus*), inanga (*G. maculatus*) and koaro (*G. brevipinnis*) could potentially be present where there is good stream shading. Black mudfish (*Neochanna diversus*) live in swamps, drains and forest pools that tend to dry up in summer and may be present in suitable habitat at the site, particularly in the lower floodplain of Watercourse 2. This species is known to be quite common in the Waikato Region, particularly the Whangamarino Swamp. All of the whitebait species except banded kokopu have National Threat Status of "At Risk – declining" as does the black mudfish.

Barriers to fish passage

Poorly designed or installed structures can pose a barrier to fish migration if:

- The water flow is too high and/or there are no resting places provided within the structure
- There is no low velocity zone or wetted margin provided at the water edge
- Water turbulence is too great (usually because the culvert is too narrow or too steep)
- The crossing is too dark (because the culvert is too long or too small)
- Water depth within the culvert is too shallow
- The river bed within the culvert is too smooth for bottom swimmers (often because the culvert has a concrete or steel bottom and normal bed material has not been able to develop)
- The gradient is too steep
- The bed level of the crossing has been raised (e.g. culvert floor is perched above the streambed)
- Debris has built up and formed a weir
- Scouring has occurred and caused the culvert to become perched (Speirs and Ryan, 2006).

Culverts on the streams: There are relatively few culverts at the site. Figure 3 shows the GPS waypoints referred to in the following text. Culverts on the main watercourses are found

under the main farm track (Waypoints 135 and 136) and under the northern driveway into the house site at 203 Helenslee Road (Waypoint 157). In the case of Watercourse 1 the culvert at Waypoint 135 is well buried in the stream bed and is relatively short (<5m) with a gentle slope. A similar small culvert occurs just upstream of this one. Neither of these would pose a significant barrier to most fish species. A concrete culvert c. 8m long under the northern driveway at Waypoint 157 is perched approximately 0.5m above the rocky stream bed at its downstream end. At the upstream end a small wooden weir c. 0.3m high lies across the upper end of the culvert. This culvert would restrict fish passage for most fish species except eels. Some habitat of reasonable quality appears to exist upstream of this culvert next to SH1.

At Waypoint 136 two large concrete culverts carry Watercourse 2 under the farm track. These are both approximately 1m in diameter and <6m in length. At the time of assessment only the eastern culvert was flowing. The lower end of both culverts is perched 0.3 – 0.50m above the stream bed. These culverts would potentially limit fish passage for most galaxiid species but would be unlikely to affect eel species. As good quality aquatic habitat occurs above the culverts in Area C this barrier is potentially restricting native fish from accessing that habitat.

There are at least four smaller concrete culverts on the western tributaries of Watercourse 2 carrying streams under farm tracks, however two of these are either not perched or the stream is running over the top of them. Above these culverts there is limited riparian vegetation and good quality aquatic habitat is probably limited as the tributaries become narrow and shallow in their upper reaches. These culverts should be further investigated as part of the more detailed aquatic assessment that will be required if the site is to be further developed.

Natural barriers to fish passage: A waterfall on Watercourse 2 some 75m upstream of the farm crossing at Waypoint 136 may pose a barrier to some fish species. At Waypoint 137 the clay stream bed of the tributary has slumped creating a vertical drop of c. 0.7m which would pose a significant barrier to most fish species.

5.3 Fauna

5.3.1 Mammals

Grazing ungulates predominantly cattle, were the most visible animals at the site. Hares

(*Lepus europaeus*) were occasionally observed at the site and rabbits (Oryctolagus cuniculus) will certainly be present in greater or lesser numbers. Possums (*Trichosurus vulpecula*) and other pest animals such as rats (*Rattus rattus* & *R. norvegicus*) and mustelids (*Mustela* spp) that are predators on the nests of native birds will also be present amongst native and exotic scrub and forest.

Long tailed bats (*Chalinolobus tuberculatus*) are very small native mammals (8 -14g) that roost in large, old canopy trees (e.g. rimu & totara), either beneath the bark or in cavities. Bats can also find suitable roosts in mature exotic trees such as pine, gum and macrocarpa. They hawk for insects at night along forest edges and above water although they are seldom noticed. Bats have been found in the wider Franklin area in small bush remnants and they could potentially be utilising the site as part of a larger home range, as they are capable of ranging up to 50km in a night. Large native and exotic trees at the site, particularly in Area G amongst the kahikatea forest and to a lesser extent Area C could provide bat roosts. Long tailed bats have a National Threat status of "Nationally Critical" (O'Donnell *et al* 2017).

5.3.2 Birds

Birds noted at the site included mallard ducks (*Anas platyrhynchos*), kingfisher (*Todiramphus sanctus*) and pukeko (*Porphyrio melanotus*) as well as the usual range of exotic passerines such as blackbirds, sparrows and starlings that are ubiquitous across human modified landscapes. Wild turkey (*Meleagris gallopavo*), peacock (*Pavo cristatus*) and geese (*Anser anser*) were also seen. Native tui (*Prosthemadera novaeseelandiae*), fantail (*Rhipidura fuliginosa*) and native pigeons (*Hemiphaga novaeseelandiae*), were observed amongst patches of bush. Australasian harrier hawk (*Circus approximans*), morepork (Ninox novaeseelandiae), silvereye (*Zosterops lateralis*) and grey warbler (*Gerygone igata*) could be expected to be present or be visitors to the site. None of these bird species are nationally or regionally threatened.

5.3.3 Lizards

Important lizard habitat types include open rough grassland, shrubland and mature native trees, all of which occur at the site.

Open rough grassland and artificial structures can include rough grass areas, including roadside and bush side verges, particularly kikuyu grass and including pampas bushes. These vegetation types provide thick cover and high light levels that are suited to ground-based skinks. Discarded debris and buildings within and around these environments often provides

good cover for native skinks to take refuge under. This type of habitat is limited as the site is intensively grazed, particularly over the winter months and disturbance would be frequent.
Shrubland includes low-medium height vegetation, typically including regenerating scrub such as manuka (*Leptospermum scoparium*), kanuka (*Kunzea* spp.), mingimingi (*Leucopogon fasciculatus*) ferns and tree ferns. These environments have medium light levels with some ground cover as well as arboreal (tree-climbing) habitats. **Areas B, D & F** contains this type of habitat.
Mature trees provide good habitat for tree dwelling geckos. **Areas A, C, E, & G** contain this type of habitat.

Lizard species that could potentially be present in areas of rough grassland and artificial structures or in shrubland include the copper skink (*Oligosoma aeneum*) and ornate skink (*Oligosoma ornatum*). Green gecko (*Naultinus elegans*) and forest gecko (*Mokopririrakau granulatus*) are typically found in shrubland or mature native trees. Although the copper skink is not threatened, the other three species have a National Threat status of "At Risk-declining".
The likelihood of lizards being present is relatively low due to past habitat modification and ongoing disturbance by grazing livestock. If they are present their densities are likely to be low as they are preyed upon by introduced predators such as rats, cats and mustelids.

6 ASSESSMENT OF EFFECTS OF POTENTIAL CHANGES IN LAND USE ON ECOLOGICAL VALUES

6.1 Draft Development Plan

Proposed development of the site is at an early stage of planning (Figure 4). Broadly, the land to the east of Watercourse 2 is of gentler contour and would be developed for residential use. To the west of Watercourse 2 the topography of the land is steep and broken with numerous small watercourses. This land is proposed for future countryside living, while recognising that there are some significant constraints to development here. An extensive area surrounding Watercourse 2, a riparian setback along Watercourse 1 and the steep scarp supporting cliff forest on the western side of the site are all proposed for retention as reserves. The reserve area would encompass virtually all of the areas identified in this report as having terrestrial or aquatic ecological values.

Figure 4 Draft Concept Plan for development of the site

6.1 Potential ecological effects of changes to land use

The key ecological values of the site lie mostly with the two main watercourses and their extensive network of side tributaries. The areas of mature kahikatea floodplain forest and the regenerating broadleaved podocarp broadleaved forest along Watercourse 2 provide good quality terrestrial habitat for native fauna and contribute to landscape connectivity and aquatic habitat values. Current and historic landuse has resulted in loss of riparian vegetation; however the rocky channels of the main watercourses remain mostly unmodified and freshwater aquatic habitat values are moderate to good. Native vegetation associated with the main stream of Watercourse 2 provides good riparian shading and terrestrial habitat, however across the rest of the site native vegetation is sparse. A change in land use from the existing agricultural use to more intensive residential and/or use could be expected to result in the following general environmental impacts:

1. An increase in impervious surfaces associated with buildings and roading infrastructure could result in alterations to the quantity, quality and rate of flow of stormwater to watercourses within the upper Pokeno Stream catchment.
2. Disturbance caused by earthworks at the site has the potential to affect the water quality of downstream receiving environments such as the lower Pokeno stream and the Waikato River.
3. The removal of grazing livestock is likely to have generally beneficial effects on the terrestrial and aquatic habitat values of the site through a reduction in pugging of stream banks and disturbance of bush areas.
4. Road crossings and development of the eastern side of the site for urban residential dwellings will require crossing the main watercourses and their tributary streams. This may require culverting of intermittent and permanent streams along all, or sections of their length resulting in changes to the hydrology of the site, loss of aquatic habitat and barriers to fish passage.
5. Major modifications to the natural landforms including road construction, extensive retaining walls and stormwater retention devices, particularly close to watercourses can result in loss of connectivity between streams and their catchments. Streams may then become little more than drainage channels despite mitigation measures such as riparian planting.
6 Small areas of native forest on the edges of Areas A, C, D,E, F and G, individual mature

native trees and areas of mixed native and exotic scrub (Area B) may be removed resulting in edge effects on the remaining bush and loss of habitat for native birds, bats and lizards.
7. There may be a permanent or temporary overall loss of woody vegetation from the site and increased fragmentation of native vegetation resulting in a loss of ecological connectivity.
8. Areas of open wetland particularly along Watercourse 1 that have the potential to be restored to greater functionality and naturalness following livestock removal could be lost or modified due to development.

6.2 Assessment of the overall scale of ecological effects

Based on the current concept plans the potential ecological effects will be greatest on the eastern side of the site where more intensive development is proposed. Culverting of a section (>100m) of the eastern intermittent tributary to Watercourse 1 appears likely and several crossings of the watercourse and its upper permanent tributary are proposed. Road crossings on both Watercourse 1 and Watercourse 2 will fragment the riparian vegetation along these watercourses and may result in several major culverts on Watercourse 2.
On the western side of the site the steep topography and land stability issues are likely to result in major landform modification to create stable roads and house sites for the proposed countryside living zone.
General principles for mitigation of the effects of the project on environmental values include the following:

- Alterations in the quantity, quality and rate of flow of stormwater runoff due to the construction of buildings and roading infrastructure are expected to have the greatest effects on the water quality and aquatic habitat values of the site and the overall catchment. Good modelling of stormwater flows and design of the stormwater management system both during construction phases and the operational phase of the development can avoid or mitigate most negative ecological effects. The contribution of water from the western tributaries to Watercourse 2 needs to be recognised and maintained. Ultimately there is potential to improve water quality and aquatic habitat values through good stormwater management and restoration of wetlands and riparian vegetation.
- Similarly the effects of earthworks can be managed to a high standard to avoid

negative effects on water quality.

- Landform modification can result in irreversible negative effects on the natural character and the ecological values of the site. Development design that is sympathetic and appropriate to the site can help to maintain and enhance the natural values of the site.
- The scale of effects associated with the modification and culverting of streams, loss of vegetation and wetlands are potentially significant. Recognition of these issues at the outset and incorporation of measures to minimise negative effects on these natural features as part of the project design can greatly reduce the eventual scale of effects.
- Habitat values for native fauna can be maintained and enhanced through the retention of native vegetation, additional riparian planting of native species and control of mammalian predators such as possums, stoats and rats.

7 RECOMMENDATIONS AND CONCLUSIONS

7.1 Ecological constraints to development of the site

Negative environmental effects due to development of the catchment can be managed through the early recognition of environmental issues and impacts and the formulation of an environmentally sensitive design. Ecological constraints to the proposed development identified at the preliminary stage include:

1. The need to maintain the natural hydrology of the site as far as possible.
2. The retention of native riparian vegetation along Watercourse 2 and its tributaries.
3. The retention and protection of mature kahikatea floodplain forest in Area G
4. The retention and protection of regenerating podocarp broadleaved forest in Area C
5. The retention and protection of cliff forest on tephra cliffs in Area H.
6. The retention and enhancement of wetlands along Watercourse 1.
7. Protection and enhancement of aquatic habitat values and water quality within the watercourses at the site, including facilitation of native fish passage.

Detailed fauna and aquatic habitat assessments should be undertaken prior to the detailed design stage in order to establish baseline stream ecological values (SEV) for the main watercourses and to detect the presence of native fish, lizards, and bats. This detailed

information is required to inform the detailed design of the development. Any development proposal should demonstrate that the ecological values of the catchment will be enhanced through appropriate design and landuse. There should be a commitment to working with the natural landforms and ecological features of the site. The current draft concept plan envisages the steeper areas on the western side of the site being developed as lower intensity countryside living sites and the retention of key areas of native vegetation and wetlands as described in (2) – (6) above. The maintenance of the natural hydrology of the site and protection of aquatic habitat values will need to be addressed during the engineering and stormwater design process with expert input from a suitably qualified and experienced ecologist.

7.2 General ecological recommendations for site development

An Ecological Management Plan (EMP) should be developed for the site by a qualified ecologist in consultation with engineering and landscape architects early in the overall development process. It is important that interdisciplinary consultation takes place so that optimal environmental outcomes are achieved. The EMP would include but is not limited to the following general recommendations:

1. Ensure stormwater design and management recognises and provides for the maintenance and enhancement of stream ecological values for native fauna.
2. Employ design that is sympathetic to the natural landforms and avoid major landform modifications such as large retaining walls as far as possible.
3. Maintain the natural hydrology of the site as far as possible and minimise culverting of streams or channel alteration of natural watercourses. Bridging of the main watercourses is preferable to culverting from an ecological viewpoint, particularly in the case of Watercourse 2. Any culverts should be as short as possible and designed to facilitate fish passage.
4. The creation of ornamental lakes and ponds as part of the landscaping of the site is not recommended. Any stormwater retention structures should be off-line to the streams.
5. Ensure the riparian areas along permanent streams are fenced off from livestock and kept free of structures as far as possible. Implement a planting plan for these areas to re-establish native riparian vegetation. As a minimum a 20m setback from all

permanent streams is recommended, however along Watercourse 2 the setback will need to be considerably wider to encompass the existing riparian vegetation along the stream and the broad floodplain at the southern end.

6. Retain the side tributaries as natural streams as far as possible and provide a minimum 10m riparian setback from these with native riparian planting.
7. Eradicate invasive pest plants across the site including barberry, hawthorn and grey willows, and control animal pests such as possums, rats and stoats to enhance habitat values for native fauna.
8. Retain, protect and enhance the vegetation within **Areas A, C,D, F, G & H** through fencing, edge planting, legal protection and ongoing weed and pest control. Similarly, as many possible of the small stands of mature native trees (such as **Area E**) and individual native trees (mainly totara) found across the site should be retained as they provide a measure of ecological connectivity in the landscape.
9. Retain and restore wetland areas along Watercourse 1.
10. Utilise site appropriate native plants and trees for public amenity planting giving consideration to re-establishing ecological connections and the provision of food and nest sites for native fauna.
11. Plant any artificial stormwater ponds/structures with appropriate native wetland plants to provide additional wetland habitat for native fauna.
12. Provide for specialist management of any native fish, lizards or bats that are detected at the site.
13. Manage any vegetation removal to minimise effects on native birds.

7.3 Conclusions

Ecological mitigation should focus on protection and enhancement of existing native vegetation and wetlands as detailed in this report and the maintenance and enhancement of aquatic habitat values.

The immediate fencing of the kahikatea stand in Area G that is currently grazed would be an important step towards preserving these trees and halting their further decline and death.

The two larger wetlands along Watercourse 1 would respond well to physical protection and restoration planting and the early implementation of riparian protection and planting would enhance the visual and landscape values of the development.

Maintaining permanent watercourses as natural, open channels and providing a good width

of native riparian planting would help to maintain and enhance the aquatic habitat values and ecological connectivity of the site.

A site-wide Ecological Restoration Planting Plan that reflects the existing native plant communities should be developed by a qualified plant ecologist. Consultation between the ecologist and the landscape architect should occur to ensure the Landscape Planting Plans and Ecological Planting Plans are compatible and to ensure appropriate native plants are selected for landscaping. Connectivity with natural areas in the surrounding landscape should be a key consideration.

Consideration also needs to be given to ensuring potentially invasive exotic amenity plants that may compromise the ecological values of the site are not introduced by future property owners. This could be achieved via a consent notice on the property titles with a list of prohibited amenity plants that are known to be invasive. Such a list can be derived from the Waikato Regional Pest Management Strategy.

The expected outcome of the proposed ecological management would be the maintenance and enhancement of indigenous aquatic and terrestrial habitats and an overall increase in ecological connectivity of the wider landscape. The retained and restored native habitats would also provide significant benefits to the future inhabitants of the development by providing places for passive recreation and enjoyment of the natural environment.

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9 SITE PHOTOGRAPHS

Plate 1 ***View of Area A totara stand with upper wetland along the western tributary of Watercourse 1 in the foreground.***

Plate 2 ***Band of riparian vegetation along Watercourse 1 upstream of Area A dominated by privet.***

Plate 3 ***Area B with short canopy of barberry and hawthorn on a boulder substrate.***

Plate 4 ***Area C, regenerating podocarp broadleaved forest in steep upper gully of Watercourse 2***

Plate 5 Area D upper stream gully of Watercourse 2 below Area C with scattered totara and kanuka. Note greyish barberry bushes scattered throughout.

Plate 6 Area E, a small group of remnant native trees along an upper western tributary. Pines in the background are one of two small stands on the property. Note the slumped banks along the watercourse with patches of rush wetlands.

Plate 7 Area F Vegetation along Watercourse 2 below the farm crossing. A broad, open floodplain is surrounded by totara, kanuka and occasional kahikatea.

Plate 8. View of Area G from the north showing the kahikatea forest with conical tops in the middle distance. Area F of totara and kanuka is in the foreground.

Plate 9 Kahikatea trees on the floodplain in Area G upstream of the fenced kahikatea forest. The trees appear in rather poor health and several are dead.

Plate 10 Area H, cliff forest on tephra cliffs in the north west corner of the site with kiekie, kawakawa, rangiora, turepo and old mahoe trees.

Plate 11 Lower wetland on Watercourse 1 below Area A. Note grey willow in the upper wetland below the totara stand.

Plate 12 Upper extent of Watercourse 1 at the site showing the bouldery character of the stream channel.

Plate 13 Confluence of Watercourse 1 (clear water) with its western tributary (brown silty water) showing silty water running off the upper wetland along the western tributary while being grazed by cattle.

Plate 14 Watercourse 2as it flows through its floodplain. Note the cobble bottom with a thick layer of silt.

APPENDIX 1 PLANT SPECIES RECORDED FOR 179 HELENSLEE ROAD

NB Species lists are not exhaustive but provide a list of the plants recorded during the initial ecological survey.

Native plants

Botanical name	Common Name	Area/s recorded
Conifers		
Dacrycarpus dacrydioides	Kahikatea	A, B, C, E, F, H
Dacrydium cupressinum	Rimu	C
Podocarpus totara	totara	A, D,E, F, G
Prumnopitys ferrugineus	Miro	C
Dicot trees & shrubs		
Alectryon excelsus	Titoki	B (planted)
Beilschmiedia tarairi	Taraire	C, G
Beilschmiedia tawa	Tawa	C
Brachyglottis repanda	Rangiora	H
Coprosma areolata	Thin leaved coprosma	G
Coprosma robusta	karamu	C
Dysoxylem spectabile	Kohekohe	H
Elaeocarpus dentatus	Hinau	C
Geniostoma ligustrifolium	Hangehange	E
Hebe stricta	koromiko	H
Hedycarya arborea	Pigeonwood	G
Knightia excelsa	rewarewa	C, G, H
Kunzea robusta	kanuka	A, C, D, F, H
Laurelia novaezelandiae	Pukatea	C
Litsea calicaris	Mangeao	H
Melicytus ramiflorus	Mahoe	C, , F, G, H
Metrosideros excelsa	Pohutukawa	B (planted)
Myrsine australis	mapou	C, G, H
Piper excelsum	kawakawa	C, E, G, H
Pseudopanax crassifolius	Lancewood	C,F,G
Rhabdothamnus solandri	Turepo/NZ gloxinia	H
Vitex lucens	puriri	C
Monocots		
Cordyline banksii	Forest cabbage tree/ ti ngahere	C
Freycinetia banksii	kiekie	C, E,H
Rhopalostylis sapida	nikau	C, E, G
Ripogonum scandens	Supplejack	C
Ferns		
Adiantum cunninghamii	Common maidenhair fern	H

Asplenium bulbiferum	Hen and chickens fern	H
Asplenium oblongifolium	Shining spleenwort	H
Blechnum filiforme	Thread fern	G, H
Blechnum parrisiae	Rasp fern	E, H
Cyathea dealbata	Silver fern	F, G
Cyathea medullaris	mamaku	C, F, G
Deparia petersenii	Deparia	B, D, E, F, G
Dicksonia squarrosa	Wheki ponga	F
Diplazium australe	diplazium	F
Lastreopsis glabella	Smooth shield fern	E
Microsorum pustulatum	Hounds tongue fern	H
Notogrammitis billardierei	Common strap fern	H
Pneumatopteris pennigera	Gully fern	E
Pyrrosia eleagnifolia	Leather fern	H
Climbers and epiphytes		
Astelia hastata	Tank lily	C, G
Passiflora tetrandra	Kohia vine/ native passion vine	G
Metrosideros perforata	Small white rata	C, H
Metrosideros fulgens	Climbing ret rata	H
Metrosideros carminea	Carmine rata	H
Rubus cissoides	Bush lawyer	H
Sedges & grasses		
Carex geminata agg.		E
Carex virgata		E
Carex uncinata		G
Oplismenus imbecilis	Naïve basket grass	H

Exotic Plants

Botanical name	Common Name
Acer sp	Maple
Aesculus hippocastanum	Horse chestnut
Apium nodiflorum	Water celery
Banksia integrifolia	Coastal banksia
Berberis glaucocarpa#	Barberry
Crataegus monogyna#	Hawthorn
Digitalis purpurea#	Foxglove
Fagus sylvatica var *purpurea*	Copper beech
Gleditsia triacanthos	Honey locust
Ilex aquifolium	Holly
Juncus effusus	Weak rush
Leycesteria formosa#	Himalayan honeysuckle
*Ligustrum lucidum**	Tree privet
*Ligustrum sinense**	Chinese privet
Liquidambar styraciflua	Liquidambar
Ludwigia palustris	Water purslane
Paulownia tomentosa	Paulownia
Persicaria hydropiper	Water pepper
Pinus radiata	Monterey pine
Populus deltoides	Common poplar
Quercus palustris	Pin oak
Quercus robur	European oak
Rhododendron arboreum	Rhododendron
Rubus fruticosus#	Blackberry
*Salix cinerea**	Grey willow
Selaginella kraussiana#	Selaginella
*Solanum mauritianum**	Woolly nightshade
Tradescantia fluminensis#	Tradescantia
*Ulex europaeus**	Gorse

* Pest plants listed in the Waikato Regional Pest Management Plan (WRPMP)
#: other weedy species not listed in the WRPMP

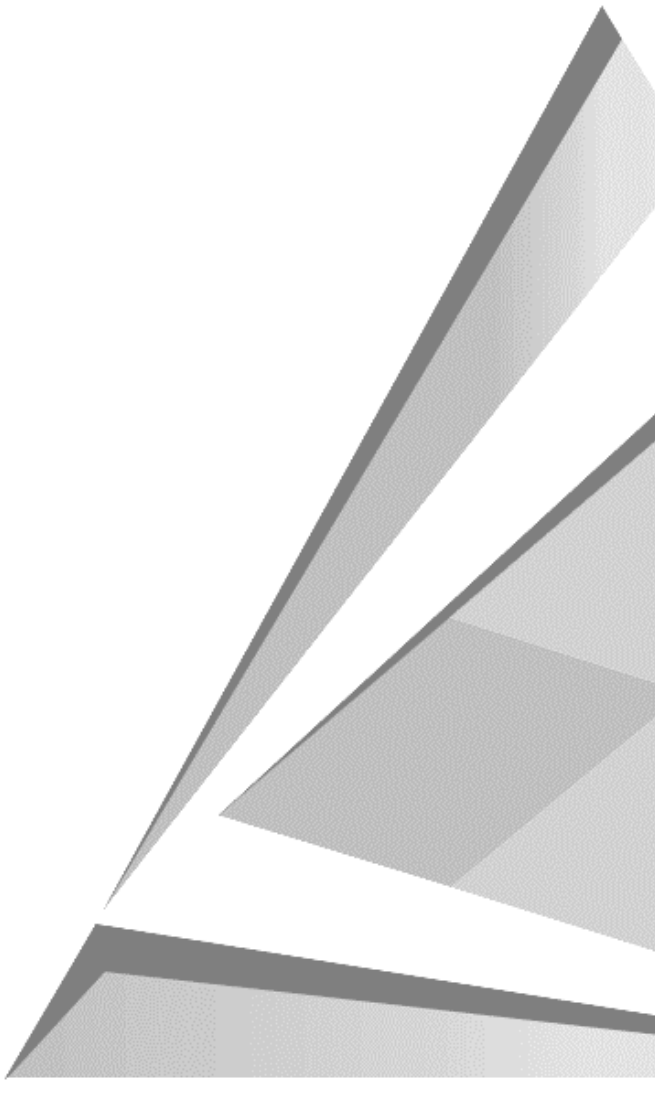
APPENDIX 2 STREAM DEFINITIONS AS SET OUT IN THE AUCKLAND UNITARY PLAN CHAPTER J.

Permanent river or stream: The continually flowing reaches of any river or stream

Intermittent stream: Stream reaches that cease to flow for periods of the year because the bed is periodically above the water table. This category is defined by those stream reaches that do not meet the definition of permanent river or stream and meet at least three of the following criteria:

a) *it has natural pools;*
b) *it has a well-defined channel, such that the bed and banks can be distinguished;*
c) *it contains surface water more than 48 hours after a rain event which results in stream flow;*
d) *rooted terrestrial vegetation is not established across the entire cross-sectional width of the channel;*
e) *organic debris resulting from flood can be seen on the floodplain; or*
f) *there is evidence of substrate sorting process, including scour and deposition*.

APPENDIX C
GEOTECHNICAL FEASIBILITY ASSESSMENT
GROUND CONSULTING LTD



CSL TRUST

HELENSLEE ROAD, POKENO

GEOTECHNICAL FEASIBILITY ASSESSMENT FOR A PROPOSED SUBDIVISION

REF: R4006-1A
DATE: 26 JUNE 2018

GCL
Ground Consulting Ltd

REPORT QUALITY CONTROL

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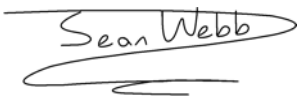
REV	DATE	REVISION STATUS	AUTHOR	REVIEWER
A	26 JUNE 2018	ISSUED TO CLIENT	SEAN WEBB	FRASER WALSH
APPROVAL				
AUTHOR SIGNATURE			REVIEWER SIGNATURE	
NAME		SEAN WEBB	NAME	FRASER WALSH CMEngNZ (PEngGeol)
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1 INTRODUCTION

1.1 PROJECT BACKGROUND

A geotechnical feasibility assessment has been undertaken by GCL for a proposed subdivision at Helenslee Road, Pokeno at the request of the client CSL Trust. The site location is presented in Drawing 001.

This geotechnical feasibility assessment has been prepared for the purpose of providing sufficient geotechnical information in order to develop and progress a proposed plan change to allow subdivision for residential purposes. A specific geotechnical assessment for the proposed development will be undertaken for subdivision consent.

1.2 PREVIOUS INVESTIGATIONS

We are unaware of any publicly available geotechnical investigations which have been undertaken within the proposed subdivision. GCL has previously conducted investigations through-out the local area and are therefore familiar with the local geology. Previous GCL reports containing pertinent information relevant to the current site have been reviewed for the purposes of this report.

1.3 CURRENT GEOTECHNICAL INVESTIGATIONS

The investigations undertaken as part of this feasibility assessment have consisted of:

- Desktop study of the site including:
    - Published Geology.
    - Historic Aerial Photographs.
    - Google Earth Imagery.
    - Waikato Regional Council GIS Viewer.
- Site mapping and reconnaissance by a Principal Engineering Geologist.

1.4 PROPOSED SITE DEVELOPMENT

Plan change development plans have been provided by Birch Surveyors Ltd. The plans in summary show the following with relevance to geotechnical aspects of this assessment:

- The majority of the subdivision consists of medium density residential housing which is accessed via. a series of new public roads off Helenslee Road to the east, Ridge Road to the west and proposed subdivisions to the south.
- Countryside living areas consisting of small rural lifestyle blocks are located within the western portion of the proposed subdivision and are accessed via. the aforementioned public roads.
- Significant subdivision watercourses, overland flowpaths and native bush areas are to remain and will be utilised as reserve areas.
- The subdivision will be progressively constructed in stages principally from east to west.

- Stormwater will be managed by the existing significant watercourses and overland flowpaths.
- Wastewater will be managed by a connection to the Pokeno reticulated wastewater system.

2 SITE CONDITIONS

2.1 SITE LOCATION

The subdivision is situated within Pokeno of the Waikato Region, located 10kms south east of Pukekohe town centre and 5km north of the Waikato River. The subdivision is accessible off Helenslee Road and Ridge Road.

The subdivision is currently surrounded by farmland and rural lifestyle development.

A site location map is presented on Drawing 001.

2.2 SITE TOPOGRAPHY

The subdivision is located on three predominant landforms as shown on Drawing 002. The landforms are described as follows:

2.2.1 Low Lying Slopes and Flats

Low lying slopes and flats are located within the south eastern portion of the subdivision. The flats are utilized for cropping and pastureland and are drained via. a series of ditch drains and overland flowpaths and streams.

2.2.2 Gently Rolling Slopes

The subdivision contains extensive areas of gently rolling slopes predominately within the eastern portion subdivision and decreasing progressively to the west. The gentle slopes are typically located over a series of ridge crests which extend down to the flow lying flats and intermediary flowpaths. The ridge crests are typically utilized as pastureland with some pockets of bush.

The slopes contain pockets of moderately steep topography but given their size are not mapped on Drawing 002.

2.2.3 Moderately Steep to Steep Slopes

The subdivision contains extensive areas of moderately steep to steep slopes predominately within the western portion subdivision and decreasing progressively to the east. The moderately steep to steep slopes are typically located over a series of sharp ridge crests and intermediary gullies which extend down to the flow lying flats. The slopes are typically utilized as pastureland with some pockets of bush.

The slopes contain pockets of gently sloping topography but given their size are not mapped on Drawing 002.

2.3 SITE SURFACE WATER FEATURES

The low lying flats contain a series of ditch drain and overland flowpaths which drain down to the south-eastern edge of the site. The ditch drains contained minor flows on inspection and may dry up in part over the summer months.

The series of gullies which extend down to the low lying flats contain watercourses of various sizes. The majority of catchments which feed the watercourses are small to moderate in size. It appears from the subdivision scheme plan provided, the majority of watercourses will remain.

2.4 SLOPE INSTABILITY FEATURES

The low lying slopes and gently rolling slopes contain no observed slope instability features.

The moderately steep to steep slopes contain primarily regolith type slope instability features associated with shallow soil creep and slumping ground. The steeper slopes also contain semi-circular shaped gully head formations in places which may represent the remnants of old highly eroded landslides. These features become more apparent within the western portion of the subdivision off Ridge Road. Further investigation of these features is warranted for subdivision consent given the potential impact on subdivision development. Otherwise, the moderately steep slopes do not contain any deep-seated and/or large-scale slope instability features.

2.5 AERIAL PHOTOGRAPHS

Aerial photographs available from the Auckland Council GIS Viewer and Google Earth dating from 2004 to 2015 were studied to observe the site over time and assess the geomorphological setting. The review of historic aerial photography indicates that there has been no significant modification of the subdivision over this time period.

3 GROUND CONDITIONS

3.1 PUBLISHED GEOLOGY

The Geological Map of New Zealand, Sheet 3, at a scale of 1:250,000 maps the low lying flats as being underlain by Holocene alluvial deposits. The lower foothills within the western portion of the subdivision are underlain by Mercer Sandstone consisting typically of massive sandstone. The remainder of the subdivision is mapped as the Kerikeri Volcanic Group of the South Auckland Volcanic Field. The South Auckland Volcanic Field consists of basalt lava, scoria, ash, lapilli and lithic tuff.

3.2 SUB-SURFACE CONDITIONS INFERRED FROM SITE MAPPING

Sub-surface investigations have not been undertaken as part of this feasibility assessment, however, from site mapping undertaken we note the following with respect to ground conditions:

- The low lying slopes and flats are likely underlain by alluvial deposits which typically consist of SILT and PEAT based soil. Alluvial soil can be weak, especially when combined with shallow groundwater levels as is likely the case across the majority of the flats.

- The gently rolling slopes are likely mantled with volcanic deposits associated with numerous volcanic centres located to the immediate west of the subdivision. The deposits likely consist of weathered volcanic ash with possible weathered volcanic tuff in the upper reaches.
- The lower (eastern) portion of the moderately steep to steep slopes are likely underlain by the Waitemata Group at depth. This locally consists of Mercer Sandstone.
- The upper (western) portion of the moderately steep to steep slopes are likely underlain by the volcanic deposits which covers the Waitemata Group at depth. This locally consists of significant volcanic tuff deposits which outcrop close to Ridge Road.

4 GROUNDWATER CONDITIONS

Sub-surface investigations have not been undertaken as part of this feasibility assessment, however, from site mapping undertaken we note the following with respect to groundwater conditions:

- The low lying slopes and flats likely contain shallow groundwater levels. The groundwater table appears to be partially controlled by a series of ditch drains which extend through the flats. The groundwater table may reach the ground surface within the flats for periods during the winter months.
- The gentle to moderately rolling slopes likely contain depressed groundwater levels given the more elevated nature of the topography. Shallow groundwater levels are expected along the base of the intermediary gullies.

5 SUBDIVISION DEVELOPMENT FEASBILITY

5.1 GENERAL

The subdivision has been divided into subdivision development zones as shown on Drawing 003. The subdivision development zones are based on the landform site mapping undertaken. The subdivision development zones provide general recommendations on allowable subdivision development and constraints which can be utilised to provide a subdivision scheme plan. The subdivision development zones are summarized as follows:

5.2 DEVELOPMENT ZONE A

5.2.1 General

Zone A is land is considered to be suitable for residential development and should provide safe and stable conditions. Zone A land is typically associated with:

- Gently sloping topography with slope angles of no steeper than 1(v) on 4(h).
- Topography which is not associated with high groundwater levels.
- Topography which is not associated with surface water flows and/or ponding.

The extent of Zone A land is shown on Drawings 003 and closely follows the "gently rolling slopes" landform.

5.2.2 Foundation Conditions

Zone A land is likely underlain by competent ground conditions which are expected to provide "good ground" according to NZS 3604:2011.

5.2.3 Site Earthworks Constraints

Zone A is not expected to provide significant constraints on subdivision development earthworks.

5.2.4 On-site Stormwater Disposal

Zone A is expected to provide suitable conditions for the disposal of stormwater generated from impervious surfaces. This can be accommodated by soakage structures and/or detention and slow release structures.

5.3 DEVELOPMENT ZONE B

5.3.1 General

Zone B land is not suitable for residential development under existing conditions and includes the moderately steep to steep slopes. Zone B land, however, can provide suitable subdivision development conditions with appropriate remedial measures. Zone B land is typically associated with:

- Moderately steep to steep topography with slope angles of steeper than 1(v) on 4(h).
- Topography which is associated with surface water flows and/or ponding.
- Topography which is associated with slope instability features.

The extent of Zone B land is shown on Drawings 003. We note that some portions of Zone B land may not reasonably be utilized for residential development given the likely prohibitive development costs associated with earthworks and ground stabilisation measures.

5.3.2 Remedial Measures

Zone B land can provide suitable subdivision development conditions with appropriate remedial measures. Such measures include:

- Structural in-filling or re-grading of steep slopes in order to provide acceptable overall slope grades, that being slope angles of < 1(v) on 4(h).
- Engineered retaining along the edge of the gullies. This enables development to at least the edge of the gully features.
- Structural in-filling and diversion of the site overland flowpaths.

5.4 DEVELOPMENT ZONE C

5.4.1 General

Zone C land may not be suitable for residential development under existing conditions and includes the low lying slopes and flats. The suitability of building within Zone C is dependant on the strength and saturation of the alluvial deposits which likely underlie this zone. Zone C

land, however, can provide suitable subdivision development conditions with appropriate remedial measures.

The extent of Zone C land is shown on Drawings 003.

5.4.2 Remedial Measures

Zone C land can provide suitable subdivision development conditions with appropriate remedial measures. Such measures include:

- Structural in-filling, draining or re-grading of low-lying areas to provide acceptable groundwater table clearances.
- Structural in-filling and diversion of the site overland flowpaths.
- Removal of alluvial deposits and replacement with engineered fill.
- Pre-loading of alluvial deposits to provide engineered building platforms.
- Engineered foundation design to accommodate low bearing capacity soils.

6 SPECIFIC GEOTECHNICAL ASSESSMENT

This report provides subdivision development zones and a number of remedial options in order to provide suitable conditions for subdivision development. A specific geotechnical assessment should be undertaken as part of subdivision development design by a suitably qualified person.

7 LIMITATIONS

7.1 GENERAL

Ground Consulting Ltd has undertaken this assessment in accordance with the brief as provided, based on the site and subdivision location as shown on Drawing 002. This report has been provided for the benefit of our client, and for the authoritative council to rely on for the purpose of processing the consent for the specific project described herein. No liability is accepted by this firm or any of its directors, servants or agents, in respect of its use by any other person, and any other person who relies upon information contained herein does so entirely at their own risk.

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The sub-surface conditions have been extrapolated between the investigations undertaken. Whilst care has been taken to provide sufficient sub-surface information following best practice, no guarantee can be given on the validity of the inference made and it must be appreciated that actual conditions could vary from the assumed model.

7.2 FURTHER INVESTIGATIONS REQUIRED

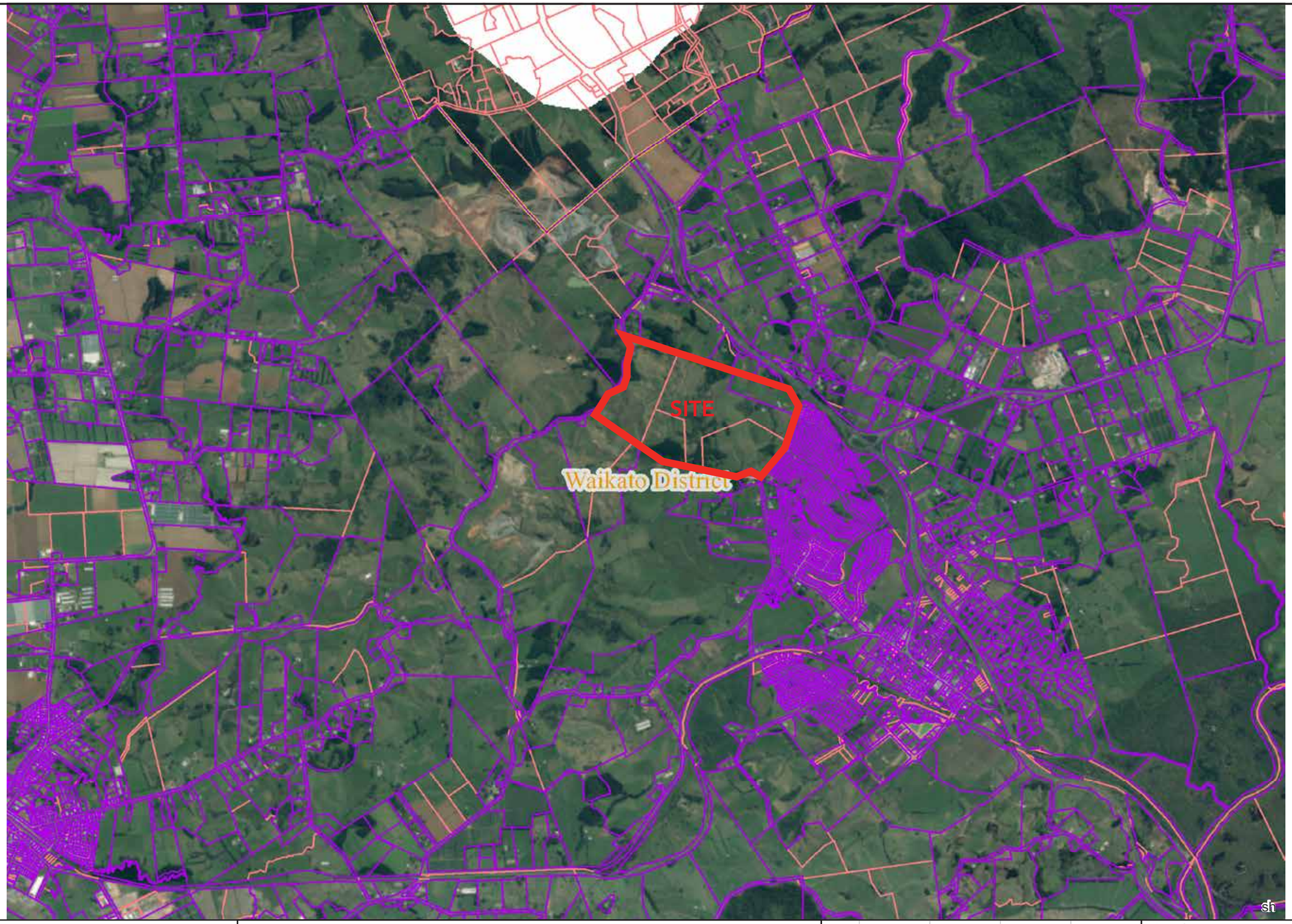
This assessment has been undertaken for the proposed site development to date for the purposes of obtaining a plan change. Any structural changes, alterations and additions made

to the proposed development should be checked by a suitably qualified person and may require further investigations and analysis for the purposes of obtaining a subdivision consent should a plan change be granted.

In addition, geotechnical inspections will be required during construction to assess site slopes, foundation excavations, retaining walls and other geotechnical aspects of the development. This is to ensure ground conditions encountered are in accordance with the findings of this assessment. If ground conditions differ from those presented in this report, advice on design and construction modifications should be sought from a suitably qualified person.

DRAWINGS

N



GCL Ground Consulting Ltd

CSL TRUST

HELENSLEE ROAD, POKENO

SITE LOCATION PLAN

Rev	Date	Status	Drafted	Reviewer
A	06/06/2018	Issued	L.K	F.W

File Ref. MAC://Projects_3000/3396/R3396-1/R3396-1-DRW002cdr

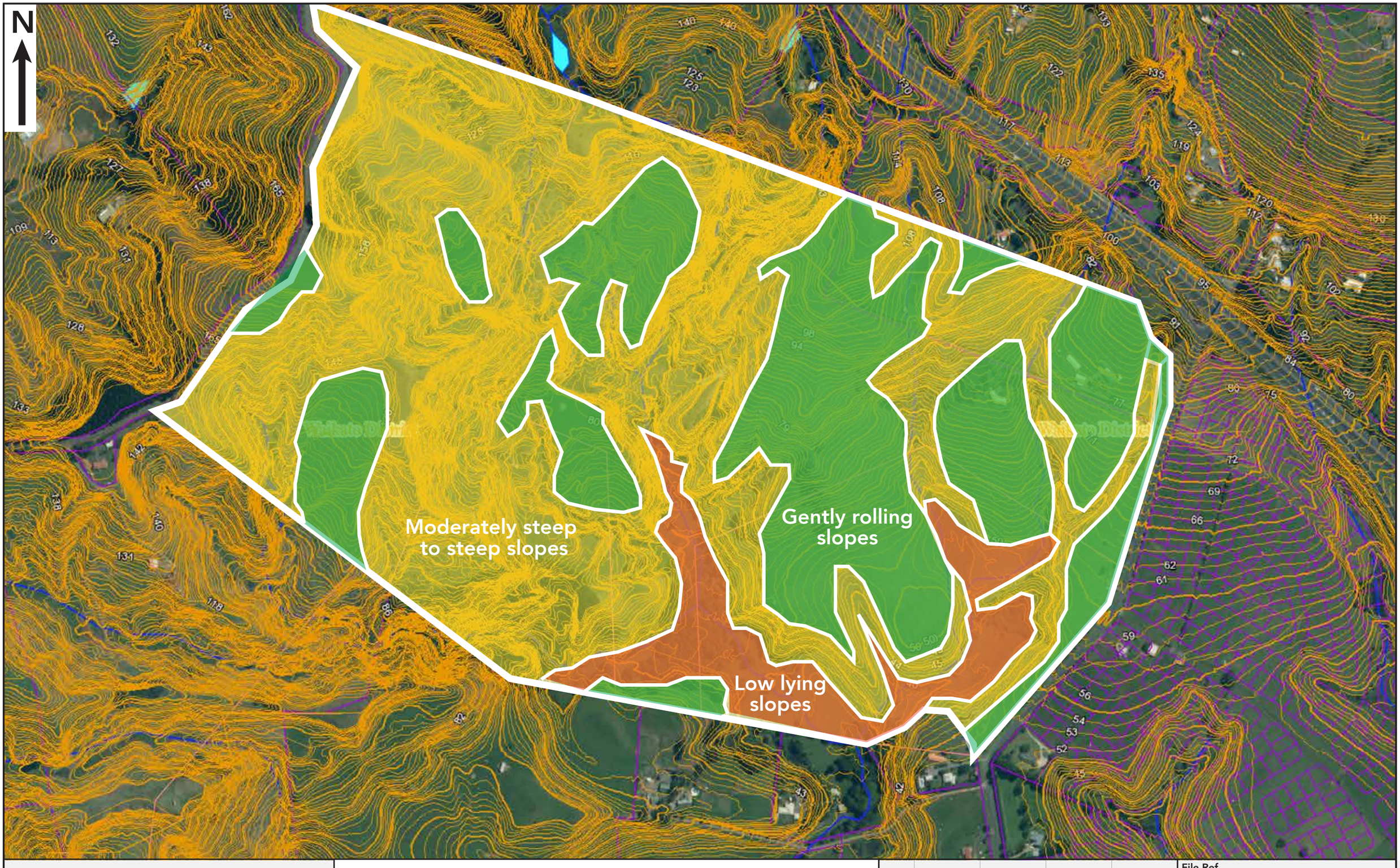
Scale (A4) 1:20,000

0 4 20 40m

Project No. 4006

Report Ref. R4006-1

Drawing No. 001



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CSL TRUST

HELENSLEE ROAD, POKENO

SITE PLAN: LANDFORMS

Rev	Date	Status	Drafted	Reviewer
A	06/06/2018	Issued	L.K	F.W

File Ref. MAC://Projects_3000/3396/R3396-1/R3396-1-DRW002cdr

Scale (A4) 1:5000

0 20 100 200m

Project No. 4006

Report Ref. R4006-1

Drawing No. 002

GCL Ground Consulting Ltd

CSL TRUST

HELENSLEE ROAD, POKENO

SITE PLAN: SUBDIVISION DEVELOPMENT ZONES

Rev	Date	Status	Drafted	Reviewer
A	06/06/2018	Issued	L.K	F.W

File Ref. MAC://Projects_3000/3396/R3396-1/R3396-1-DRW002cdr

Scale (A4) 1:5000

0 20 100 200m

Project No. 4006

Report Ref. R4006-1

Drawing No. 003

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Ground Consulting Ltd

APPENDIX D
INTEGRATED TRANSPORT ASSESSMENT
COMMUTE TRANSPORTATION CONSULTANTS

179 & 205 Helenslee Road, Pokeno

Proposed Plan Change

Transportation Assessment Report

24 September 2018

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www.commute.kiwi

Project:	179 & 205 Helenslee Road, Pokeno – Proposed Plan Change
Report title:	Transportation Assessment Report
Document reference:	J00939 179 & 205 Helenslee Road 24092018
Date:	24 September 2018

Report Status	Prepared By	Reviewed By	Approved By
Final Report	Nilu Seneviratne	Leo Hills	Leo Hills
			

Table of Contents

1 INTRODUCTION

Commute Transportation Specialists "Commute" has prepared an Integrated Transport Assessment (ITA) for a proposed submission to the Waikato District Plan (District Plan) review to rezone a large portion of land located at 179 & 205 Helenslee Road in Pokeno (referred to as "the site"). The site is currently zoned as "Rural" in the Waikato District Plan ("District Plan") and the proposal intends to rezone the area to a mix of "Residential' zone and 'Country Living' zone to allow for a 414-lot residential development and associated neighbourhood centre.

The potential residential development will be supported by a new internal road network comprising a hierarchy of roads. The new road network will have a total of six connections to the existing road network including two connections onto Helenslee Road, Ridge Road and the planned roading network at 53 Munro Road.

Commute have prepared an ITA (referred to as the "53 Munro Road ITA") for a previous submission to rezone the land at 53 Munro Road immediately south of the site, from 'Rural' to 'Residential' zone, to allow for the development of a 1322 lot residential subdivision. This submission is currently being notified as part of the Proposed District Plan – Stage 1. For the purpose of this assessment, it is assumed that all of the elements relating to the residential development at 53 Munro Road, including intersection upgrades, are adopted prior to the construction of the potential residential development at the site.

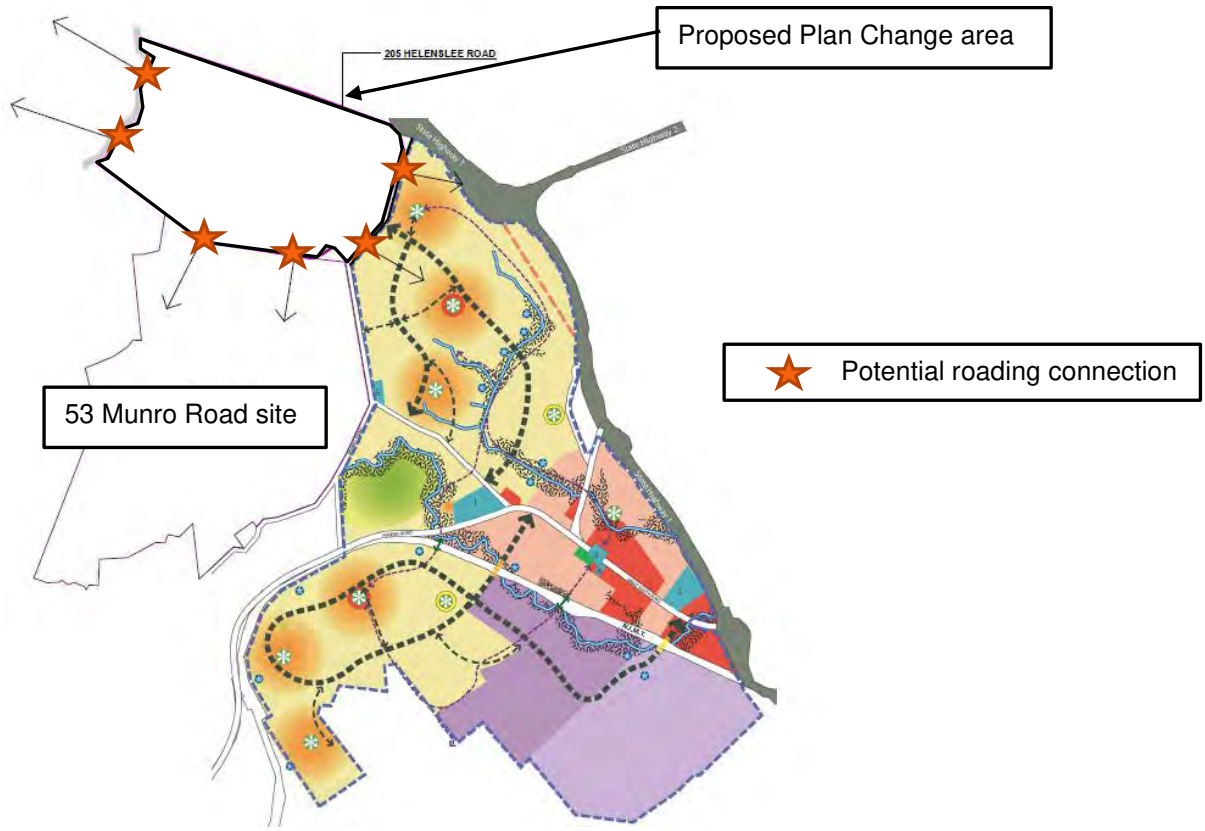
The key transportation considerations for this proposal are:

- The accessibility of the site to the various modes of transport; and
- The ability of the surrounding road network to safely and efficiently support the proposed development.

These and other transportation issues will be addressed in this report.

Figure 1-1 shows the subject site in relation to the Pokeno Structure plan area and 53 Munro Road boundary line.

Figure 1-1: Site in relation to the surrounding road network



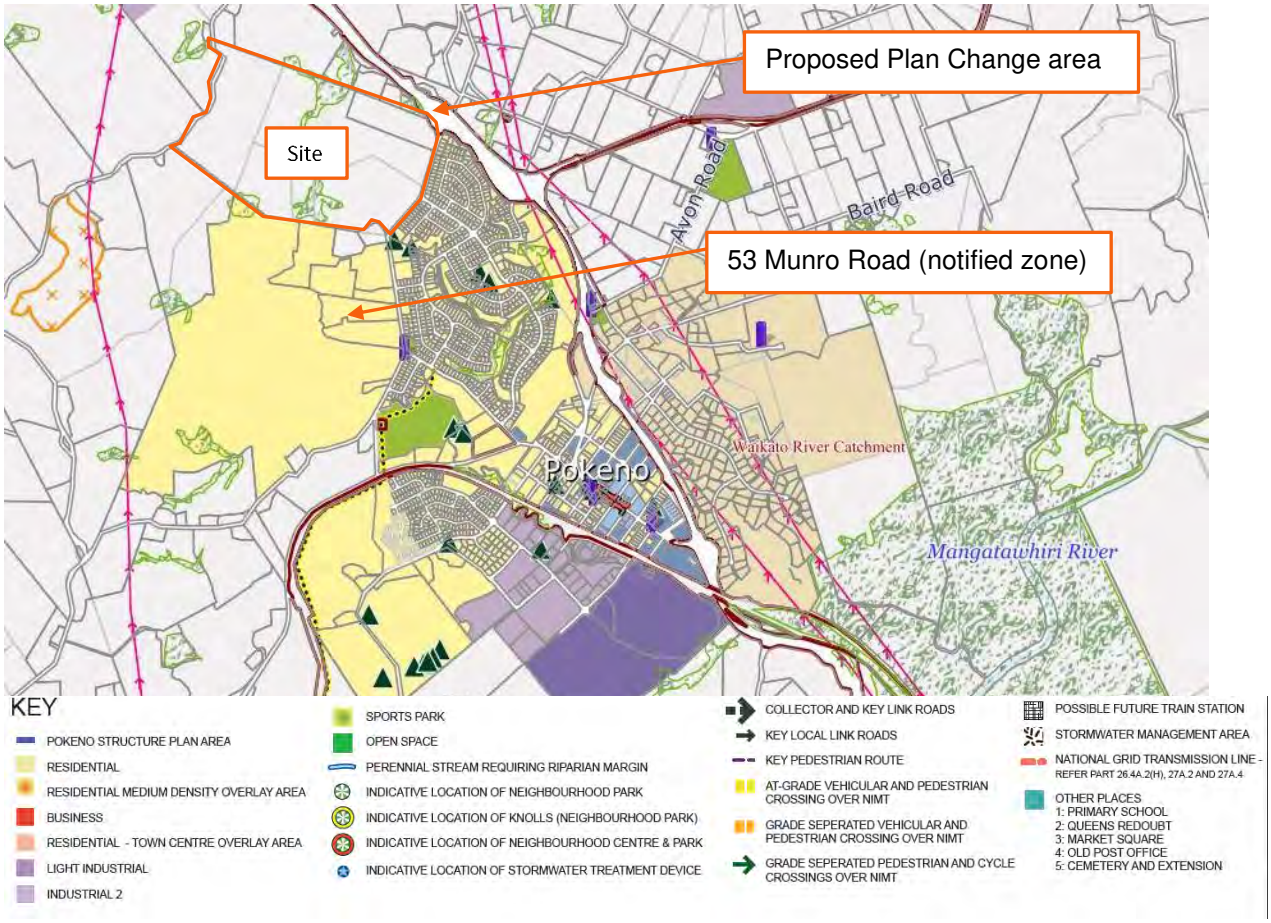
2 EXISTING ENVIRONMENT

2.1 SITE LOCATION

The site is located at 179 & 205 Helenslee Road in Pokeno. It is located approximately 53km south of Auckland, and 72km north of Hamilton, therefore is still in a commutable distance from both these cities. Pokeno is located directly west of the State Highway 1 (SH1) motorway, and southwest of the SH2 motorway. The Tuakau town centre is located west of the site via Pokeno Road.

The site is zoned as 'Rural' under the Waikato District Plan (District Plan) and currently caters for several dwellings. The neighbouring site zoning varies in each direction, with the land to the east and of the site zoned as Residential 2. West and north of the site, the land is zoned as Rural (similar to the subject site). As noted, a submission has been made to the Waikato District Plan to rezone the portion of land south of the site (at 53 Munro Road) from 'Rural' to 'Residential'; that site is now identified as a notified zone ('Residential') within the Proposed District Planning maps as shown in Figure 2-1 below.

Figure 2-1: Site Location in relation to Proposed District Plan zoning maps (notified)



The site is located directly west of the Pokeno Structure Plan (PSP) boundary. The PSP provides a comprehensive framework for the staged growth of the Pokeno village into a town. The structure plan sets out the future zoning in the area allowing for various residential, industrial and business activity surrounding the existing town centre.

2.2 ROAD NETWORK

The site is bounded by Helenslee Road to the east and Ridge Road to the west.

As noted above, a residential subdivision is planned to the south of the site (at 53 Munro Road) and will comprise a new internal road network which is expected to have two connections to the southern boundary of the site; a number of roading upgrades are planned as part of this development and are outline in later sections of this report. It is also noted that the development of the PSP area will require new and upgraded roading infrastructure including at nearby intersections to cater for the increase in traffic volumes.

2.2.1 HELENSLEE ROAD

Helenslee Road provides a single traffic lane in each direction (separated by a centreline), connecting to Razorback Road to the north and Pokeno Road to the south. Helenslee Road has a road reserve width of some 20.1 m and a sealed carriageway of approximately 7.0 m. Primarily were residential development has occurred, a pedestrian footpath is provided along the eastern side of Helenslee Road (including outside the subject site). Additionally, intermittent on-street parking is permitted on both sides of the road. A flush median is provided along sections of Helenslee Road to facilitate right

turn movements into Mark Ball Drive, Hill Park Drive and an unnamed road (near the intersection with Munro Road).

On the 2nd April 2018 the speed limit on Munro Road changed from 100 km/hr to 60 km.hr[1].

Photograph 1 shows the existing layout of Helenslee Road looking north near the intersection with Munro Road.

Photograph 1: Helenslee Road (north)

2.2.2 MUNRO ROAD

Near the vicinity of the site, Munro Road provides a single lane in both direction with no centreline or edge line markings. Munro Road has a road reserve width of some 20 m, including a carriageway of approximately 6.0 m. Near the vicinity of the site, Munro Road has unsealed shoulders of varying width and grassed berms. Munro Road connects to Helenslee Road to the north and Pokeno Road to the south and is bounded by 'Residential 2' zoned land on the east side and 'Rural' zoned land to the west. A one-way bridge is located on Munro Road just north of the intersection with Huia Road (as shown in Photograph 2 below).

With reference to the One Road Network Classification (ONRC), Munro Road is classified as a secondary collector road. The purpose of a secondary collector road is to '***provide a secondary***

[1] https://www.waikatodistrict.govt.nz/your-council/public-consultations/past-consultations/speed-limit-review

distributor/ collector function, linking local areas of population and economic sites and may be the only *route available within this local area'.* No pedestrian footpaths are provided on either side of Munro Road.

On the 2nd April 2018 the speed limit on Munro Road changed from 100 km/hr to 60 km.hr[2].

Photograph 2 shows the existing layout of Munro Road looking south from the intersection with Helenslee Road.

As shown in Photograph 1, a one-way bridge is located directly north of the Huia Road/ Munro Road intersection, with priority given to southbound traffic.

Photograph 2: Munro Road (looking north towards Helenslee Road)

2.2.3 RIDGE ROAD

Ridge Road is located adjacent to the western boundary of the site and extends between the SH1 northbound on-ramp/ Nikau Road to the north and Whangarata Road (south). Ridge Road comprises of undulating terrain and provides a single lane in either direction separated by centreline pavement markings. The Ridge Road quarry is located south of the site along Ridge Road.

The posted speed limit is 100 km/hr.

Photograph 3 shows the existing layout of Ridge Road near the intersection with the SH1 northbound on-ramp.

[2] https://www.waikatodistrict.govt.nz/your-council/public-consultations/past-consultations/speed-limit-review

Photograph 3: Ridge Road looking towards the SH1 Northbound off-ramp

2.2.4 POKENO ROAD

Pokeno Road is a two-lane road (separated by a centreline), connecting to Whangarata Road to the west and Great South Road to the east. Close to the site (near intersection with Munro Road), Pokeno Road has a road reserve width of some 41.5 m and a sealed carriageway width of approximately 7.6 m. Towards the eastern end of Pokeno Road (near intersection with Helenslee Road), the road reserve width is some 20.1 m with a sealed carriageway width of approximately 6.1 m. East of the Pokeno School, a pedestrian footpath and intermittent kerbside parking is provided along the southern side of Pokeno Road only.

On the 2nd April 2018 the speed limit along Pokeno Road (between 100 m west of Munro Road to existing 70 km/hr/ 100 km/hr change) changed from 100 km/hr to 80 km.hr[3]. East of this, the speed limit changes to 50 km/hr.

Photograph 4 shows the existing layout of Pokeno Road looking east near the intersection with Munro Road.

[3] https://www.waikatodistrict.govt.nz/your-council/public-consultations/past-consultations/speed-limit-review

Photograph 4: Pokeno Road

2.2.5 HELENSLEE ROAD/ MUNRO ROAD INTERSECTION

The Helenslee Road/ Munro Road intersection is located adjacent to the site and is controlled by a give-way intersection with priority given to traffic along Helenslee Road. Helenslee Road makes up the north and south leg of the intersection with Munro Road connecting to it from a southwest approach. This intersection is identified as a gateway, in need of treatment, in the PSP.

2.2.6 POKENO ROAD/ MUNRO ROAD INTERSECTION

The Pokeno Road/ Munro Road intersection is give-way controlled, with priority to traffic along Pokeno Road. Munro Road connects to the intersection with Pokeno Road at an acute approach angle from the north. Currently, the intersection provides no dedicated turning lanes/ slips lanes or additional shoulder width therefore vehicles turning right into Munro Road would obstruct through movement along Pokeno Road. This intersection is identified as a gateway, in need of treatment, in the PSP.

2.3 ACCESSIBILITY

2.3.1 PRIVATE VEHICLES

The site is well located with regards to vehicle connections to the wider Auckland and Hamilton Regions with Auckland located just 52km north of the site and Hamilton located 72 km south.

Helenslee Road provides a link to the SH1 (northbound) Razorback Road interchange which is located approximately 100 m (less than one-minute drive) north from the site. The Munro Road, Pokeno Road and Great South Road link connects to the SH1 northbound Great South Road interchange, which is located south of the SH1 Razorback Road Interchange as well as the SH2 interchange. The SH1 Great South Road interchange is located approximately 2.4 km (4-minute drive) southeast from the site. The SH1 southbound interchange is some 3.6 km (5-minute drive)

south from the site and can be accessed of Great South Road. Furthermore, the SH1 Nikau Road interchange (northbound and southbound) is located some 1.2 km north of the site via Ridge Road.

SH1 and SH2 allow for easy access to major cities such as Auckland, Hamilton and Tauranga, in which commuters are likely to travel to. The site is some 52 km (51-minute drive) from Auckland, 74 km (1-hour drive) from Hamilton and 152.0 km (2-hour drive) from Tauranga.

During peak times, travel times between the site and major cities vary and are sensitive to SH1 / SH2 motorway flows and the associated demands at the interchanges.

2.3.2 EXISTING PUBLIC TRANSPORT SERVICES

The closest bus stops are located on Great South Road (Pokeno Town Centre), approximately 2.2 km (26-minute walk) from the site, where currently one bus route passes this stop (Route 44). Additionally, a pair of bus stops are located approximately 2.4 km (28-minute walk) from the site, where the InterCity Bus Route passes. Commuters can use these bus services as a means to travel to major cities across North Island.

Given the location of the site, residents are likely to commute to Pokeno, Auckland or Hamilton. While no public transport facilities are provided between the site and Pokeno town centre, several services are provided between the Pokeno town centre and Auckland and Hamilton. The following intercity routes operate during the weekday and connect to these areas.

Table 1: Existing Bus Routes

Bus Route	Route Description	Frequency
44	Hamilton Transport Centre to Pukekohe	Runs Alternate Thursdays. Only AM services (9.20, 9.35, 10.15, 10.40, 10.55, 11.20).
44	Pukekohe to Hamilton Transport Centre	Runs Alternate Thursdays. Only PM services (2.30, 3.00, 3.20, 3.45, 4.15, 4.30).
InterCity Link	Hamilton to/from Auckland Express (8:00am only)	Monday to Friday
InterCity	Auckland to/from New Plymouth, Rotorua, Palmerston North, Gisborne or Hastings (all pass via Hamilton)	Monday to Sunday (various times throughout the day)

As shown above, there are limited transport options available for commuters. With the development of the Pokeno village estate to be implemented over the next 20 years, including both residential and an employment zone, and limited other modes of transport available, this will likely lead to a higher number of volumes on the already congested state highway road network.

2.4 WALKING

Footpaths are provided on the southern end of Pokeno Road as it enters the Pokeno town centre. As developments are established in alignment with the Pokeno Structure Plan, roads will be upgraded and pedestrian connectivity between the site and Pokeno Town Centre will be improved. In this case,

Helenslee Road, adjacent to the residential development as part of the PSP, provides a pedestrian footpath along the eastern side of the road outside the site frontage.

The Austroads Guide to Traffic Engineering Practice Part 13 – Pedestrians indicates that the practical walking distance for non-recreational walking trips is in the order of 1.5 km. Using the practical walking distance of 1.5 km and the 15th percentile walking speed of a typical fit, healthy adult of 1.3 m/s, gives a journey time of some 20 minutes. This is in line with New Zealand data in the Pedestrian Planning and Design Guide, which states that for walking trips, half are more than 10 minutes and 18% are more than 20 minutes.

The primary catchment area for pedestrians has therefore been based on a 1.5 km radius of the centre of the site as shown in Figure 2-2.

Figure 2-2: Walking Catchment

As shown above, the Pokeno School is located within walking distance of the site; furthermore, the Pokeno Town Centre and the major bus stops are located just outside of the walking catchment. Overall, the site is considered to be fairly well connected to neighbouring activities, however will require upgrades/ additional routes as part of the site development.

2.5 CYCLING

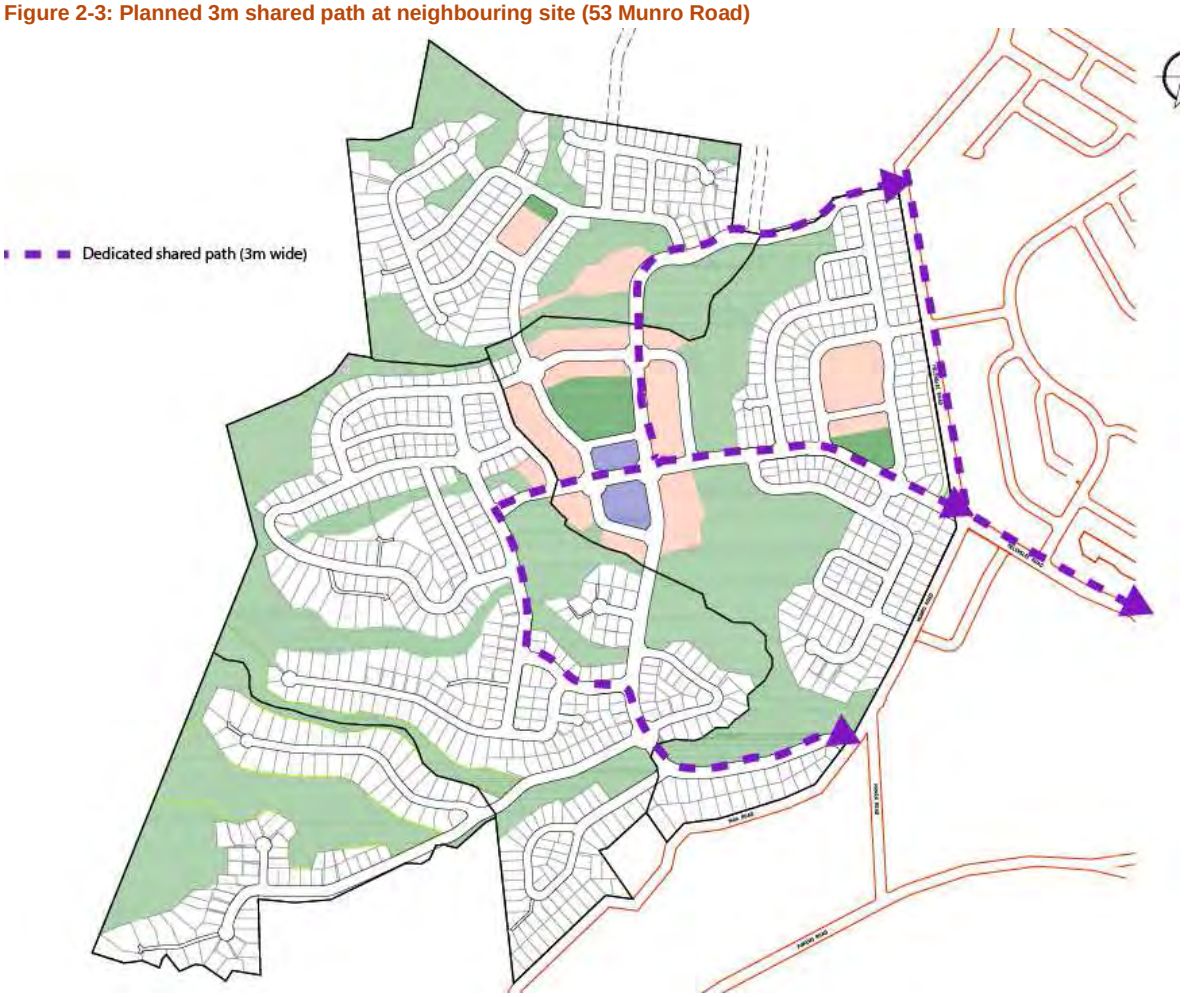
There are currently no dedicated cycle facilities on Helenslee Road, Munro Road or Pokeno Road near the vicinity of the site. As outlined in section 2.5 of the 53 Munro Road ITA, a comprehensive network of cycle facilities are planned within the residential development at 53 Munro Road and along Helenslee Road between the northern entrance and Pokeno Road. The planned cycle facilities are outlined in Figure 2-3 below, this includes the following:

- Shared off-road (3m) path along the proposed collector road network (along one-side) which connects to the existing road network (i.e. Helenslee Road).

- Shared off-road 3m cycle path along Helenslee Road from the northern boundary of the site to the southern boundary of the site.

Given the level of residential development along this route, specifically a large portion of the structure plan residential developments located directly east of the site, this is likely to encourage residents to other modes of transport when travelling to and from the Pokeno centre and local school.

Figure 2-3: Planned 3m shared path at neighbouring site (53 Munro Road)



It is considered that the proposal should expand these facilities anticipated at 53 Munro Road.

2.6 TRAFFIC VOLUMES

Daily link volumes have been extracted from the Pokeno Intersection Assessment report[4] (dated 2016) and Waikato District Plan for Pokeno Road, Munro Road, Ridge Road and Helenslee Road and are provided in Table 2 below. The peak hour has been estimated to be 10% of the daily volume; this is also outlined in Table 2.

[4] Provided by WDC as written in the Pokeno Intersection Assessment 2016 by BECA

Table 2: Traffic Volumes within Pokeno (vehicles per day)

Road	Location	Date	Daily volume	Peak Hour (estimate)
Pokeno Road	Between Ford Road and Helenslee Road	2015	3000 vpd	300 vph
Munro Road	Between Pokeno Road and Huia Road	2014	900 vpd	90 vph
Helenslee Road	Between Munro Road and SH1 overbridge	2014	1500 vpd	150 vph
Helenslee Road	Between Munro Road and Gateshead Road	2015	1500 vpd	150 vph
Ridge Road	Between Quarry entrance and SH1 off ramp	2015	745 vpd	75 vph

In addition, survey data has been extracted from the Pokeno Intersection Assessment report. These surveys were undertaken between 7:30am – 8:30am and 4:45pm to 5:45pm on the 26th November 2016 at the following intersections:

- Pokeno Road/ Munro Road intersection; and
- Pokeno Road/ Helenslee Road intersection.

The results of the surveys are shown in Figure 2-4 and Figure 2-5 below.

Figure 2-4: Munro Road/ Pokeno Road survey volumes November 2016 (AM and PM)

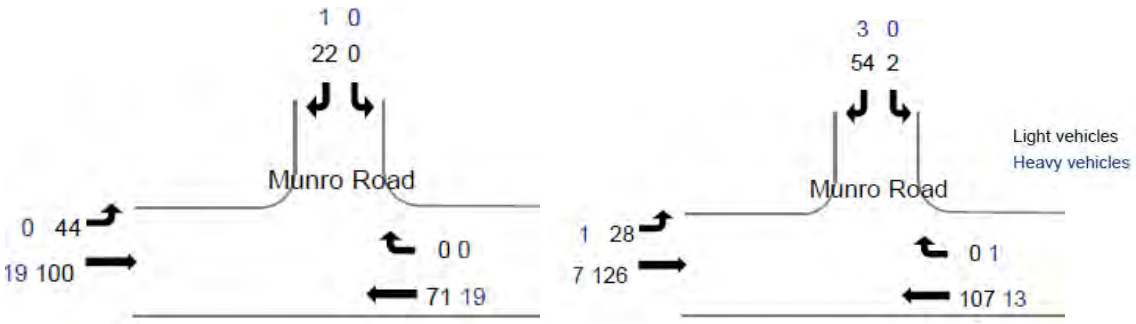
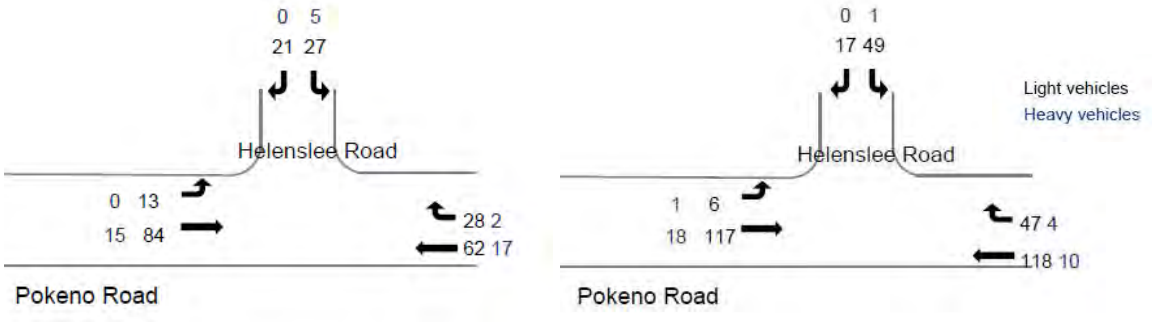


Figure 2-5: Helenslee Road/ Pokeno Road survey results November 2016 (AM and PM)



As shown above, the majority traffic volumes at the surveyed intersections are considered to be low.

The surrounding area is still developing and at the completion of the Pokeno Structure Plan, the planned residential subdivision at 53 Munro Road, and other consented developments in Pokeno, the traffic volumes in this area are likely to increase significantly from that existing.

2.7 ROAD SAFETY

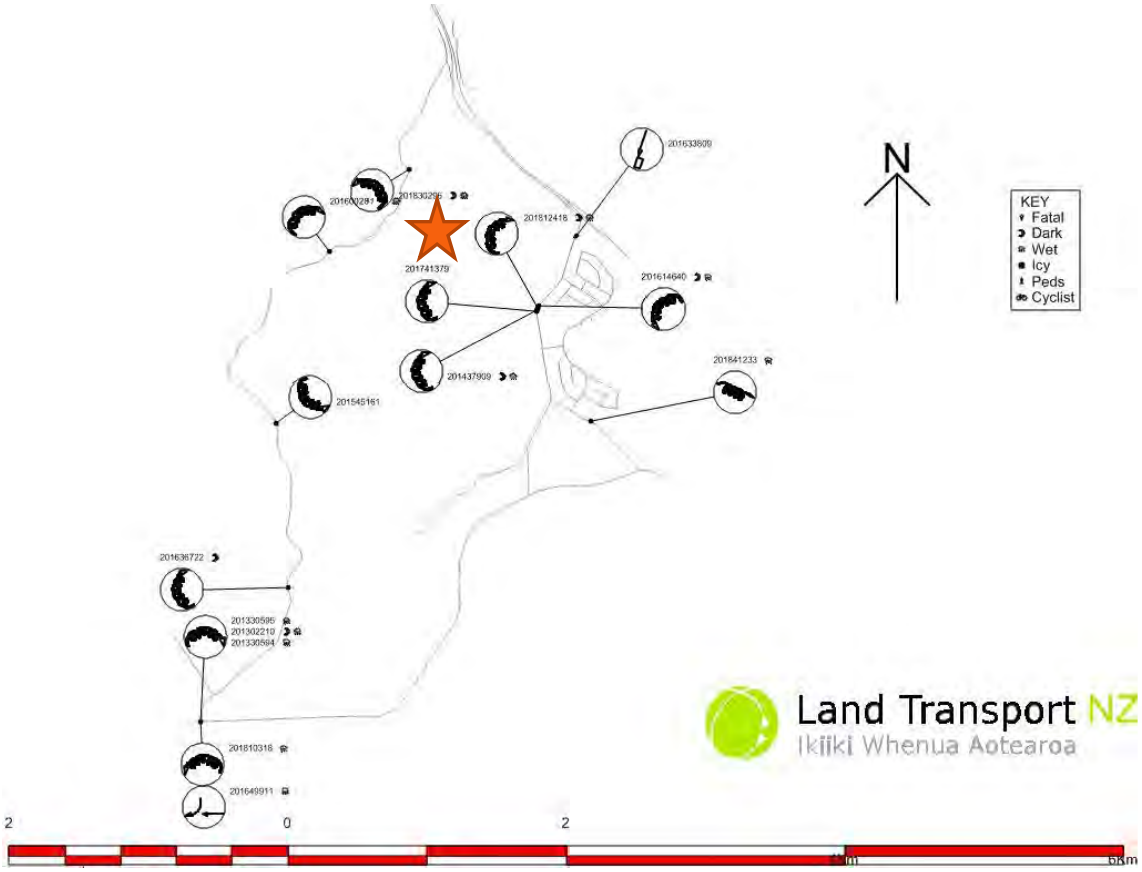
A search of the road safety record using the New Zealand Transport Agency (NZTA) Crash Analysis System (CAS) has been carried out to identify all reported crashes near the site during the five-year period from 2013 to 2017 as well as all available data in 2018. The study focused on all reported crashes reported on Helenslee Road and Ridge Road within the vicinity of the site.

A total of sixteen crashes were reported within the study area including nine crashes along Ridge Road and six crashes along Helenslee Road. Of these, fifteen crashes were a result of a vehicle losing control; the remaining crash involved merging. A summary of the crashes is provided below:

- A total of six crashes occurred at the Pokeno Road/ Ridge Road/ Whangarata Road intersection (southwest of the site), of these, five crashes involved loss of control resulting from vehicles losing control when turning right (slippery environment, inattentive and inappropriate speed were listed as contributing factors. The remaining crash involved a truck westbound along Pokeno Road hitting a car merging from the right (merging vehicle failed to give-way). Two crashes resulted in minor injuries.
- Four crashes were recorded along Ridge Road (loss of control) of which one resulted in a fatality. The fatal crash involved a truck northbound along Ridge Road losing control when turning right (medical illness, road slippery, and attention diverted were listed as contributing factors). One crash was reported within close proximity of the site and involved a van northbound along Ridge Road losing control when turning left (failed to notice bend and new driver were listed as contributing factors). Of these, four crashes were reported near the southern boundary of the site and involved vehicles losing control when turning left/ right
- The remaining crashes were reported along Helenslee Road and involved loss of control. Of these, three crashes involved a vehicle northbound along Helenslee Road losing control turning right (suddenly swerving to avoid an animal was listed a contributing factor for one of these crashes). Two crashes resulted in minor injuries. It is noted that as of 2nd April 2018 the speed limit along Helenslee Road (between Pokeno Road and SH1) was reduced from 100 km/hr to 60 km/hr.

A collision diagram of the surrounding area is provided in Figure 2-6 below.

Figure 2-6: Collision diagram



As can be seen above, a number of loss of control crashes have reported within the study area. No crashes have occurred near the vicinity of the site involving movements to and from properties on Ridge Road or Helenslee Road (relating to vehicle movements to or from the site). Therefore, from the assessment of the crash history, there is no indication of any existing significant safety concerns and on the provision that all recommendations outlined in this report are implemented, and the planned roading upgrades as part of the 53 Munro Road residential development are adopted, the proposed zone change is unlikely to exacerbate this situation in any way (provided the upgraded roads/ intersections are designed appropriately).

It is noted that the majority of the crashes occurred involved loss of control crashes. The proposal will urbanise this area and will likely reduce the occurrence of loss of control crashes.

3 PROPOSED DEVELOPMENT

The proposal intends to rezone the land located at 179 & 205 Helenslee Road in Pokeno. The site is currently zoned as 'Rural' in the District Plan and the proposal intends to rezone the land to a mix of 'Residential' zone and 'Country Living' zone to allow for the development of a 414 – lot residential development and associated local centre (shops). Of note, a total of 360 lots are proposed on the 'Residential' zone and will be developed within three stages; 54 lots are proposed on the land zoned for 'Country Living'.

A preliminary master plan has been developed for the site (provided for in **Appendix A**). The plan indicates the proposed road network to be constructed within the development.

As part of the proposal, a hierarchy of roads are proposed (on-site) to support the development and will have six connections to the existing road network; this includes two connections to the planned

road network at 53 Munro Road (south of the site) and two connections to Helenslee Road (east) and Ridge Road (west) respectively. As will be noted, all proposed intersections will be controlled by give-way intersections.

Figure 3-1 below shows the location of the six connections proposed to the existing and planned road network in relation to the site boundary and surrounding road network.

Figure 3-1: Proposed roading plan

4 PROPOSED ROAD NETWORK

As part of the development, a series of local and collector roads will be constructed to provide access to the individual properties (outlined in Figure 4-1 below). The proposed road network will form intersections with the following existing roads;

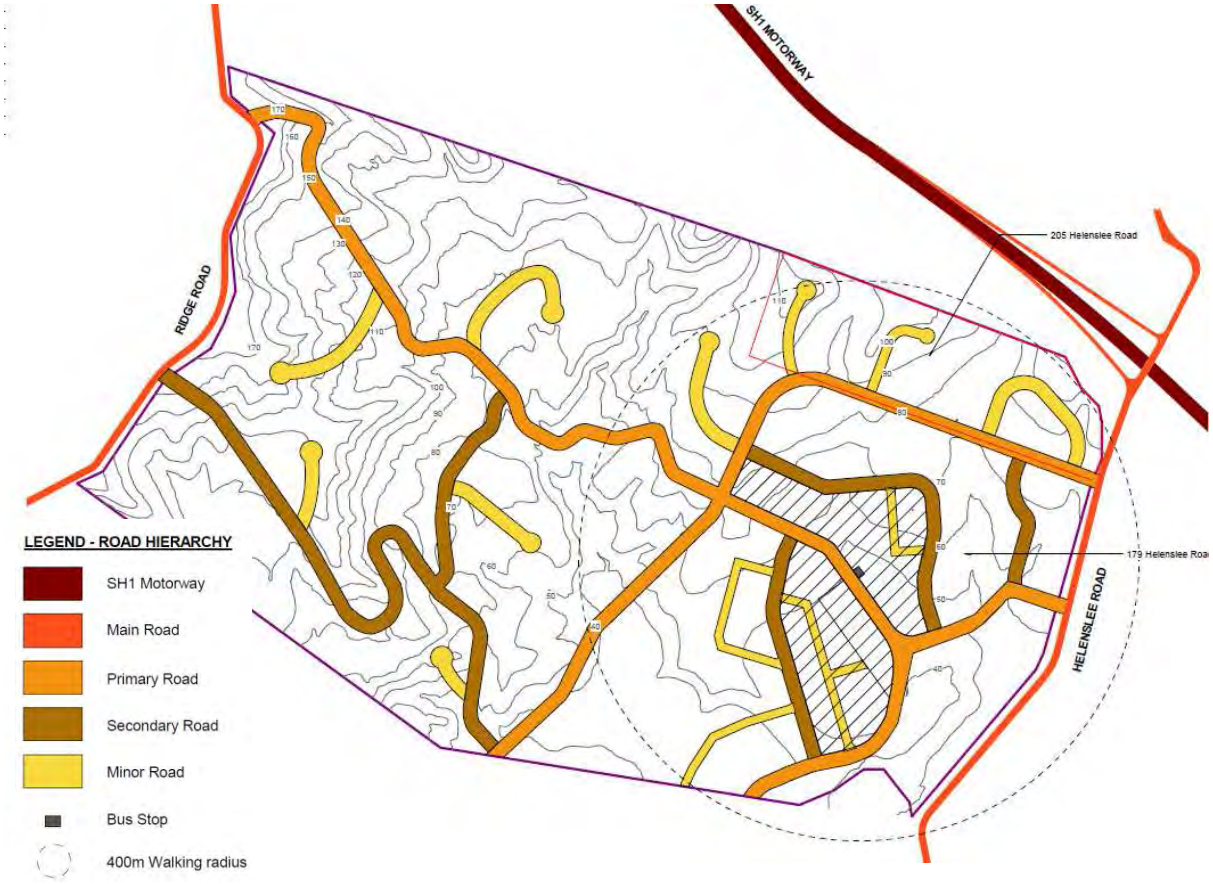
- 2 x connections onto Helenslee Road; and
- 2 x connections onto Ridge Road,

In addition, the proposal intends to amalgamate the proposed road network and the planned road network at 53 Munro Road (south of the site) via two connections.

The specific location of the intersections proposed on Ridge Road, and the southern intersection onto Helenslee Road, should be considered during the detailed design stage and comply with relevant standards including The Franklin Engineering Code of Practice, Austroads Guide and NZS4404:2010.

Figure 4-1 shows the proposed local and collector roads within the development. All new intersections onto Helenslee Road and Ridge Road will be give-way controlled.

Figure 4-1: Proposed road hierarchy



4.1.1 NZS4404:2010 CHAPTER 3: ROAD DESIGN

The Regional infrastructure technical specification (RITS) sets out the design standards and requirements for roading infrastructure in the Waikato region. Specifically, chapter 3.3.1 of the Transportation section of the RITS indicates that roads shall be designed with reference to the transportation functional classification table contained in the relevant District Plan and NZS4404 Section 3.3. The layout of the potential road network has not yet been confirmed, however this should be designed in accordance with NZS4404:2010.

Table 3.2 of NZS4404:2010 outlines the requirements for carriageways serving different land uses within different areas. The following should be provided for an urban road;

<u>Serving 1 to 200 dwellings (local road – 2000 vpd)</u>

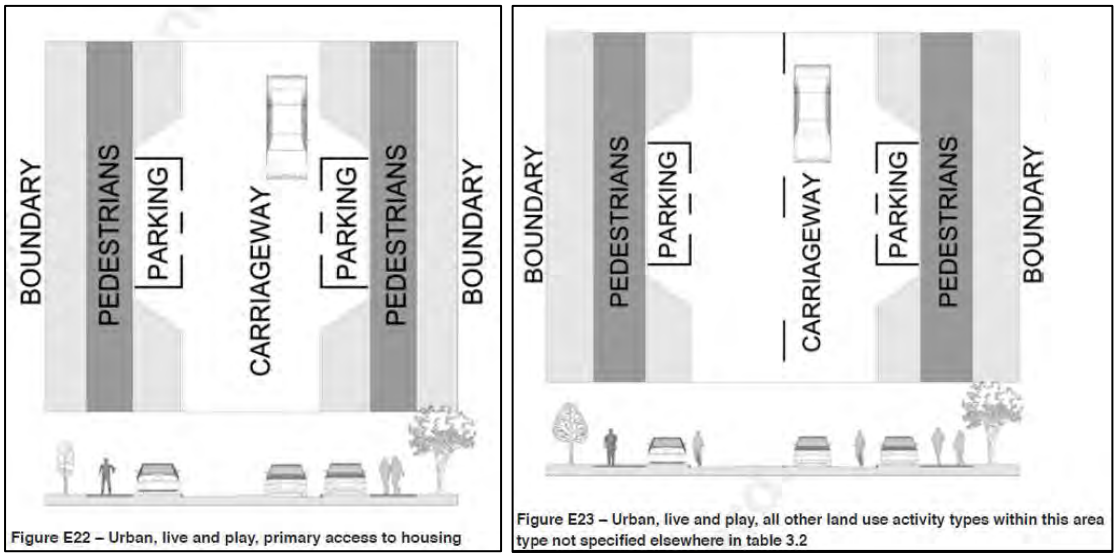
- 30 km/hr target speed limit;
- 15 m minimum road width;
- 12.5% maximum gradient (minimum of 0.4%);
- 1.5 m pedestrian footpath (one side) or 1.5 m (both sides) where more than 20 dwellings or more than 100 m in length;
- Parking may occur in the movement lane or be separated and recessed;
- Cyclists – shared (in movement lane); and
- 5.5 – 5.7 movement lane (excluding shoulder).

Serving 200 to 800 lots the following dimensions should be provided (Connector/ collector road – 8000 vpd):

- 50 km/hr target speed limit;
- 23 m minimum road width;
- 10% maximum gradient (minimum of 0.4%);
- 2.5 m pedestrian footpath (both side), separated from the carriageway;
- Parking preferred separate and recessed;
- Separate provision for cycling where local authority define cycle route; and
- 2 x 4.2 movement lane (excluding shoulder).

Figure 4-2 shows the recommended layout.

Figure 4-2: NZ4404:2010 - Figure E22 and E23 road reserve layout



4.1.2 PROPOSED PRIMARY (COLLECTOR) ROADS

All new primary collector roads are proposed to provide a 25 m road reserve. The details included in the road reserve is as follows:

- 2 x 3.5 m lane (either way);
- 3.0 m flush median;
- 2.3 m parking or berm (both sides;
- 1.2 m front berm (both sides);
- 1.8 m footpath (one side);
- 3.0 m shared path (one side) including 1.5 m footpath and cycle path respectively; and
- 1.6 m back berm (both sides).

Secondary collector roads proposed provide a 20 m road reserve comprising of the following:

- 2 x 3.0 m lane (either way);
- 0.4 m flush median;
- 2.2m parking or berm (both sides;
- 1.2 m front berm (both sides);
- 1.8 m footpath (one side);
- 1.6 m back berm (both sides).

Therefore, the proposed collector road will provide a 14.6 m carriageway, including 2.3 m parking bays on both sides along its length. The carriageway width allows for a future public transport route (7.0m wide). A 3.0m shared footpath (which can be used by cyclists/ pedestrians) is provided on one side of the road on the collector road (new) and a pedestrian footpath along the other side of the road.

Vehicle crossings for driveways should avoid being on collector roads (including proposed and existing) and over the shared path on the collector road (new). Where shared access lots/lanes cross footpaths, the footpath surface will be continued across the driveway to highlight legal footpath user right-of-way.

Figure 4-3 and Figure 4-4 show the overall cross-section with and without parking bays.

Figure 4-3: Primary Collector Road (new –parking bays)

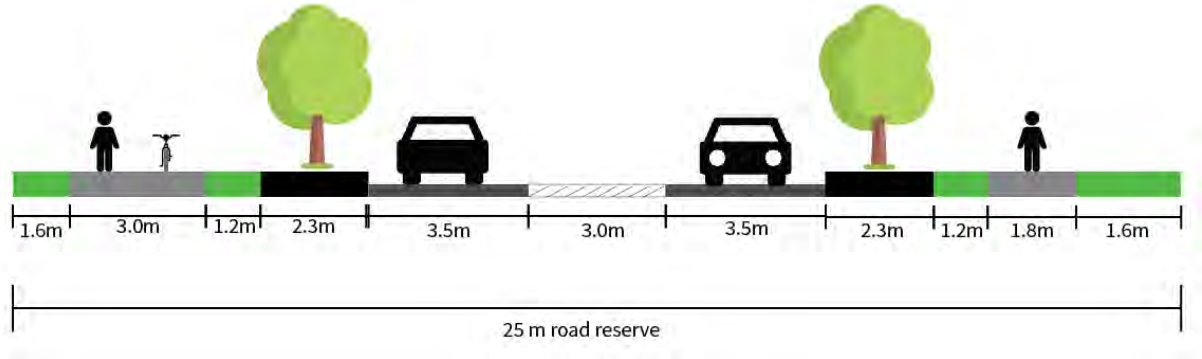
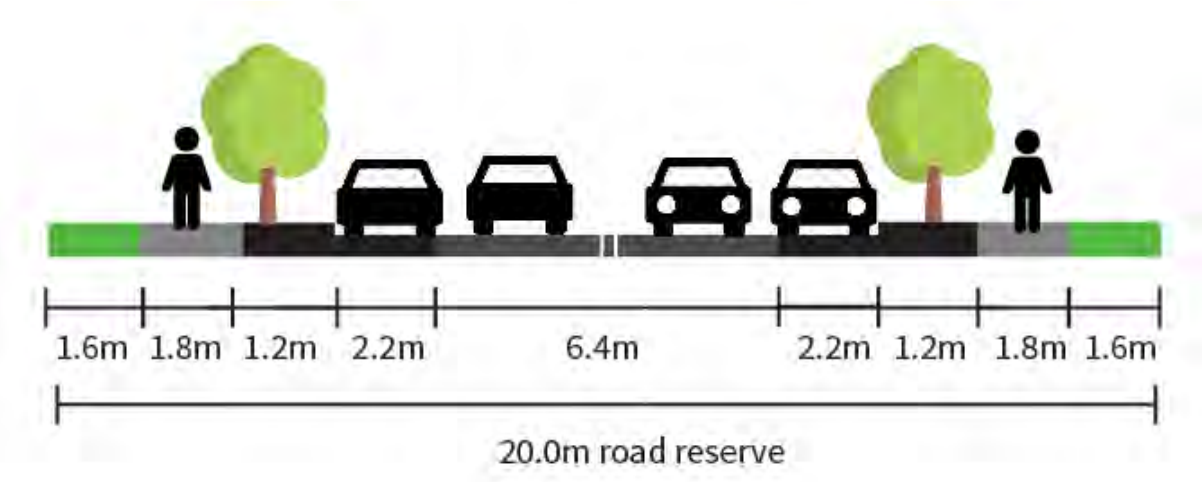


Figure 4-4: Secondary Collector road (new - no shared path)



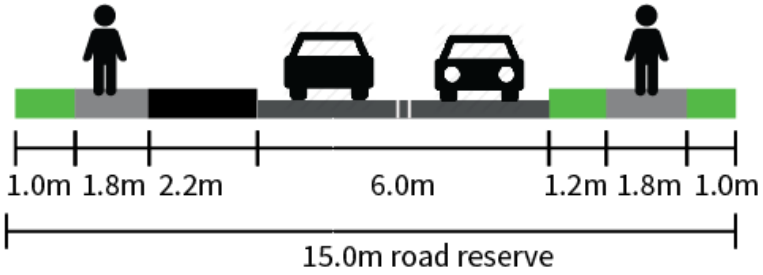
4.1.3 LOCAL ROADS

All new local roads will comprise a 15 m road reserve with the following included:

15 m road reserve

- 6.0 m carriageway (3.0 m lanes);
- 2.2 m front berm (both sides);
- 1.8 m footpath (both sides);
- 1.0 m back berm (both sides).

Figure 4-5: Local road (new) - 20.0 m road reserve



Where driveways cross footpaths, the footpath surface should be continued across the driveway to highlight legal footpath user right-of-way.

The combination of relatively narrow carriageways and side friction from on-street parking and residential driveways will create a low speed (40km/hr) environment appropriate for a residential area.

The lane widths and footpath dimensions that are proposed typically comply with NZS4404 road design guidelines. These are considered appropriate.

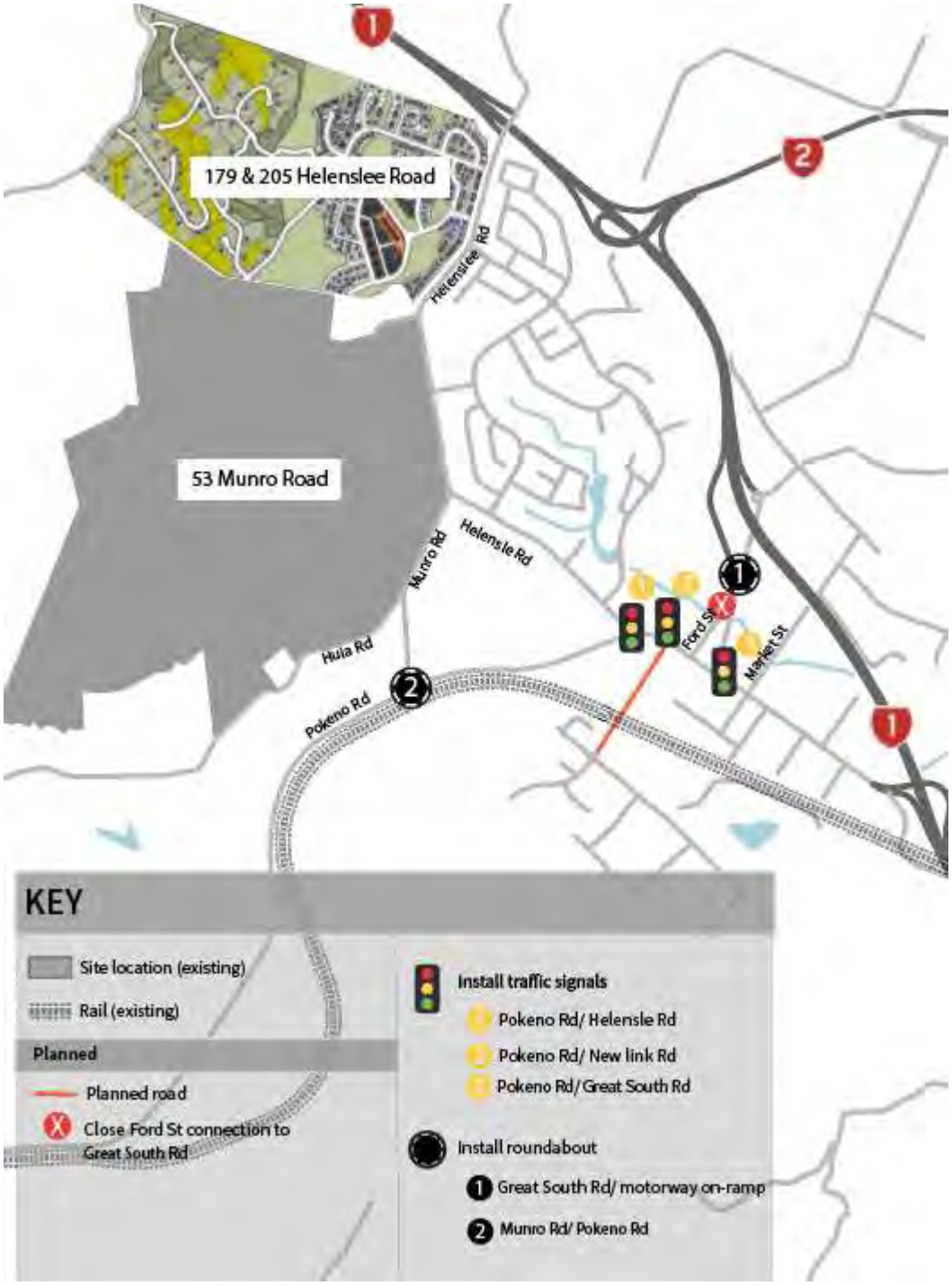
5 PLANNED ROADING UPGRADES

5.1 POKENO INTERSECTION ASSESSMENT REPORT

The Pokeno Intersection Assessment report sets out an assessment of the capacity of the existing intersection layouts in Pokeno to cater for the future traffic volumes anticipated for the year 2022 and 2040. The report recommends upgrades to key intersections within Pokeno, from a give-way control to roundabout or signals.

Figure 5-1 shows the planned upgrades, outlined in the Pokeno Intersection Assessment report (as well as the subject sites layout).

Figure 5-1: Planned intersection upgrades (Source: Pokeno Intersection Assessment report)

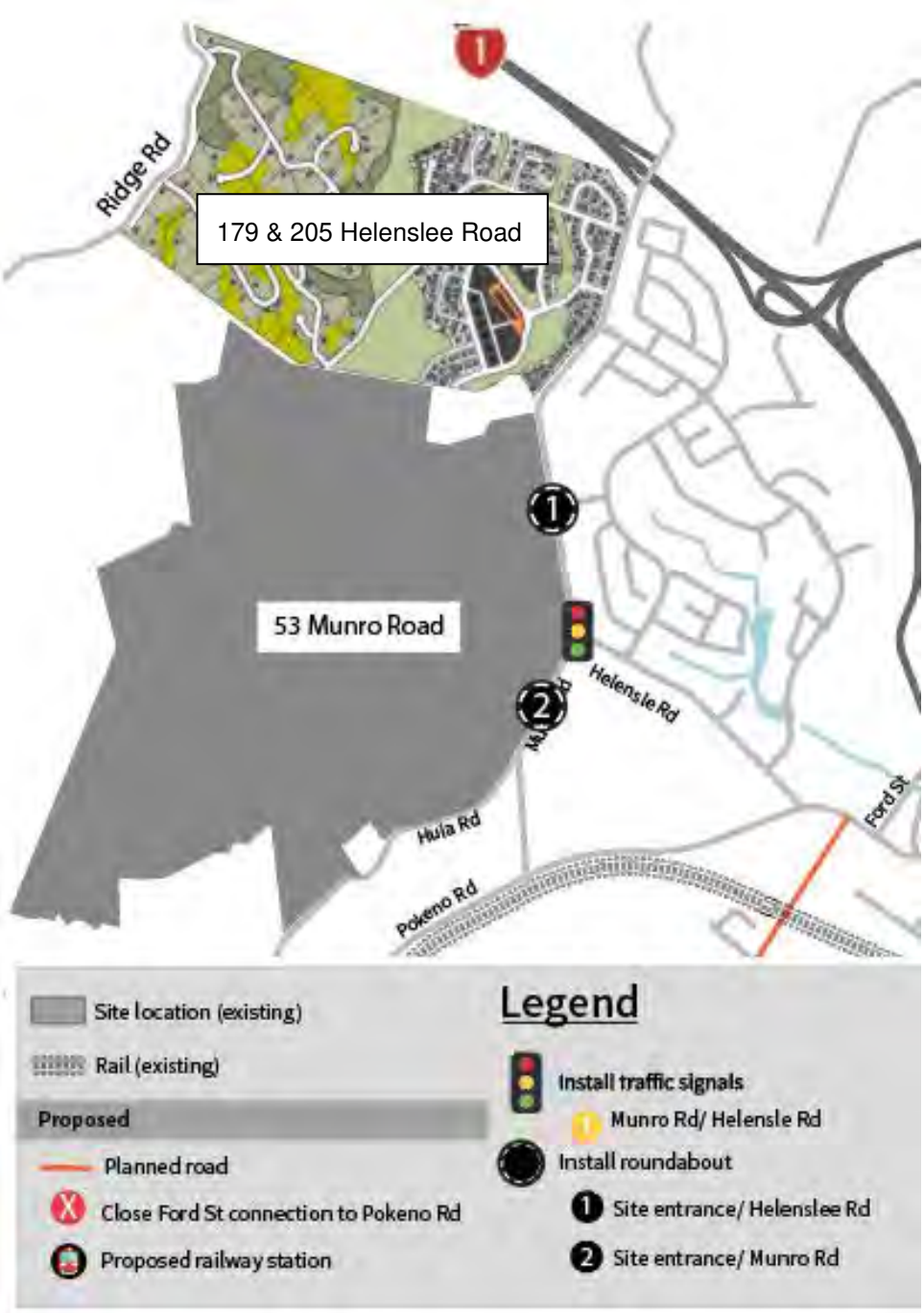


5.2 53 MUNRO ROAD ITA

As noted, a submission has been made to rezone the portion of land south of the site (at 53 Munro Road) from 'Rural' to 'Residential' to allow for the development of a 1322 lot residential subdivision; this area is currently identified as a notified zone (Residential) under the Proposed District planning maps. As part of the residential subdivision, a number of roading upgrades were proposed and are outlined in Figure 5-2 below.

For the purpose of this assessment, it is assumed that the entirety of that proposed within the 53 Munro Road ITA will be adopted into the District Plan.

Figure 5-2: Planned intersection upgrades



6 CYCLING PROVISION

As outlined in section 6 of the 53 Munro Road TIA, a comprehensive cycling network is proposed both within that site and along Helenslee Road as shown in Figure 2-3 above. The proposal intends to retain the planned cycling nature of the area by providing a 3 m shared path along all proposed primary roads within the potential residential development. The proposed shared path is expected to link to the shared path within the planned road network at 53 Munro Road. It is noted that, the

proposal should continue the shared path along the western side of Helenslee Road, along the site boundary, to encourage the use of other modes of transport for local trips.

7 TRIP GENERATION

7.1 GUIDELINES

The RTA Guide[5] provides traffic generation rates that are considered to be appropriately applied to the potential residential facility at 179 & 205 Helenslee Road in Pokeno.

The potential residential units were assessed and is most similar to in concept / location of a 'dwelling house'. As such, the RTA Guide predicts a peak hour trip rate of 0.85 trips / dwelling and daily trip rate of 9.0 trips / dwelling.

7.2 PROPOSED LEVEL OF GENERATION

7.2.1 RESIDENTIAL COMPONENT

The likely trip generation for the site is defined as follows:

Table 3: Additional traffic generation

Activity	RTA Rate	Number / GFA	Peak Hour Vehicle Trips	Daily Vehicle Trips
Dwelling house	*'0.85 trips / dwelling for peak hour & 9.0 trips / dwelling for daily trips'*	414 x lots	352	3,726

As shown above, the proposed development is likely to generate in the order of 352 trips during the peak hour and 3,726 trips daily.

7.2.2 LOCAL CENTRE (SHOPS)

The local centre proposed as part of the potential development will be located within the centre of the residential development. As such, it is considered that these shops will typically cater for the surrounding residential dwellings (e.g. local convenience store / café) and is not likely to generate additional vehicle movements external to the site and therefore has not been assessed within the following sections.

7.3 EXISTING TRAFFIC VOLUMES

As outlined in Section 2.6 of this report, traffic volumes (undertaken in November 2016) were extracted from the Pokeno Intersection Assessment report for the following key intersections:

- Pokeno Road/ Munro Road;
- Pokeno Road/ Helenslee Road;

[5] The Roads and Traffic Authority of New South Wales – Guide to Traffic Generating Developments (RTA)

Of note, for the purpose of this assessment, the surveyed volumes were distributed to the wider network, based on the existing land-use, to determine the level of traffic volumes at the intersections near the site. **Appendix B** sets out the survey results including the estimated traffic volumes at intersections within proximity of the site.

7.4 POKENO INTERSECTION ASSESSMENT VOLUMES

The PSP paramics model volumes were used to inform the PSP and have been accepted by the Waikato District Council and are considered the best available flows to determine the future demand at key intersections within Pokeno. Since the development of the existing PSP paramics model, several changes have occurred to the roading environment which are likely to alter the direction of travel for traffic volumes. These changes include:

- The closure of the Ford Street connection onto Great South Road;
- The North Island Main Trunk (NIMT) crossing was modelled on High Street, not McLean Street;
- Hill Park Drive now connects to Helenslee Road rather than Pokeno Road.

As such, the traffic volumes have been redistributed to cater for the above changes and are outlined in the Pokeno Intersection Assessment report. Of note, that report has also identified an additional two developments, comprising a total of some 430 dwellings, which have been added to the PSP volumes; both developments are expected to be 50% completed by 2022 and fully completed by 2040 respectively.

Therefore, for the purpose of this assessment, the total existing traffic volumes (referred to as the 'base volumes') for the year 2040 are the sum of the following;

- 2016 survey results undertaken by BECA in November 2016 (outlined in section 5.2 of this report);
- PSP 2040 paramics model volumes[6];
- Two new developments (total 430 dwellings); and
- The planned residential development at 53 Munro Road.

Appendix C provides the base volumes predicted for the year 2040.

8 NETWORK ANALYSIS

8.1 GENERAL

The Pokeno Intersection Assessment report provides indicative intersection forms for the years 2022 and 2040 for existing intersections within Pokeno. That assessment has been undertaken using the PSP 2022 paramics model volumes, existing surveyed volumes and additional development traffic, and is provided in Table 4 below.

[6] Extracted from the Pokeno Intersection Report prepared by the Waikato District Council/ BECA Ltd;

Table 4: Traffic volumes extracted from the Pokeno Intersection Report for the year 2022 and 2040

Table 6: Modelled Daily Traffic Flows

Modelled Approach VPD	Approach					Warrant
2016	N	E	S	W	Total	
Pokeno Road / Munro Road	400	1,100	-	1,600	3,100	Give-way
Pokeno Road / Helenslee Road	600	1,400	-	1,300	3,300	Give-way
Pokeno Road / McLean Street	-	-	-	-	0	Give-way
Pokeno Road / Great South Road	1,100	-	1,900	1,200	4,200	Give-way
Great South Road / SH1 NB On-Ramp	1,700	-	1,400	5	3,100	Give-way
½ Development, 2022	N	E	S	W	Total	
Pokeno Road / Munro Road	800	2,900	-	3,500	7,200	Give-way / Roundabout
Pokeno Road / Helenslee Road	1800	4,100	-	2,900	8,800	Signals/Roundabout
Pokeno Road / McLean Street	-	4,900	2,700	3,500	11,100	Signals/Roundabout
Pokeno Road / Great South Road	5,700	-	5,100	5,300	16,100	Signals/Roundabout
Great South Road / SH1 NB On-Ramp	3,700	100	6,000	0	9,800	Signals/Roundabout
Full Development, 2040	N	E	S	W	Total	
Pokeno Road / Munro Road	1,100	4,800	-	5,300	11,200	Give-way / Roundabout
Pokeno Road / Helenslee Road	3,000	6,700	-	4,600	14,300	Signals/Roundabout
Pokeno Road / McLean Street	-	9,900	5,400	7,100	22,400	Signals/Roundabout
Pokeno Road / Great South Road	10,400	-	8,400	9,400	28,200	Signals/Roundabout
Great South Road / SH1 NB On-Ramp	5,600	200	11,100	0	16,900	Signals/Roundabout

As shown above, all the intersections (potentially excluding the Pokeno Road/ Munro Road intersection) will require some form of mitigation by the year 2022. Of note, no detailed designs of these intersection are available.

As such, the following sections assess the intersection layouts required to cater for the future development volumes (planned and proposed) for the year 2040.

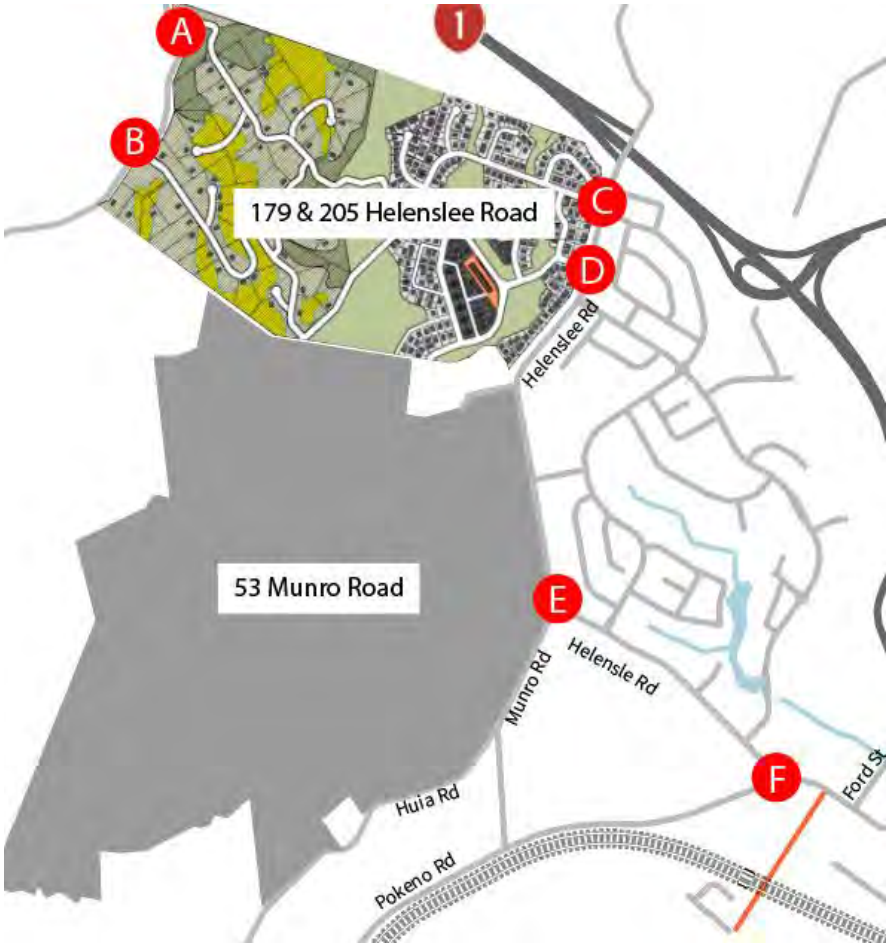
In this regard, a SIDRA intersection analysis has been undertaken (on the surrounding road network) to determine the intersection performance as a result of the predicted traffic volumes for the years 2040. The four new intersections (Intersection A – D as shown in Figure 8-1 below) proposed by the development will be assessed. Furthermore, the key surrounding (existing) intersections have been included in this assessment;

- Pokeno Road/ Helenslee Road intersection (F); and
- Helenslee Road/ Munro Road intersection (E).

Section 8 of the 53 Munro Road TIA already outlines the recommended intersection forms (indicative) to cater for the base scenario volumes as well as the planned residential development at 53 Munro road for the year 2022 and 2040. As such, for the purpose of this assessment, the recommended intersection layout for the above intersections will be extracted from the TIA, to determine where any further mitigation is required as part of the additional volumes. It is noted that the recommended intersection layouts outlined in this report are indicative only and subject to change of demand.

Figure 8-1 sets out the location of each intersection (A – F) in relation to the surrounding environment

Figure 8-1: Intersections



8.2 TRIP DISTRIBUTION / MODEL GENERATION

8.2.1.1 PROPOSED DEVELOPMENT DISTRIBUTION ASSUMPTIONS

All trips associated with the 414 dwellings have been added to the existing road network.

The RTA guide suggests that 80% of the trips by a residential development during the morning peak hour are exit movements and 20% are entry movements with the reverse occurring during the evening peak hour. Therefore, a total of 282 egress movements are expected during the morning peak hour (70 ingress movements).

Traffic distribution rates from the Pokeno Intersection Assessment report were calibrated to represent the directional vehicle movement proportions to and from Auckland, Pokeno/ Hamilton and Waikato (west) during the AM peak hour (with the same occurring during the PM peak hour). These rates were used in the PSP paramics model, specifically for the residential area on Helenslee Road, and are summarised in Table 5 below.

Table 5: AM peak

Direction	Waikato west (Tuakau)	Pokeno/ Hamilton	Auckland	TOTAL
To/ from	20%	45%	35%	100%

Total no. of trips	71 trips	158 trips	123 trips	352 trips

As can be seen above, during the morning peak hour the majority of commuters are expected to travel to Pokeno/ Hamilton and Auckland with a small proportion of residents expected to commute to the wider Waikato region.

Furthermore, vehicle movements to and from the site (during the morning and evening peak hour) have been distributed via the four proposed intersections based on the origin/ destination of the trip; this is outlined in Table 6 below.

Table 6: Proportion of Waikato west (Tuakau) vehicle movements at intersections

Origin/ destination	Intersection used	% split of Waikato (west) based trips
Waikato west (Tuakau)	Int A	50%
	Int B	50%
	Total	**100%**

Table 7: Proportion of Pokeno/ Hamilton vehicle movements at intersections

Origin/ destination	Intersection	% of Pokeno/ Hamilton based trips
Pokeno/ Hamilton	Int C	50%
	Int D	50%
	Total	**100%**

Table 8: Proportion of Auckland vehicle movements at intersections

Origin/ destination	Intersection	% of Auckland based trips
Auckland	Int A	8%
	Int B	8%
	Int C	42%
	Int D	42%
	Total	**100%**

As shown above, the direction of the vehicle movements and the route that commuters were likely to take was determined according to their destinations (Auckland, Pokeno/ Hamilton and Waikato). When distributing traffic at each of the proposed intersections, the following assumptions were made:

- For trips to and from Auckland
  - Vehicles from the "Residential' zone are expected to use the SH1 Razorback Road interchange via Helenslee Road when travelling to and from Auckland.
  - Vehicles from the 'Country Living' zone are expected to use the SH1 Ridge Road interchange via Ridge Road when travelling to/ from Auckland.

- For trips to and from Hamilton and the Pokeno town centre;
    - All vehicles leaving the site will head south along Helenslee Road towards the town centre or SH1 southbound on-ramp (vice versa for vehicle movements into the site).
- For trips to and from Waikato (west);
    - All vehicles leaving the site will head south along Ridge Road towards Whangarata Road with the reverse occurring for vehicles entering the site from west.

In summary, the trips generated by the potential residential development at the site comprising of some 414 dwellings can be distributed accordingly to the inbound/ outbound percentage (80% / 20% split) to estimate the number of vehicles travelling into and out of the site for each morning and afternoon peak hours. The directional proportions provided by BECA (shown in Table 5 above) can then be used to determine the actual number of trips to and from Auckland, Pokeno and Waikato during the morning and afternoon peak hours, which are shown in Table 9 below.

Table 9: AM peak trips

Direction	Waikato west (Tuakau)	Pokeno/ Hamilton	Auckland	TOTAL
In from	14	32	25	71 trips
Out to	56	127	99	282 trips

Table 10: PM peak trips

Direction	Waikato west (Tuakau)	Pokeno/ Hamilton	Auckland	TOTAL
In from	56	127	99	282 trips
Out to	14	32	25	71 trips

As shown above, the morning peak hour vehicle movement consists of a total of 71 inbound movements and 282 outbound movements with the reverse occurring during the evening peak hour.

8.2.1.2 ADDITIONAL TRAFFIC MOVEMENTS

Appendix D provides the estimated development traffic movements, at the proposed intersections and surrounding existing intersections, generated by the potential residential development at the site.

8.2.1.3 PROPOSED TRAFFIC MOVEMENTS

Appendix E sets out the predicted traffic volumes (proposed and planned) during the morning and evening peak for the year 2040 respectively.

Of note, for the purpose of this assessment, the traffic volumes have been assessed for years 2040 only for which the entire development is expected to be completed.

9 ASSESSMENT OF EFFECTS

9.1 ASSESSMENT METHODOLOGY

The traffic effects of the indicative development have been assessed using the traffic modelling software SIDRA Intersection.

The results presented in this report include the Degree of Saturation, which is a measure of available capacity and the Level of Service ("LOS), which is a generalised function of delay. For signal-controlled intersections, a Degree of Saturation less than 0.9 is considered acceptable. LOS A and B

are very good and indicative of free-flow conditions; C is good; D is acceptable; and E and F are indicative of congestion and unstable conditions.

As noted, this assessment assesses the intersection layout required to cater for the impact of the potential residential development on the surrounding road network and if the additional volumes trigger a change to the intersection form than that recommended in the Pokeno Intersection Assessment report. As noted, the recommended intersection layouts outlined in this report are indicative only and subject to change of demand.

9.2 INT A/ B – SITE ENTRANCE/ RIDGE ROAD (NORTHERN & SOUTHERN CONNECTION) - PROPOSED INTERSECTION

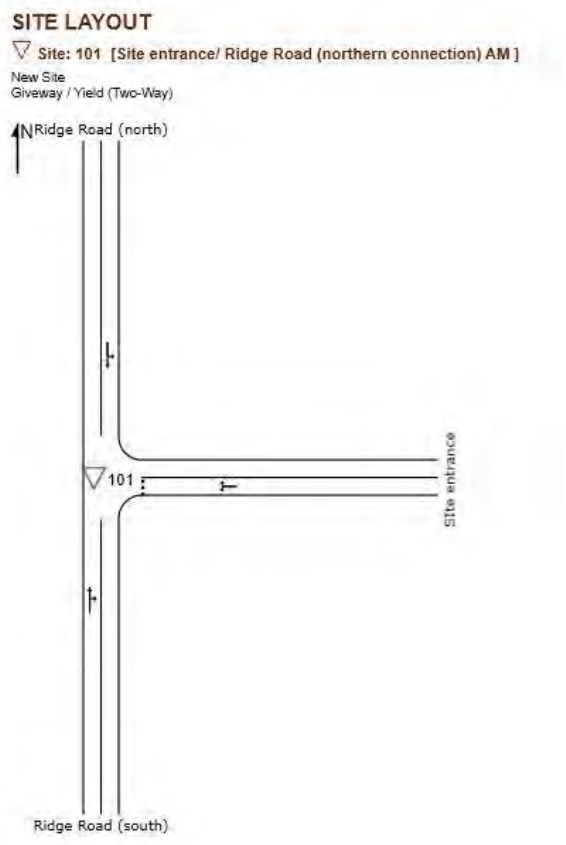
9.2.1 RECOMMENDED LAYOUT

Two new intersections are proposed along Ridge Road (one northern and southern connection respectively) as part of the potential residential subdivision. It is noted that there are no traffic volumes provided for Ridge Road in the Pokeno Intersection Assessment Report; furthermore, there is no accurate information regarding the potential development that may occur along Ridge Road in the near future. As such, the performance of the proposed intersection has been assessed based on existing (through) traffic volumes[7].

These intersections will be give-way controlled with priority to traffic along Ridge Road. The general layout of the intersection is set out in Figure 9-3 below.

[7]Waikato District Council - RAMM Traffic and Loading data - July 2018

Figure 9-1: Intersection A & B - proposed intersection layout



9.2.2 MODELLING RESULTS

The intersection performance for the proposed intersection is summarised in Table 11 and Table 13 below.

Table 11: Intersection A (northern connection/ Ridge Road intersection) movement summary - AM (PM)

Movement		Degree of Saturation (v/c)	Average delay (sec)	Level of service	95%tile back of queue (m)
South: Ridge Road	TH	0.031 (0.042)	0.0 (0.1)	LOS A (A)	0.3 (1.1)
	RT	0. 031 (0.042)	5.6 (5.7)	LOS A (A)	0.3 (1.1)
East: Site entrance	LT	0.026 (0.007)	5.7 (5.7)	LOS A (A)	0.7 (0.2)
	RT	0.026 (0.007)	5.9 (5.9)	LOS A (A)	0.7 (0.2)
North: Ridge Road	LT	0.025 (0.030)	5.6 (5.6)	LOS A (A)	0.0 (0.0)
	TH	0.025 (0.030)	0.0 (0.0)	LOS A (A)	0.0 (0.0)

Table 12: Intersection B (southern connection/ Ridge Road intersection) movement summary - AM (PM)

Movement		Degree of Saturation (v/c)	Average delay (sec)	Level of service	95%tile back of queue (m)
South: Ridge Road	TH	0.035 (0.056)	0.0 (0.1)	LOS A (A)	0.3 (1.2)
	RT	0.035 (0.056)	5.7 (5.7)	LOS A (A)	0.3 (1.2)
East: Site entrance	LT	0.026 (0.007)	5.8 (5.7)	LOS A (A)	0.1 (0.2)
	RT	0.026 (0.007)	6.0 (6.0)	LOS A (A)	0.1 (0.2)
North: Ridge Road	LT	0.039 (0.030)	5.6 (5.6)	LOS A (A)	0.0 (0.0)
	TH	0.039 (0.030)	0.0 (0.0)	LOS A (A)	0.0 (0.0)

As shown above, both new intersections on Ridge Road are expected to operate acceptably. All movements operate at overall LOS A with a maximum average delay of 6.0 seconds and 95%tile back of queue of 0.7 m. As such, it is considered that a give-way intersection is considered acceptable to cater for the proposed traffic volumes at Intersection A and B.

It is noted that the intersections should be reassessed at detailed design stage, to determine whether or not further development has occurred along Ridge Road (resulting in significant increases of through movement along Ridge Road), and the final detailed design for the intersection (e.g. right turn bays / sight distance).

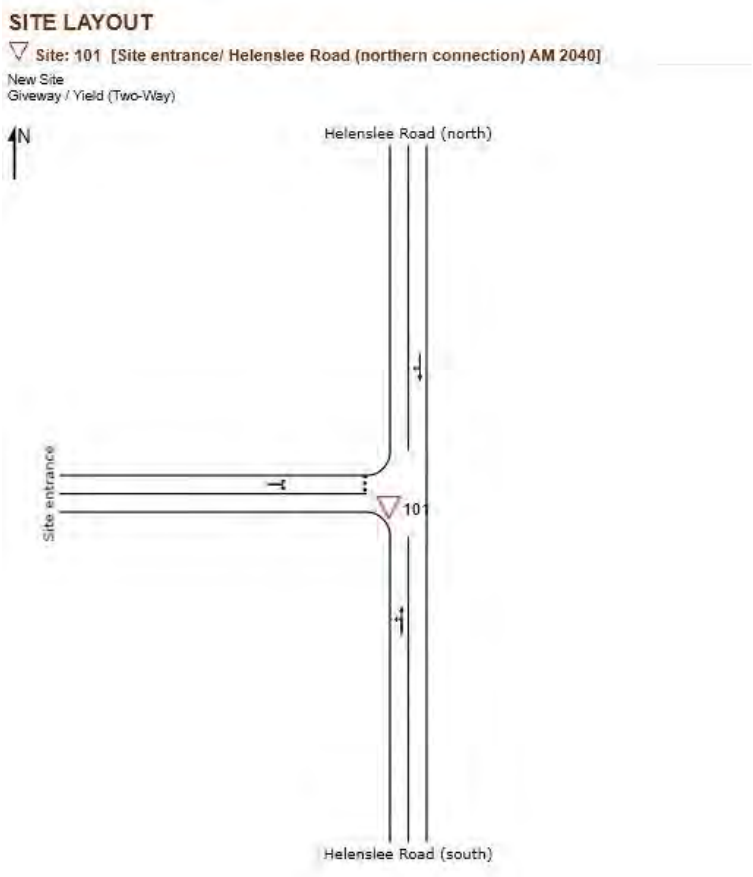
9.3 INT C - SITE ENTRANCE/ HELENSLEE ROAD (NORTHERN CONNECTION) - PROPOSED INTERSECTION

9.3.1 RECOMMENDED LAYOUT

This is a new intersection that will be established as part of the potential residential subdivision and as such no layout is outlined in the Pokeno Intersection Assessment report.

This intersection will be give-way controlled with priority to traffic along Ridge Road. The layout of the intersection is set out in Figure 9-2 below.

Figure 9-2: Intersection C recommended layout (indicative)



9.3.2 SIDRA MODELLING RESULTS

The intersection performance for the year 2040 are summarised in Table 13 below.

Table 13: 2040 Intersection C movement summary - AM (PM)

Movement		Degree of Saturation (v/c)	Average delay (sec)	Level of service	95%tile back of queue (m)
South: Helenslee Road	LT	0.360 (0.254)	5.6 (5.6)	LOS A (A)	0.0 (0.0)
	TH	0.360 (0.254)	0.0 (0.0)	LOS A (A)	0.0 (0.0)
North: Helenslee Road	TH	0.292 (0.471)	0.2 (0.4)	LOS A (A)	1.6 (6.9)
	RT	0.292 (0.471)	10.6 (9.4)	LOS B (A)	1.6 (6.9)
West: Site entrance	LT	0.295 (0.088)	10.2 (7.2)	LOS B (A)	7.7 (1.9)
	RT	0.295 (0.088)	18.8 (20.3)	LOS C (C)	7.7 (1.9)

As shown above, the new intersection is expected to operate acceptably for the 2040. All movements operate at overall LOS A – B in 2040; this excludes the right turn movement from the site entrance

which is expected to operate at a LOS C during the morning and afternoon peak. This particular movement experiences a maximum delay of 20.3 seconds (evening peak) and 95%tile queue of 1.9 m. with the right turn movement from the site approach changing to LOS C in 2040 (PM). As such, a give-way controlled intersection is considered adequate to cater for the proposed traffic volumes at this intersection.

To ensure minimal disruption to Helenslee Road is recommended that this intersection be designed and constructed with a right turn bay on Helenslee Road into the site (similar to the existing Hillpark drive / Helenslee Road intersection) and have two approach lanes on the new subject road.

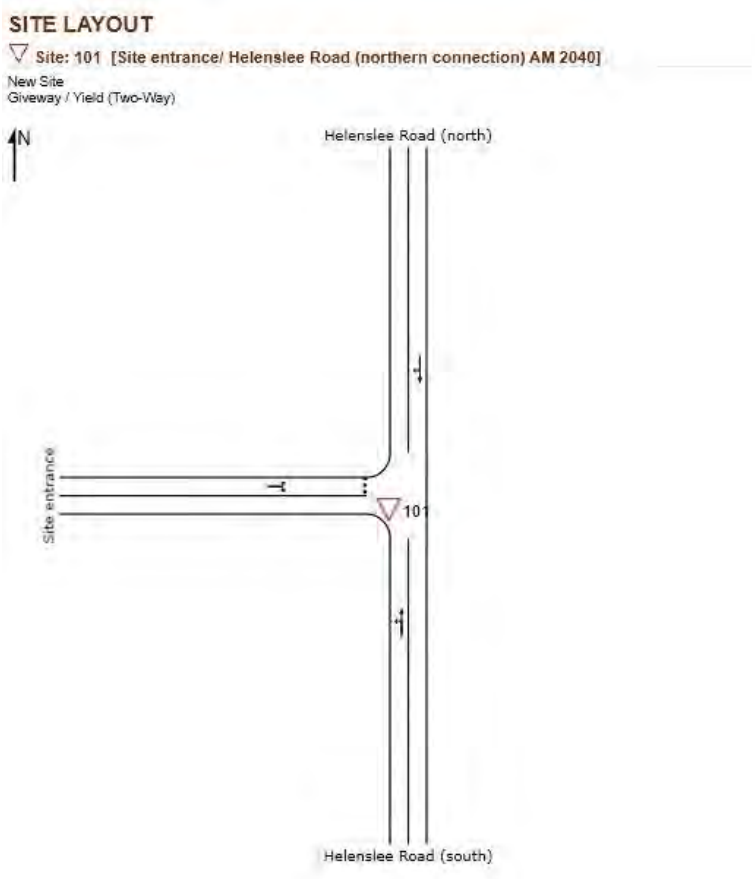
9.4 INT D - SITE ENTRANCE/ HELENSLEE ROAD (SOUTHERN CONNECTION) – PROPOSED INTERSECTION

9.4.1 RECOMMENDED LAYOUT

This is a new intersection that will be established as part of the potential residential subdivision and as such no layout is outlined in the Pokeno Intersection Assessment report.

This intersection will be give-way controlled with priority to traffic along Ridge Road. The layout of the intersection is set out in Figure 9-3 below.

Figure 9-3: Intersection D - proposed intersection layout



9.4.2 MODELLING RESULTS

The intersection performance for the year 2040 is summarised in Table 14 below.

Table 14: 2040 Intersection D movement summary - AM (PM)

Movement		Degree of Saturation (v/c)	Average delay (sec)	Level of service	95%tile back of queue (m)
South: Helenslee Road	LT	0.346 (0.284)	5.6 (5.6)	LOS A (A)	0.0 (0.0)
	TH	0.346 (0.284)	0.0 (0.0)	LOS A (A)	0.0 (0.0)
North: Helenslee Road	TH	0.321 (0.460)	0.2 (0.5)	LOS A (A)	1.7 (7.3)
	RT	0.321 (0.460)	10.5 (10.0)	LOS B (B)	1.7 (7.3)
West: Site entrance	LT	0.300 (0.091)	10.0 (7.5)	LOS B (A)	7.8 (2.0)
	RT	0.300 (0.091)	19.3 (20.9)	LOS C (C)	7.8 (2.0)

As shown above, the new intersection is expected to operate acceptably for the 2040. All movements operate at overall LOS A – B in 2040; this excludes the right turn movement from the site entrance which is expected to operate at a LOS C during the morning and afternoon peak. This particular movement experiences a maximum delay of 19.3 seconds (evening peak) and 95%tile queue of 2.0 m. As such, a give-way controlled intersection is considered adequate to cater for the proposed traffic volumes at this intersection.

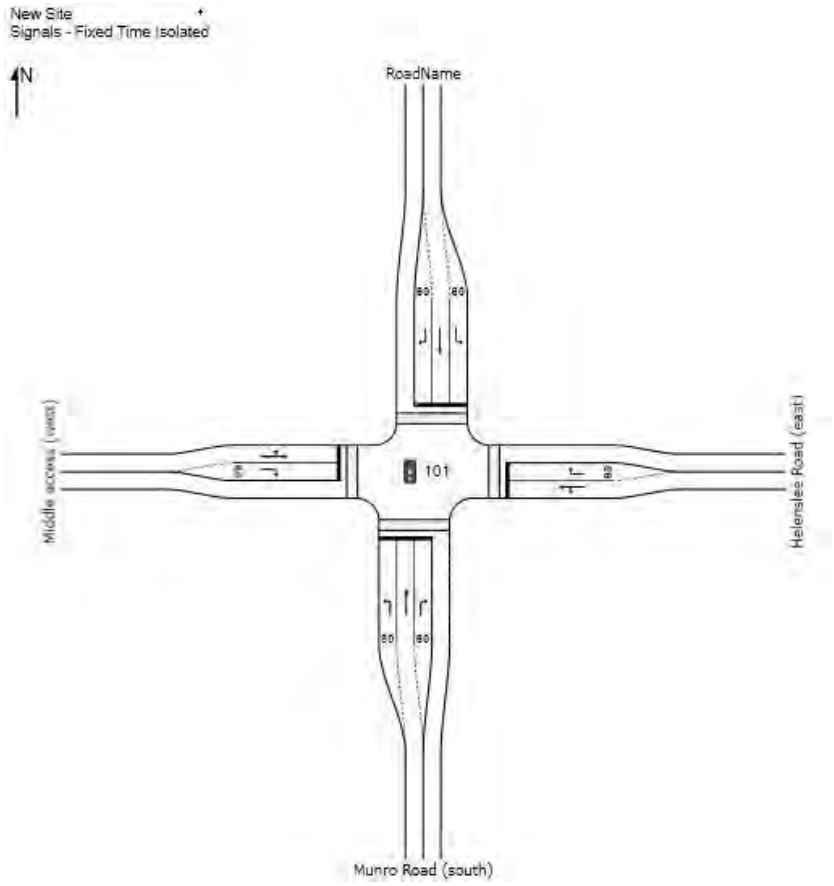
To ensure minimal disruption to Helenslee Road is recommended that this intersection be designed and constructed with a right turn bay on Helenslee Road into the site (similar to the existing Hillpark Drive / Helenslee Road intersection located some 80m to the south of this intersection) and have two approach lanes on the new subject road.

9.5 INT E – HELENSLEE ROAD/ MUNRO ROAD/ NEW ROAD PLANNED INTERSECTION

As outlined in section 9.4 of the 53 Munro Road TIA, upgrades are planned at the Munro Road/ Helenslee Road intersection as part of the development. The recommended layout of the intersection for the year 2040 is shown in Figure 9.3 of the TIA and Figure 9-4 below.

The intersection will be signalised as part of the 53 Munro Road residential development, with an additional western approach connecting to that site.

Figure 9-4: Intersection E proposed layout



9.5.1 MODELLING RESULTS

The expected performance of the intersection for the year 2040 (AM and PM), as a result of the proposed development (and 53 Munro Road), are outlined in Table 15 and Table 16 below respectively.

Table 15: Intersection E AM movement summary 2040 – proposed (already planned)

Movement		Degree of Saturation (v/c)	Average delay (sec)	Level of service	95%tile back of queue (m)
South: Munro Road	LT	0.043 (0.060)	26.4 (25.6)	LOS C (C)	8.7 (6.8)
	TH	0.294 (0. 410)	23.7 (22.9)	LOS C C)	72.2 (56.5)
	RT	0.521 (0. 321)	75.9 (46.3)	LOS E (D)	21.1 (12.6)
East: Helenslee Road	LT	0.135 (0.128)	57.1 (37.2)	LOS E (D)	15.7 (9.7)
	TH	0.135 (0.128)	51.5 (31.6)	LOS D (C)	15.7 (9.7)
	RT	0.904 (0.909)	78.3 (56.4)	LOS E (E)	137.5 (78.9)

North: Helenslee Road	LT	0.881 (0.881)	48.4 (44.3)	LOS D (D)	274.9 (157.6)
	TH	0. 211 (0.295)	22.7 (21.9)	LOS C (C)	49.7 (38.9)
	RT	0. 229 (0.141)	74.1 (45.3)	LOS E (D)	9.0 (5.4)
West: New road	LT	0.903 (0.845)	78.4 (48.3)	LOS E (D)	134.8 (81.4)
	TH	0. 903 (0.845)	72.8 (42.7)	LOS E (D)	134.8 (81.4)
	RT	0. 120 (0.141)	56.1 (39.5)	LOS E (D)	13.8 (9.0)

Table 16: Intersection E PM movement summary 2040 – proposed (already planned)

Movement		Degree of Saturation (v/c)	Average delay (sec)	Level of service	95%tile back of queue (m)
South: Helenslee Road	LT	0.117 (0.126)	38.6 (30.1)	LOS D C)	13.7 (10.0)
	TH	0. 686 (0. 736)	39.0 (30.5)	LOS D (C)	99.6 (75.3)
	RT	0. 205 (0. 192)	54.3 (39.9)	LOS D (D)	10.3 (7.3)
East: Helenslee Road	LT	0.467 (0.446)	48.7 (35.8)	LOS D (D)	44.2 (31.2)
	TH	0.467 (0.446)	43.1 (30.2)	LOS D (C)	44.2 (31.2)
	RT	0.903 (0.446)	56.6 (42.6)	LOS E (D)	180.7 (86.7)
North: Helenslee Road	LT	0.615 (0.575)	43.5 (33.2)	LOS D (C)	82.6 (51.3)
	TH	0.878 (0.861)	50.4 (37.1)	LOS D (D)	138.6 (100.4)
	RT	0. 851 (0.794)	63.5 (45.4)	LOS E (D)	49.2 (34.4)
West: New road	LT	0.190 (0.182)	46.5 (34.2)	LOS D (C)	16.8 (11.8)
	TH	0.190 (0.182)	40.9 (28.6)	LOS D (C)	16.8 (11.8)
	RT	0.035 (0.053)	32.0 (30.4)	LOS C (C)	4.7 (3.9)

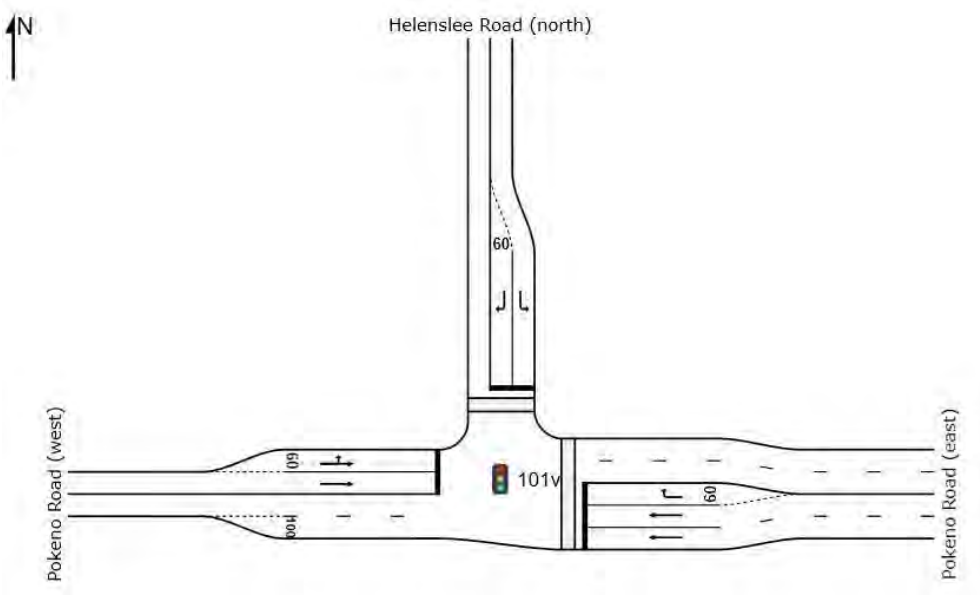
As shown above, the performance of the intersection declines as a result of the additional traffic volumes with a number of movements operating at a LOS E during the morning peak and LOS D (evening peak). During the morning peak, the maximum average delay is 48.3 seconds and occurs at the left turn on the western approach (from 53 Munro Road); this increases to 78.4 seconds as a result of the potential development. The maximum 95%tile back of queue occurs at the northern approach (274.9 m) which operates at degree of saturation of 0.881 (near capacity).

Overall it is considered that the proposed signalised intersection is operating near capacity in 2040 however it is considered acceptable.

9.6 INTERSECTION F - POKENO ROAD/ HELENSLEE ROAD INTERSECTION (EXISTING)

As outlined in section 9.9.1 of the TIA, upgrades are required at the Helenslee Road/ Pokeno Road intersection as a result of the increasing traffic volumes. This is in alignment with the Pokeno Intersection Assessment report which states that a signal/ roundabout intersection form is warranted for the 2022 and 2040 at the Helenslee Road/ Pokeno Road intersection. The recommended layout of the intersection for the year 2040 is shown in Figure 9-5 below.

Figure 9-5: Intersection F - Planned Pokeno Road/ Helenslee Road intersection layout



As such, with the additional traffic volumes generated by the potential residential development, the performance of the intersection for the year 2040 (AM and PM) are outlined in Table 17 and Table 18Table 18 below.

Table 17: Intersection F AM movement summary 2040 – proposed (already planned)

Movement		Degree of Saturation (v/c)	Average delay (sec)	Level of service	95%tile back of queue (m)
East: Pokeno Road	TH	0.357 (0.311)	8.6 (5.2)	LOS A (A)	36.3 (25.2)
	RT	0.766 (0.547)	20.2 (13.9)	LOS C (B)	38.7 (21.2)
North: Helenslee Road	LT	0.880 (0.826)	27.1 (20.9)	LOS C (C)	109.6 (176.0)
	RT	0.113 (0.212)	20.3 (22.8)	LOS C (C)	7.7 (7.6)
	LT	0.846 (0.826)	32.3 (26.6)	LOS C (C)	74.3 (59.4)

West: Pokeno Road	TH	0.846 (0.826)	26.8 (21.1)	LOS C (C)	74.3 (59.4)

Table 18: Intersection F PM movement summary 2040 – proposed (already planned)

Movement		Degree of Saturation (v/c)	Average delay (sec)	Level of service	95%tile back of queue (m)
East: Pokeno Road	TH	0.388 (0.399)	4.8 (4.6)	LOS A (A)	52.8 (48.3)
	RT	0.863 (0.765)	29.6 (19.7)	LOS C (B)	161.7 (83.8)
North: Helenslee Road	LT	0.292 (0.285)	12.3 (12.8)	LOS B (B)	37.2 (31.9)
	RT	0.131 (0.140)	34.8 (31.5)	LOS C (C)	7.5 (6.9)
West: Pokeno Road	LT	0.795 (0.730)	37.7 (30.4)	LOS D (C)	85.1 (69.1)
	TH	0.795 (0.730)	32.4 (25.2)	LOS C (C)	85.1 (69.1)

As shown above, the intersection continues to work acceptably with the potential residential development. All movements continue to operate at overall LOS A – C with the exception of the left turn from Pokeno Road (western approach) operating at a LOS D (previously LOS C) during the evening peak. The degree of saturation for this particular movement increases from 0.73 to 0.795 and the 95%tile back of queues increases to 85.1 m; the degree of saturation remains less than 0.9 therefore this is considered acceptable.

10 MITIGATION SUMMARY

10.1 INTERSECTIONS

Based on the above assessment, the following intersections, outlined in in Table 19 below, are recommended for the year 2022 and 2040.

Table 19: Recommended Intersection upgrades (indicative)

Intersection name		Existing intersection form	Pokeno Intersection report recommendation (2022)	2040 layout (recommended as part of 53 Munro Road)	2040 layout (recommended)
A	Site entrance/ Ridge Road	-	-	-	Give-way
B	Site Entrance/ Ridge Road	-	-	-	Give-way

C	Site entrance/ Helenslee Road	-	-	-	Give-way
D	Site Entrance/ Helenslee Road	-	-	-	Give-way
E	Munro Road/ Helenslee Road	Give-way	-	Signals	Signals (unchanged)
F	Helenslee Road/ Pokeno Road	Give-way	Roundabout/ signals	Signals	Signals (unchanged)

Furthermore, consideration should be given to the following:

- Access to individual properties should be minimised along Helenslee Road; and
- The two give-way intersection on Helenslee Road should be deigned with a painted flush median / right turn bay on Helenslee Road and two-lane approach to Helenslee Road.

It is also recommended to assess the performance of these intersections in the year 2022 to ensure that the intersection is performing as expected.

10.2 PUBLIC TRANSPORT

As noted in section 2.3.2 of this report, there are limited public transport services in Pokeno. The proposal intends to establish a bus stop within the site. In this regard, the following public transport services should be considered to mitigate the transport effects of growth in this region and provide residents with an alternative transport mode when traveling to and from the site.

10.2.1 RECOMMENDED PUBLIC TRANSPORT SERVICES

Travel data has been obtained from NZ Stats commuter view which provides an interactive mapping tool showing the number of people commuting between area units throughout New Zealand. The data obtained was collected during the 2013 census. Figure 10-1shows the direction of travel for commuters in Pokeno.

Figure 10-1: Travel to work (NZ stats)

Based on the NZ stats data, the following can be concluded for commuters within Pokeno during 2013:

- Approximately 70% of the Pokeno resident working population commute out of the area (the remainder work within Pokeno).
- the majority of commuters travel north to Auckland (54%) and Pukekohe (8%) with some travelling east and west of Pokeno including Tuakau (4%).

As such, any public transport network implemented should cater for these regions. The following services are recommended:

- Bus services to the southern elected rail stations in Auckland, operating on the hour between 6:00am – 9am;
- Local public transport services: bus route starting from the Pokeno town centre which passes through the proposed plan change area, the Helenslee residential block (located directly east of the site) and concludes back at the town centre. Of note, some thought should be given to connecting Tuakau and Pokeno via some means of public transport to encourage residents travelling to and from these destinations to utilise the public transport network;
- Lastly, given the recent improvements of connections between Hamilton and Pokeno (the Waikato expressway) the reduced travel time between the two areas is likely to encourage

residents to commute to Hamilton. As such, consideration of an express bus route should be given for residents commuting between Pokeno and Hamilton.

Of note, the above recommendations are indicative and should be considered in conjunction with the community and any future land use developments to ensure the correct commuter areas are being incorporated.

It is noted that the Pokeno Structure Plan provides and an indicative bus route (shown in Figure 10-2 below). If this plan change is approved, consideration should be given to incorporating the plan change area into this bus route.

Figure 10-2: PSP indicative walking/ bus route

11 PARKING

11.1 WAIKATO DISTRICT PLAN (FRANKLIN SECTION)

Table 51.A of the Franklin Section states that the minimum parking spaces required for a dwelling house is '1 covered or uncovered car park per unit'.

On this basis, each dwelling should provide a minimum of one parking space per dwelling to comply with the current district plan requirements.

11.2 ON-STREET PARKING

On-street parking on the proposed collector road can be determined at future resource consent stages however it is generally considered that a minimum of 1 space per 4 dwellings is an appropriate

design standard. This would equate to some 103 parking spaces for the plan change area. These can be distributed between the local and collector road network.

This may require investigation of on-street angled parking and the provision of time restrictions to avoid residents using on-street parking as informal resident parking.

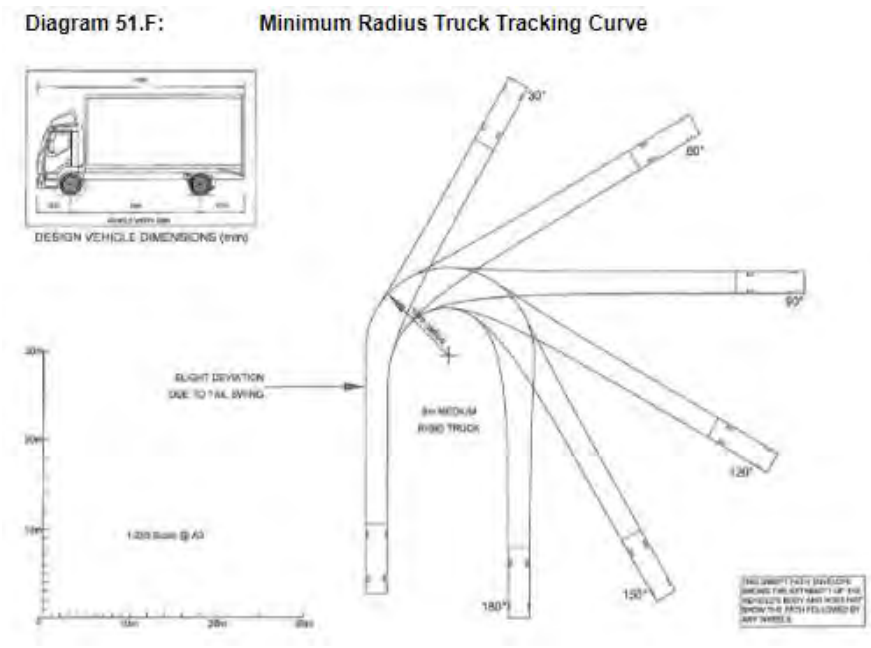
11.3 SERVICING

Rule 51.2 of the District Plan outlines the requirement for loading areas and spaces. For sites within other zones (excluding business zone) the following is required:

- Every activity shall have, on its own site, such provision as is appropriate for the safe and efficient setting down or picking up of all people, goods and materials likely to be associated with its normal operation or functioning. All such areas shall be formed and drained to an all-weather, dust free condition prior to any commencement of the activity to which the space or area relates.

Further, manoeuvring areas associated with loading spaces shall comply with the tracking curves as set out in Diagram 51.F (provided in Figure 11-1 below).

Figure 11-1: Radius truck tracking curve



The proposed road network would be designed to accommodate an 8m medium rigid truck as shown in the figure above. Within the site, it is expected that trucks will be able to access each apartment building for the purposes of furniture delivery and rubbish collection.

This can be investigated at subsequent resource consent stages.

12 INTEGRATION WITH FUTURE TRANSPORT NETWORK

12.1 GENERAL

The following section provides a review of established policy and plans in relation to the proposed development. The documents reviewed comprise:

- The Waikato Plan 2017;
- Waikato Regional Land Transport Plan;
- Waikato Regional Public Transport Plan;
- Regional walking and cycling strategy; and
- Franklin Engineering code of practice.

12.2 THE WAIKATO PLAN

The Waikato Plan ("the plan) is a comprehensive document that identifies and addresses issues that the region faces and seeks to take advantage of opportunities for the Waikato. The plan identifies five key priorities with 10 key action plans to address these priorities. The five priorities are as follows:

1. Planning for population change;
2. Connecting communities through targeted investment;
3. Partnering with iwi/ Maori;
4. Addressing water allocation and quality; and
5. Advancing regional economic development.

In order to achieve the second priority (connect communities), four key transport related actions have been identified including;

- Key action 4: advocate on behalf of regional transport priorities;
- Key action 5: Integrate Waikato and Auckland Transport networks;
- Key action 6: encourage development of a nationally significant cycling and walking experience; and
- Key action 7: Establish a freight and logistics action group.

As noted, the proposed residential development, will provide for an additional 414 dwellings, this will enable and support an increase in population within Pokeno and the North Waikato. It will also provide a roading network which integrates with the existing and Pokeno town centre as well as the wider state highway network to both the Waikato and Auckland, including pedestrian features encouraging the use of alternative modes for local journeys. Several public transport services have also been recommended to better integrate the Waikato and Auckland transport networks. Based on this, the proposal is considered to support the Waikato Plans priorities.

12.3 WAIKATO REGIONAL LAND TRANSPORT PLAN (RLTP)

The Waikato Regional Land Transport Plan (2015-2045) sets out the direction for the region's transport system for the next 30 years. It identifies the land transport objectives and direction for land transport that the region is seeking to achieve to contribute to an effective, efficient and safe land transport system. Six transport objectives are identified in the plan and are summarised below:

- Providing an integrated and aligned land-use and transport system;
- Providing an effective and efficient land transport system that enhances economic well-being and support growth;
- Achieve a significant reduction in risk, deaths and serious injuries across the region;
- Provide an adaptable and flexible approach to managing and developing the land transport system that optimises funding options;
- Provide communities access to a multi modal land transport system that functions effectively to meet their social, cultural and economic needs; and
- Provide an environmentally sustainable and energy efficient land transport system that is robust and resilient to external influences.

A number of upgrades are planned to the existing land transport infrastructure near the vicinity of the site.

The proposed upgrades to the existing land transport infrastructure surrounding the site will integrate and align with the current road network as well as support the proposed growth in the area, thus contributing to a safe, efficient and effective transport system within Pokeno. These upgrades will connect the proposed development with the existing Pokeno town centre community and provide access to multi modal services such as cycling walking and public transport.

As such, the proposed Plan Change is considered to be supportive of the RLTP objectives.

12.4 WAIKATO REGIONAL PUBLIC TRANSPORT PLAN (RPTP)

The Waikato Regional Public Transport Plan 2015 - 2025 outlines the strategic direction for public transport in the Waikato region over the next 10 years. The plan aims to deliver an effective, efficient and integrated public transport system for the region. The vision of the RPTP is to deliver "***a growing and affordable public transport system that contributes to the economic, social and environmental*** *vitality of the region'*. The following key policy focus areas are outlined in the RPTP to support this goal:

- Effective and efficient transport services for the region while meeting current and future demands;
- affordable transport services to users and funders;
- a framework to ensure coordinated planning for the delivery of public transport services and infrastructure;
- an attractive and easily identifiable public transport network providing easily accessible information;
- procurement process that follows the best planning practices; and
- Improved value for money.

There are currently very limited public transport services available in the Pokeno area. However, the ITA provides recommendations to establish public transport services within Pokeno that would connect the area to locations within the wider network such as Auckland, Tuakau and Hamilton. Establishment of these services would provide the development with improved access to public transport services and has the potential to reduce traffic flows between these areas.

The RPTP plan does not identify any significant changes to the rural public transport services. In this regard, provided that the public transport services outlined in this ITA are implemented, the proposed development is considered to align well with the objectives of the RPTP.

12.5 REGIONAL WALKING AND CYCLING STRATEGY

The Waikato Regional Public Transport Plan 2015 - 2025 outlines the strategy for walking and cycling within the Waikato region in accordance with the RLTS. The vision of the strategy is that: "Walking and cycling are safe, integrated and accessible activities in the Waikato region". The strategy intends to achieve this vision with the following three policies and actions:

- Support the construction and maintenance of accessible walking and cycling infrastructure throughout the regions for all user types;
- Promote travel demand management and travel behaviour change initiatives that assist walking and cycling in relieving urban congestion and improving journey time reliability; and
- Recognise the role that walking and cycling can play in the economic development of the region.

The proposed development intends to provide an internal pedestrian path pedestrian path

The proposed development intends to provide a shared path (walking and cycling) within the development as well as along the main street connecting the site near the Pokeno Centre and

school. This will provide an easily accessible path for the use of other modes of transport to and from the site and has the potential to reduce the number of vehicles on the road network. Therefore, the proposal is considered to align well with the walking and cycling strategy.

12.6 FRANKLIN ENGINEERING CODE OF PRACTICE

Should the proposed Plan Change be approved, any roading improvements will follow approved standards namely the Franklin Engineering Code of Practice, Austroads and NZS4404:2010.

13 CONSTRUCTION TRAFFIC

The development site is currently occupied by several dwellings and demolition works followed by earth works would be required before any new development could be constructed. Again, this would be subject to subsequent resource consent processes.

To facilitate construction, a left in/ left out access could be established on Munro Road to accommodate truck movements to and from the site. The volume of earth works is unknown at this stage however can be undertaken over an extended period to minimise traffic effects of necessary.

As is typical with a development of this scale, it is recommended that as part of any later resource consent, a Construction Traffic Management Plan (CTMP) should be required as a condition. It is considered that this Construction Traffic Management Plan should include:

- Construction dates and hours of operation including any specific non-working hours for traffic congestion/noise etc, aligned with normally accepted construction hours in the Auckland Region;
- Truck route diagrams between the site and external road network.
- Temporary traffic management signage/details for both pedestrians and vehicles, to manage the interaction of these road users with heavy construction traffic; and
- Details of site access/egress over the entire construction period and any limitations on truck movements. All egress points should be positioned to achieve appropriate sight distances.

Based on experience of constructing similar projects and bearing in mind capacity within the existing road network, with the appropriate Construction Traffic Management Plan in place and the above measures implemented, it is considered that construction activities can be managed to ensure any generated traffic effects are appropriately mitigated.

14 IMPLEMENTATION PLAN

The following summarises an indicative Implementation Plan. It sets out proposed works that are proposed to be addressed as part of development of this site.

Table 20: Implementation Plan

Trigger	Indicative Upgrade	Comments	Funder
Consents as required	Construction of internal roads including collector roads with 3m shared paths	Provided as required within each stage	Developer
Consents as required	Construction of new 3m shared paths on existing road network including: • on Helenslee Road from the site to the south at 53 Munroe Road to Pokeno Road	Helenslee road from 53 Munroe Road subject site considered to be required initially.	Developer
As demand occurs.	Provision of PT service from / within the site	Collector roads to allow for PT provision in future. Bus service to be provided by Council when required	Council
As development occurs	Provisions of wider intersection upgrades as per 53 Munro Road	Development of subject site assumes development at 53 Munro Road (and network upgrades) has already occurred	Developer (53 Munro Road)
Consents as required	Provision of new priority give-way intersections on Ridge Road and Helenslee Road	Helenslee Road intersection to have right turn bay on Helenslee Road and two approach lanes on side road. Sight distance and exact location on Ridge Road to be determined	Developer
Initially	Upgrade of Helenslee Road from the north of 53 Munro Road development to the north of the subject site	Upgrade generally required on western side only (eastern side already upgraded	Developer

The above works are indicative only and are subject to change depending on the scale of development proposed. The detail of mitigation measures may be revisited at Resource Consent stage.

15 CONCLUSIONS

Based on the assessments undertaken in this report, it is concluded:

- The site, with the mitigation measures identified, has good accessibility to various transport modes: walking, cycling, bus and private vehicle;
- The effects of the proposed increase in vehicles are expected to be minimal provided that the upgrades to intersections recommended in this report are implemented (including those associated with the neighbouring site at 53 Munro Road);

- Sufficient parking can be provided on-site. On street parking is recommended to be established with a parking rate of approximately 1 on-street parking space per 4 dwellings through resource consents stages;
- The proposed development is consistent with and encourages key regional and district transport policies.

The traffic effects of the development potential that could be achieved under the Residential zone, with the implementation of the measures identified in Section 14, are considered acceptable and there is no reason, from a transport perspective, to preclude approval of the proposed Plan Change.

APPENDIX A - MASTER PLAN

LEGEND

- Steeper land
- Gentle slope
- Proposed Countryside Living Zone
  Lot Sizes: 5000m² +
- Proposed Residential Zone (Low Density Zone)
  Lot Sizes: 500 - 600m² +
- Proposed Residential Zone (Medium Density Zone)
  Lot Sizes: 300m² +
- Proposed local centre (shops)
- Reserve / SNA
- Proposed road

FEASIBILITY STUDY

DRAWING REVISIONS

DESCRIPTION	DATE	REV
Feasibility Study	2018.05.25	PD

ARCHITECTURO architects
109A Ti Rakau Drive
Pakuranga, Auckland 2010
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NZIA Practice | Project Management | Architectural Design

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CLIENT / PROJECT

CSL Trust

179 & 205 Helenslee Road

DRAWING TITLE

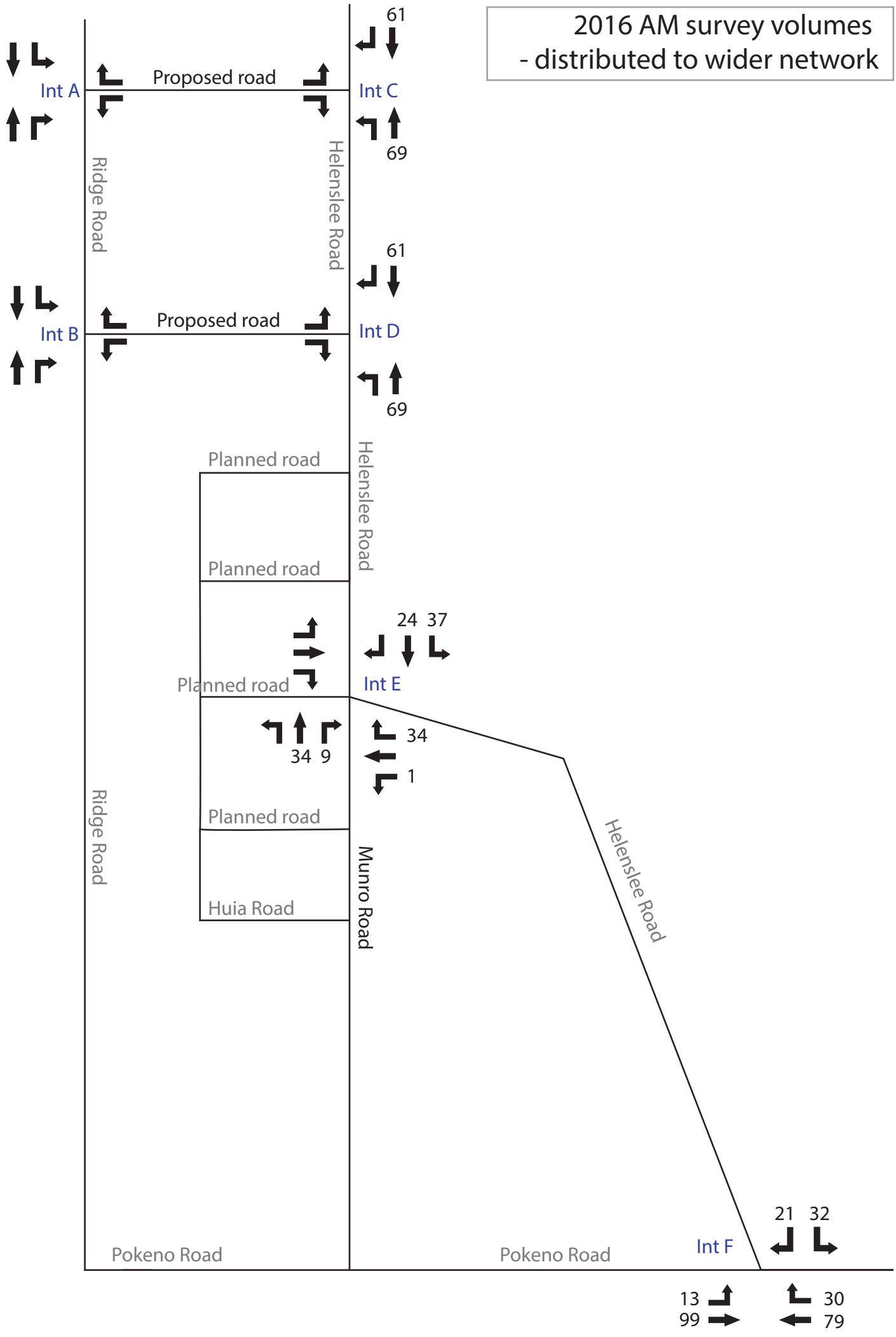
Master Site Plan

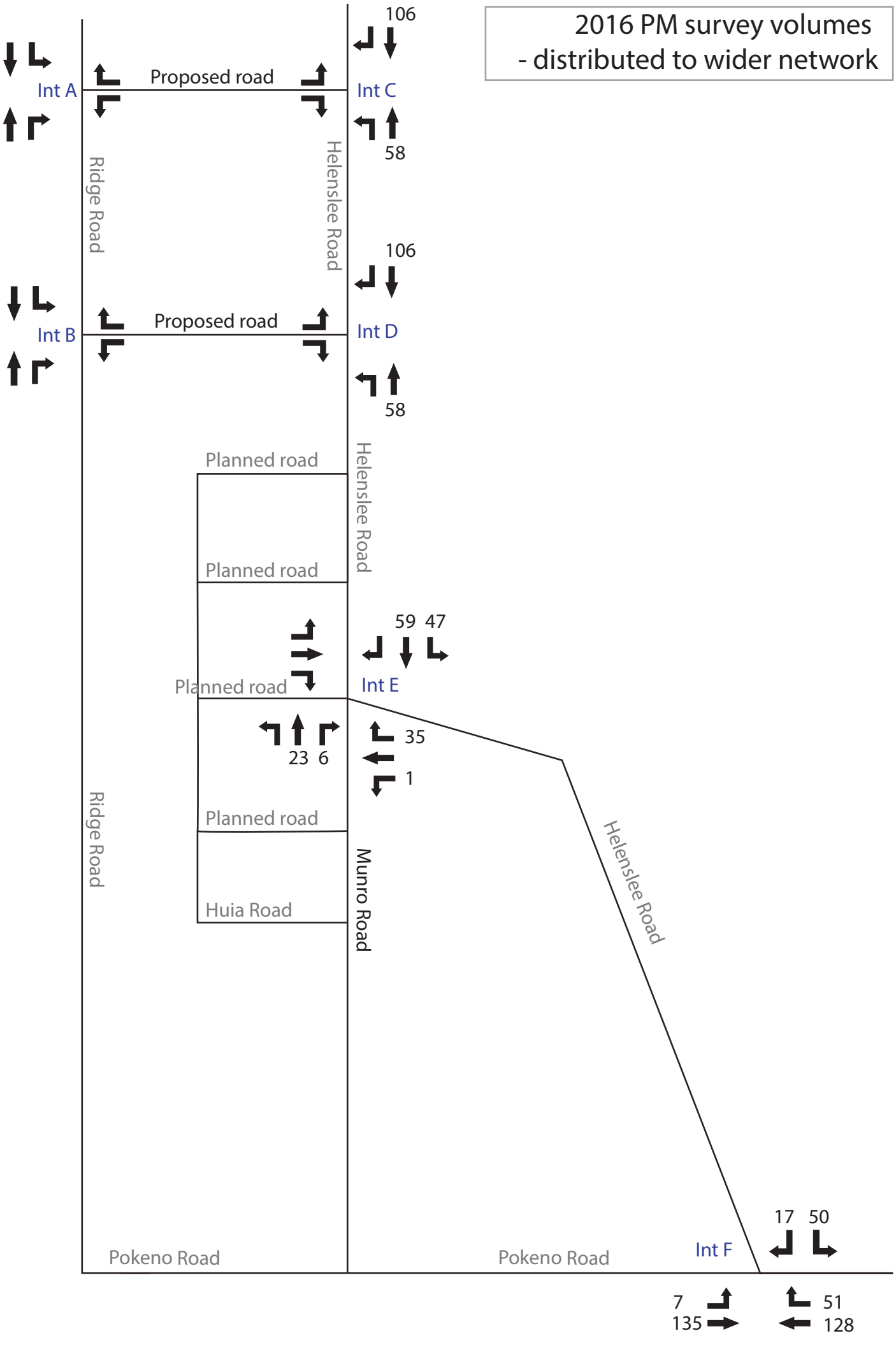
	DATE	INITIAL
DESIGNED	2017.11.21	B HO
DRAWN	2018.05.25	C LOH
CHECKED	2018.05.25	B HO
APPROVED	2018.05.25	B HO

SCALE @ A1	SCALE @ A3
1 : 2500	1 : 5000

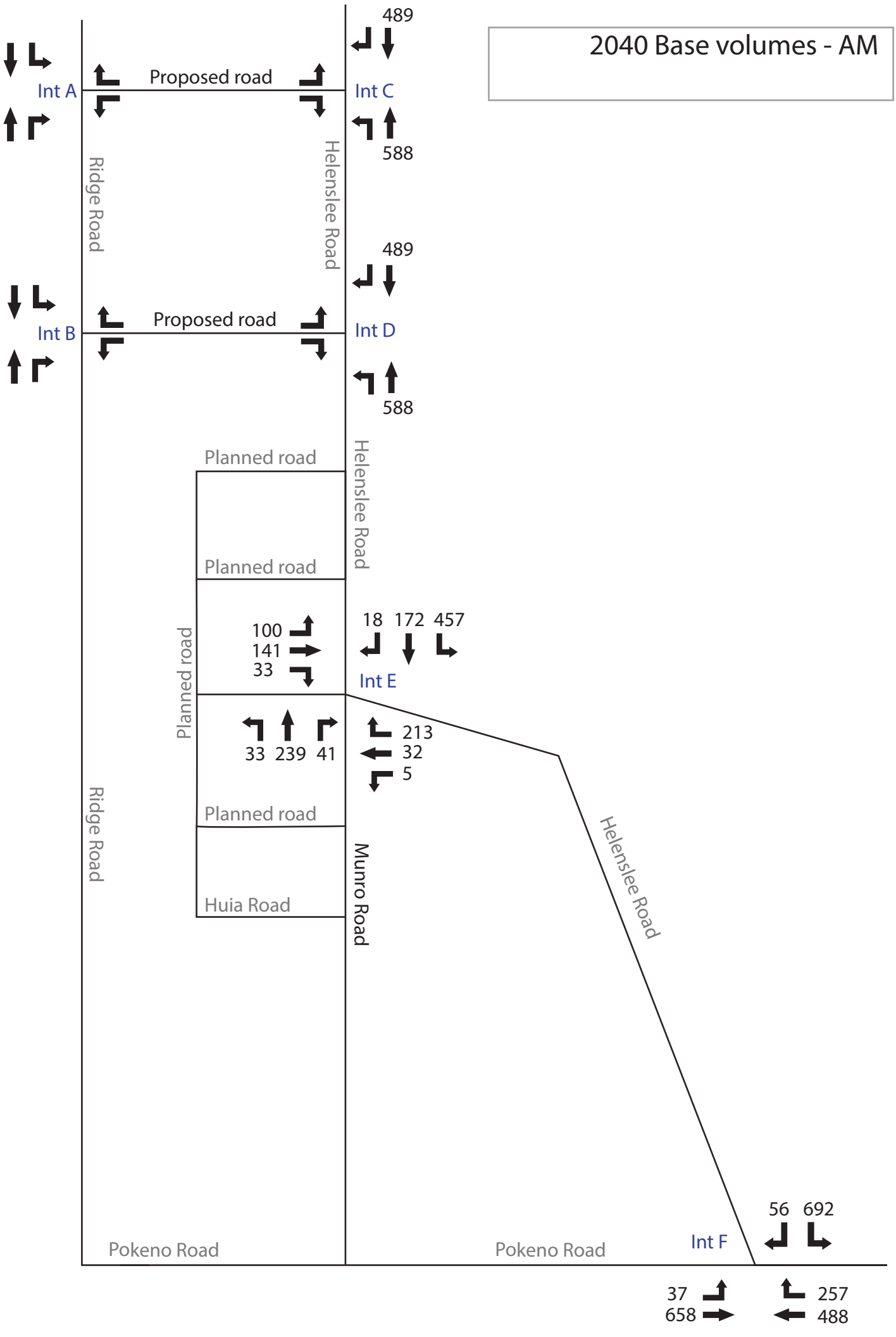
JOB NUMBER	DRAWING NUMBER	REVISION
1812	A111	PD

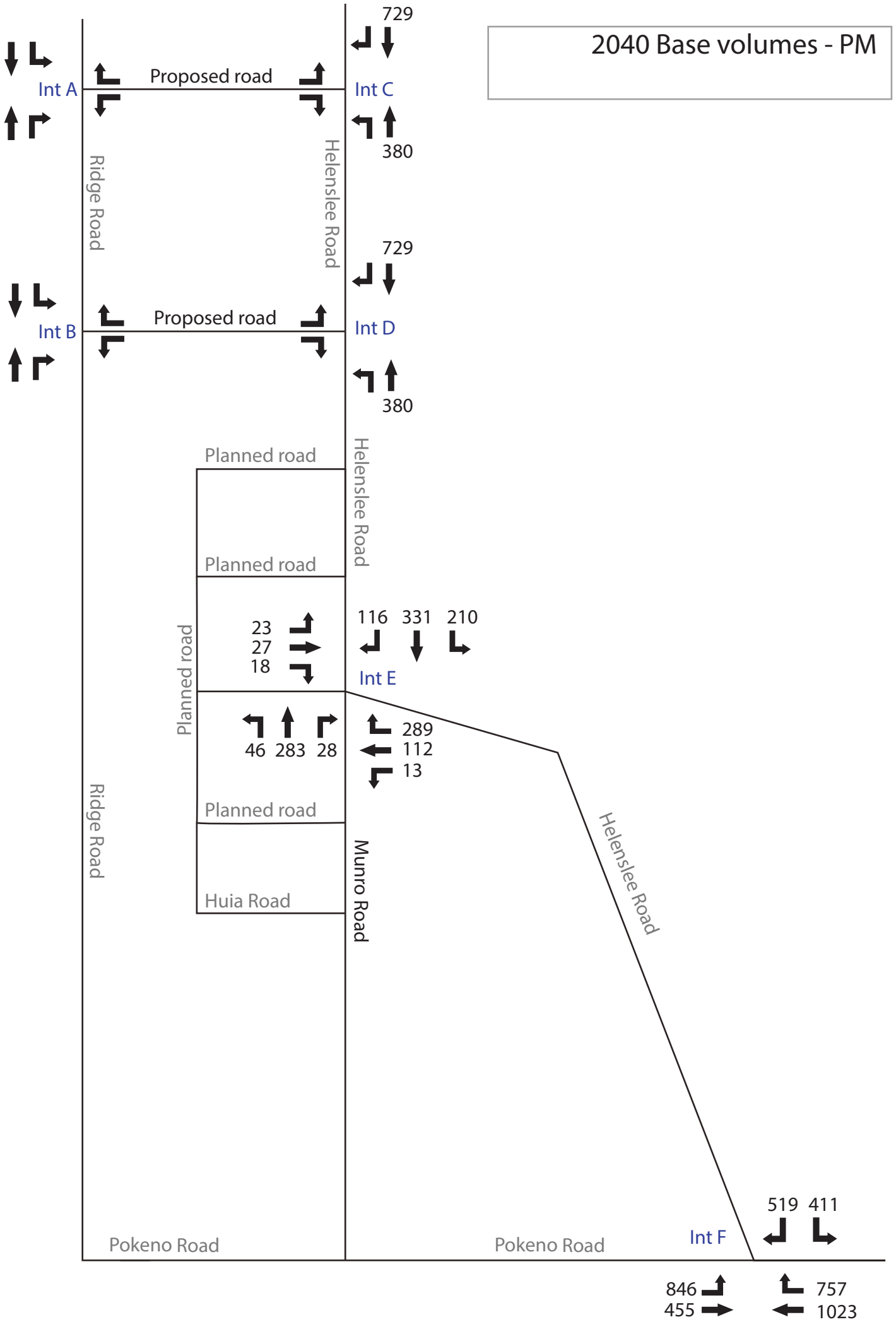
APPENDIX B – EXISTING 2016 TRAFFIC VOLUMES


2016 AM survey volumes
- distributed to wider network
Int A
Proposed road
Int C
61
69
Ridge Road
Helenslee Road
Int B
Proposed road
Int D
61
69
Planned road
Planned road
Helenslee Road
24 37
Int E
Planned road
34 9
34
1
Planned road
Huia Road
Munro Road
Helenslee Road
Ridge Road
Pokeno Road
Pokeno Road
Int F
21 32
13
99
30
79

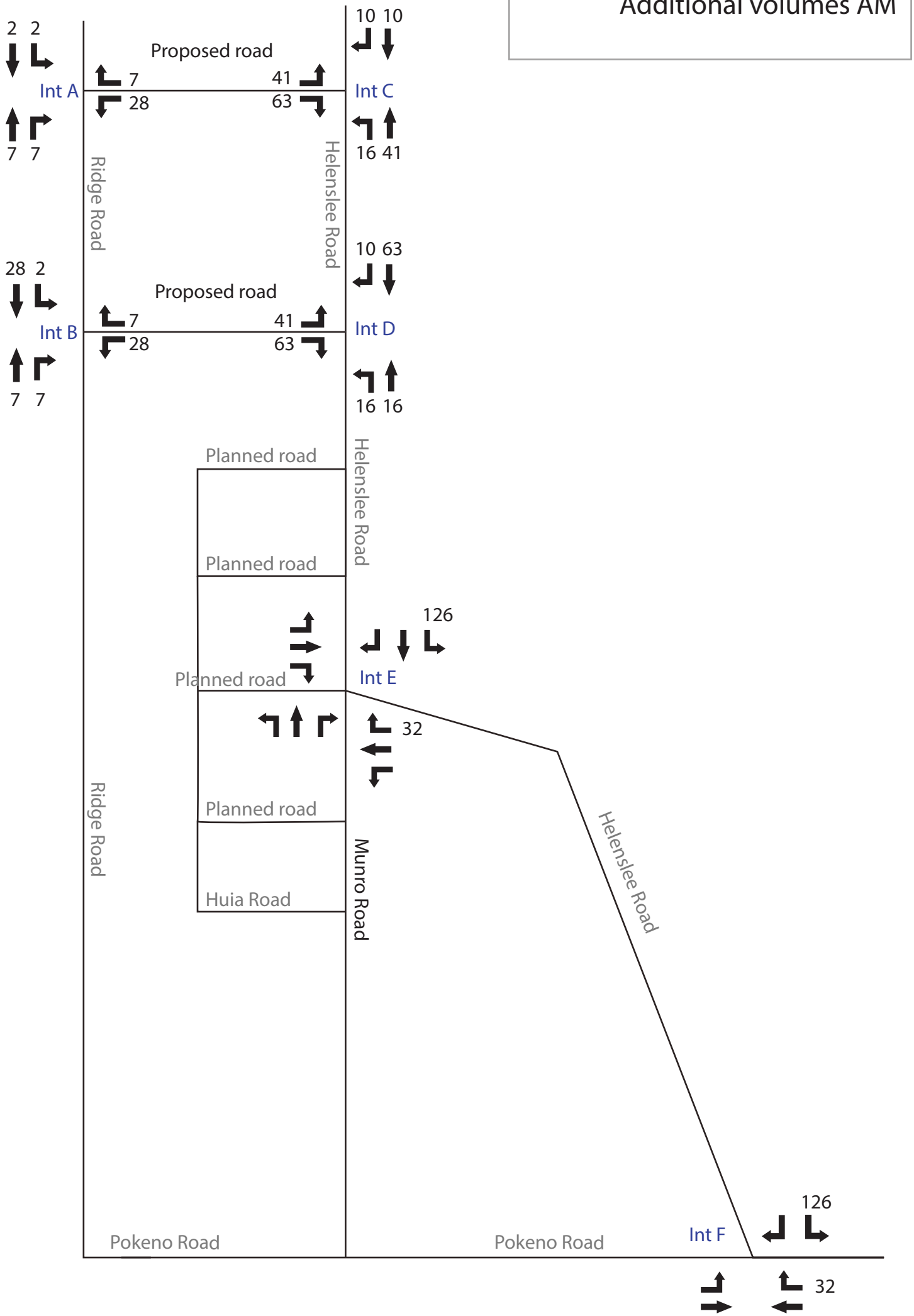

2016 PM survey volumes
- distributed to wider network
Int A
Proposed road
Int C
106
58
Ridge Road
Helenslee Road
Int B
Proposed road
Int D
106
58
Planned road
Planned road
Helenslee Road
59 47
Int E
Planned road
23 6
35
1
Planned road
Huia Road
Ridge Road
Munro Road
Helenslee Road
Pokeno Road
Pokeno Road
Int F
17 50
7
135
51
128

APPENDIX C – 2040 BASE VOLUMES


2040 Base volumes - AM
Int A
Proposed road
Int C
489
588
Ridge Road
Helenslee Road
Int B
Proposed road
Int D
489
588
Planned road
Planned road
Helenslee Road
100
141
33
18 172 457
Int E
Planned road
33 239 41
213
32
5
Planned road
Huia Road
Munro Road
Helenslee Road
Ridge Road
56 692
Int F
Pokeno Road
Pokeno Road
37
658
257
488


2040 Base volumes - PM
Int A
Proposed road
Int C
729
380
Ridge Road
Helenslee Road
Int B
Proposed road
Int D
729
380
Planned road
Planned road
Helenslee Road
116 331 210
23
27
18
Int E
Planned road
46 283 28
289
112
13
Planned road
Huia Road
Munro Road
Ridge Road
Helenslee Road
519 411
Int F
Pokeno Road
Pokeno Road
846
455
757
1023

APPENDIX D – ADDITIONAL VOLUMES (POTENTIAL DEVELOPMENT)


Additional volumes AM
2 2
Int A
7 7
Proposed road
7
28
41
63
Int C
10 10
16 41
Ridge Road
Helenslee Road
28 2
Int B
7 7
Proposed road
7
28
41
63
Int D
10 63
16 16
Planned road
Planned road
Helenslee Road
126
Int E
Planned road
32
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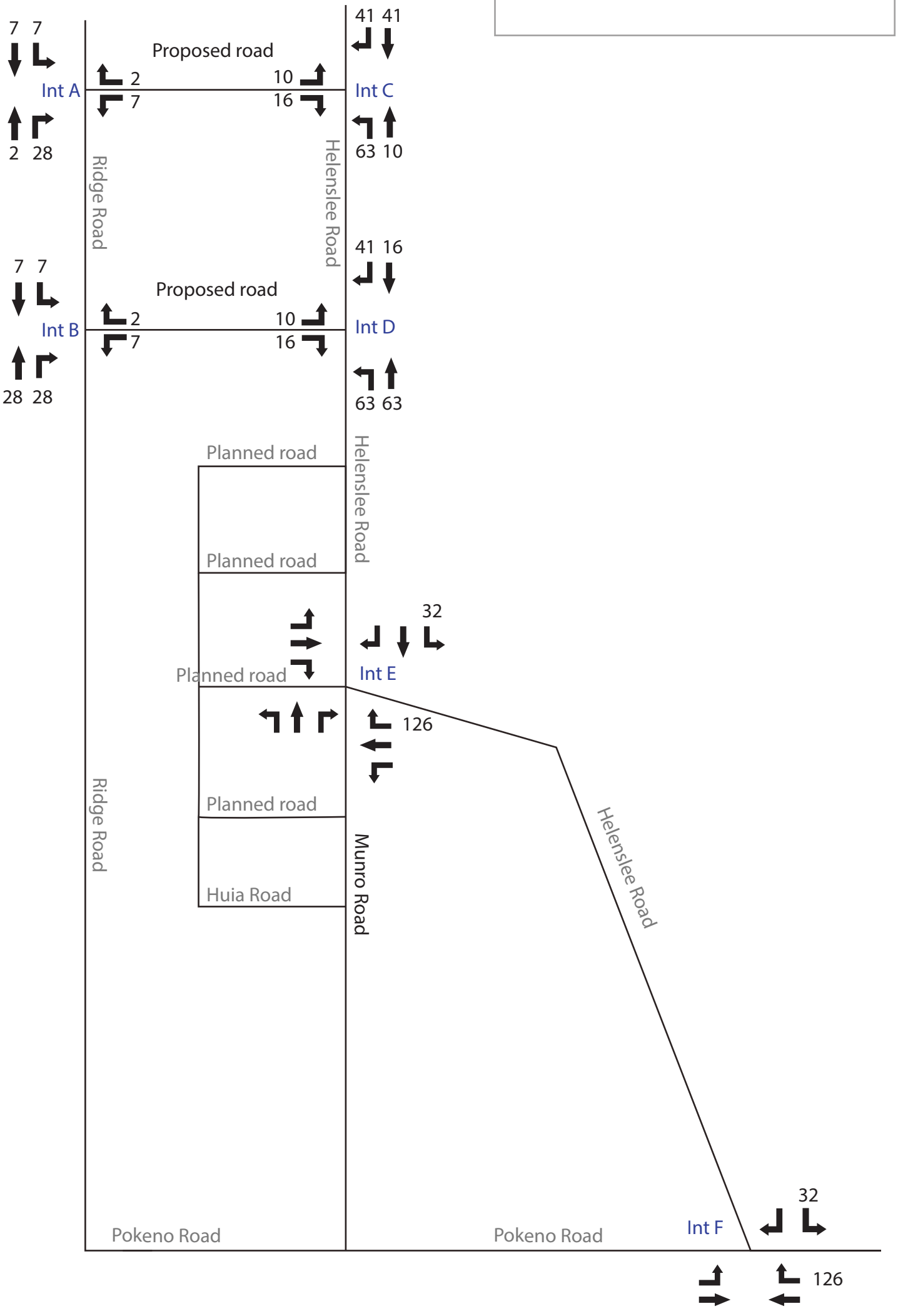
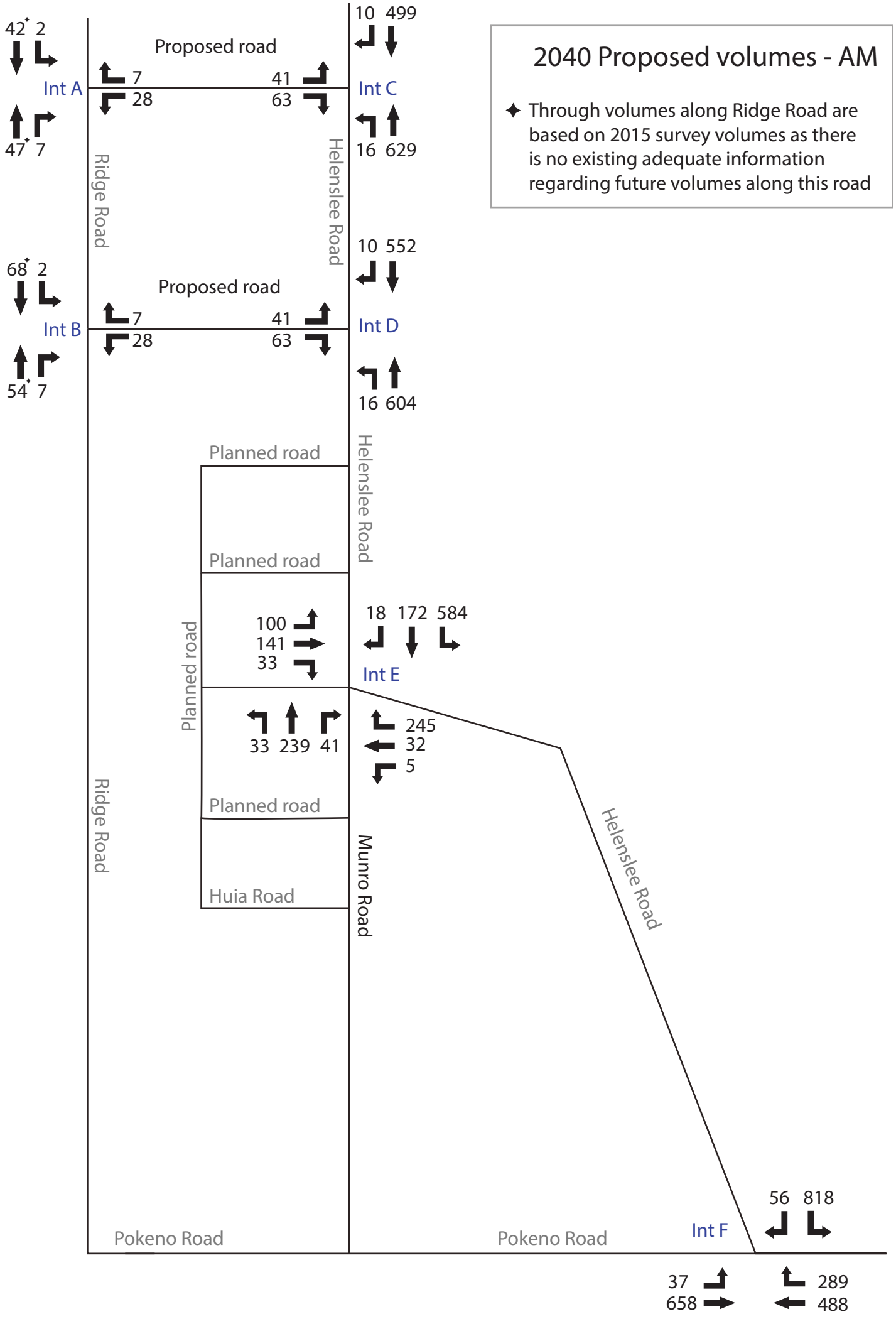
Huia Road
Ridge Road
Munro Road
Helenslee Road
126
Int F
Pokeno Road
Pokeno Road
32

Additional volumes PM



APPENDIX E – PROPOSED TRAFFIC VOLUMES 2040


2040 Proposed volumes - AM
✦ Through volumes along Ridge Road are based on 2015 survey volumes as there is no existing adequate information regarding future volumes along this road
Proposed road
Proposed road
Planned road
Planned road
Planned road
Planned road
Huia Road
Int A
Int B
Int C
Int D
Int E
Int F
Ridge Road
Ridge Road
Helenslee Road
Helenslee Road
Helenslee Road
Munro Road
Pokeno Road
Pokeno Road
42 2
47 7
7
28
41
63
10 499
16 629
68 2
54 7
7
28
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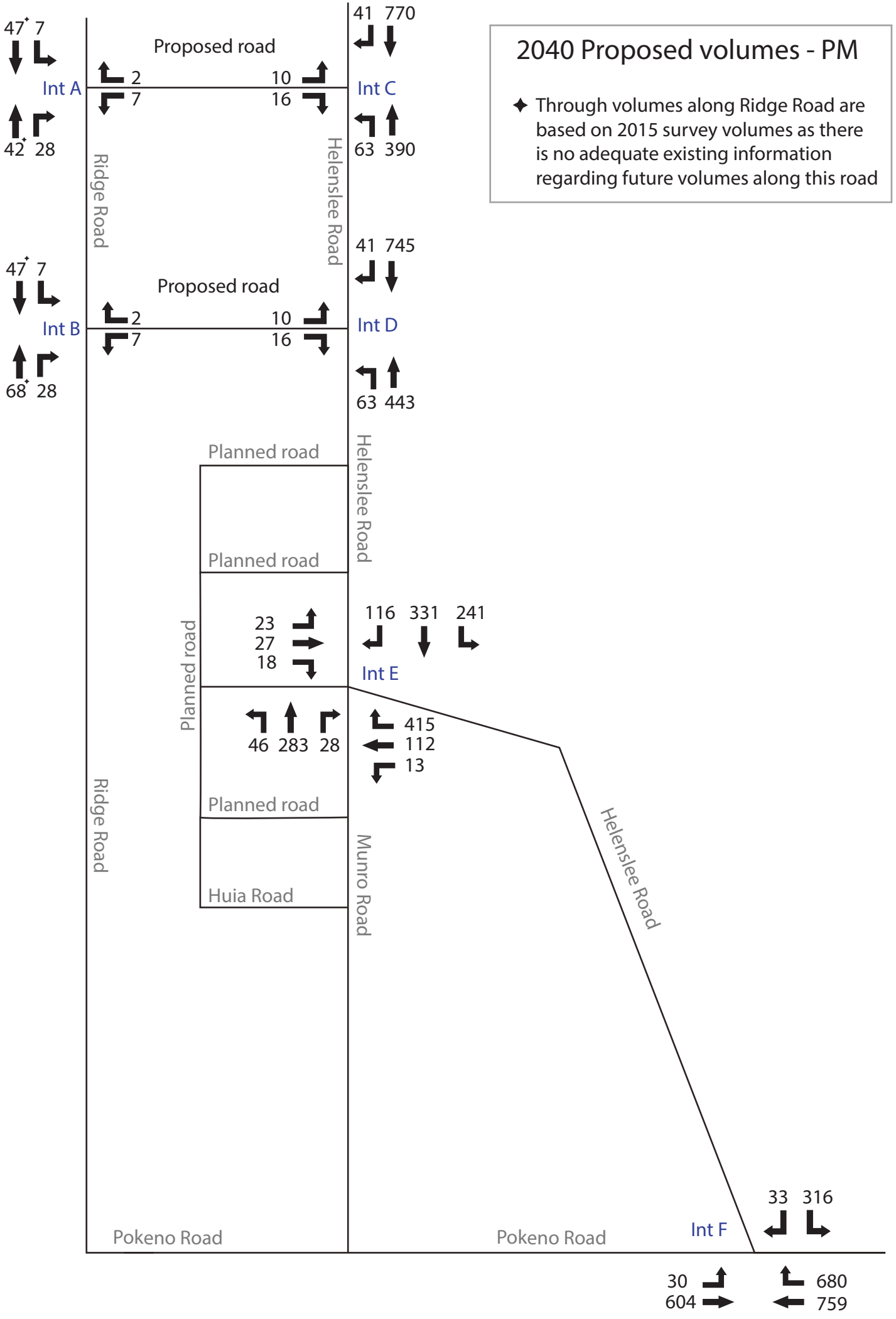
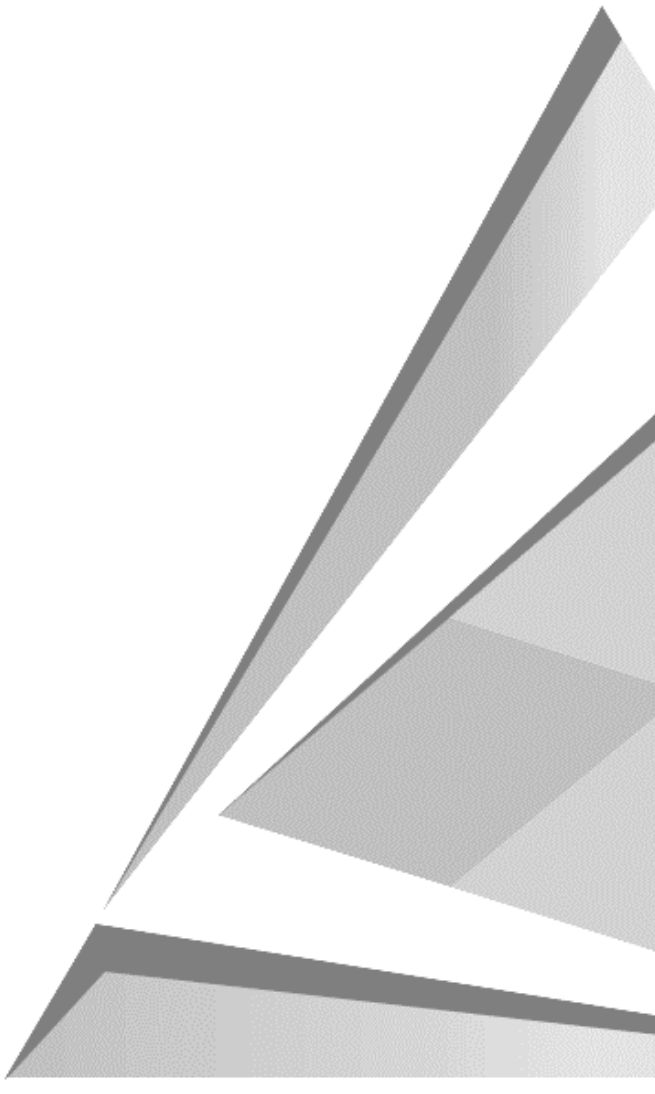
245
32
5
56 818
37
658
289
488


2040 Proposed volumes - PM
✦ Through volumes along Ridge Road are based on 2015 survey volumes as there is no adequate existing information regarding future volumes along this road
Proposed road
Proposed road
Planned road
Planned road
Planned road
Planned road
Huia Road
Int A
Int B
Int C
Int D
Int E
Int F
Ridge Road
Ridge Road
Helenslee Road
Helenslee Road
Helenslee Road
Munro Road
Pokeno Road
Pokeno Road
47✦ 7
42✦ 28
2 7
10 16
41 770
63 390
47✦ 7
68✦ 28
2 7
10 16
41 745
63 443
23 27 18
116 331 241
46 283 28
415 112 13
33 316
30 604
680 759

APPENDIX E
ENGINEERING REPORT
MAVEN ASSOCIATES



ENGINEERING REPORT

POKENO WEST STRUCTURE PLAN

POKENO

Maven Associates	Job Number 101034		Rev B
Job Title Pokeno West Structure Plan Title Engineering Report	Author WM	Date 29.06.18.	Checked GB

CONTENTS

APPENDICES

1.0 INTRODUCTION

1.1 PROJECT AND BACKGROUND

The purpose of this report is to provide an assessment of infrastructure associated with the development of the future Residential area of West Pokeno ("structure plan area"), identified within Figure 1 Locality Plan (below). This report supports the intended rezoning of the subject site and provides the framework for the required infrastructural upgrades.

The design and layout of the structure plan area (concept plan prepared by Birch Surveyors) has been developed around the proposed zones and land use controls of the Draft Proposed District Plan and has been developed through on-going consultation and collaboration with the Waikato District Council ("WDC").

Figure 1: Locality Plan (site in red) Source: Waikato Council Intramaps

This report provides a high-level analysis of the service infrastructure associated with the future development of the structure plan area and provides comment on matters to be considered pursuant to its development.

The structure plan area is currently zoned as rural under the operative Waikato District Council District Plan – Franklin Section ("WCDP: F"); however, as part of the District Wide Review undertaken by WDC this area is to be re- zoned to Residential.

The structure plan area has been designed around three stages, based on the early consultation with WDC and the then desire to use a combination of live and deferred zones. DWC have since resolved to remove the deferred zones from the District Wide Review. The structure plan area will be subject to a live zoning. In total the residential redevelopment of the structure plan area will provide for approximately 1350 new houses, as per the Birch Surveyors Concept Plan provided within Figure 2, below;

Figure 2: Overall Concept Plan Source: Birch Surveyors

In terms of phasing, the following report and accompanying calculations have been based three 'stages' for the infrastructural assessment. These smaller catchments will provide for the phased growth of the structure plan area and provide a more appropriate means of understanding the progressive infrastructural needs. In summary, the stages have been based on the following assumptions:

Stage 1:
Residential 1 area (assumed 650 residential lots, supporting general residential, medium density nodes, and neighbourhood centre) full service infrastructure required.

Stage 2:
Residential 2 area (assumed 450 residential lots, supporting general residential and medium density nodes) full service infrastructure required.

Stage 3:
Residential 3 area (assumed 300 residential lots) full service infrastructure required.

The information provided herein relates to the stormwater, wastewater, water supply, other service infrastructure and the potential capacity to service future development.

The calculations and assessments included in this report are a 'desktop' analysis and are preliminary in nature based on information available at time of issue.

This report is to be read in conjunction with the other specialist reports and is to accompany the overall structure plan documents for the site which accompany the WDC plan change, inclusive of the GHD draft long-term wastewater and water strategy for Pokeno.

1.2 SITE DESCRIPTION

The structure plan area encompasses a total area of approximately 160ha. The site is located west of the existing Pokeno urban footprint between the existing town centre to the east and the quarry to the west. The site stretches from Helenslee Rd in the north to Munro Rd in the south.

The south-eastern corner of the structure plan area (intersection of Helenslee Road and Pokeno Road) lies 1km from the Pokeno Town Centre's shops and services located on Great South Road.

The structure plan area is bound by the Waikato Expressway to the north and the North Island Main Trunk Railway (NIMTR) to the west.

The structure plan area currently comprises farmland used for cropping and grazing. Vegetation on the site is limited to hedgerow boundaries. A cluster of buildings stand on the site which are typical rural farm homes with no historic characteristics.

Existing services including a wastewater and stormwater drainage network, water main and other services are located adjacent to the structure plan area within the existing urban area identified within Appendix A – Waikato District Council IntraMaps.

Stormwater management is currently provided by natural watercourses and overland flow paths. Stormwater runoff from roads are via swales, infrastructure is limited to culverts at the road and rail crossings.

The low-lying portion of the site located to the south-east is identified as being subject to surface water flooding during large storm events according to the Pokeno Stormwater Catchment Management Plan.

1.3 TOPOGRAPHY

The topography of the study area varies significantly with steep hill country in the upper parts of the catchment to the north and west and low lying flat areas within the valley floors lower in the catchment to the south east.

The structure plan area lies on the south eastern side of a broad ridge. Ground levels within the structure plan area range from approximately RL 125 at the highest point of the catchment to RL 25.

The structure plan area is part of the Tanitewhiora stream catchment. Stormwater runoff from the ridge forms an overland flow path from the west to the east. The flowpaths across the site define the surrounding terrain and form the headwaters of a tributaries of the Tanitewhiora stream.

The Tanitewhiora stream and its tributaries drain around 1,270 hectares. The structure plan area discharges to a low point on Munro Road via a stream under an existing road bridge.

2.0 OVERLAND FLOW AND FLOODING

In terms of overland flow and flooding a preliminary overview to determine the extent of any issues has been undertaken.

2.1 OVERLAND FLOW

The Pokeno Stormwater Catchment Management Plan identifies overland flow paths ("OLFP's") which traverse the site from the west to the east. The flowpaths across the site define the surrounding terrain and form the headwaters of a tributaries of the Tanitewhiora stream.

The majority of all significant OLFP's are localised and confined to existing farm watercourses indicated on Figure 3 OLFP Plan, below.

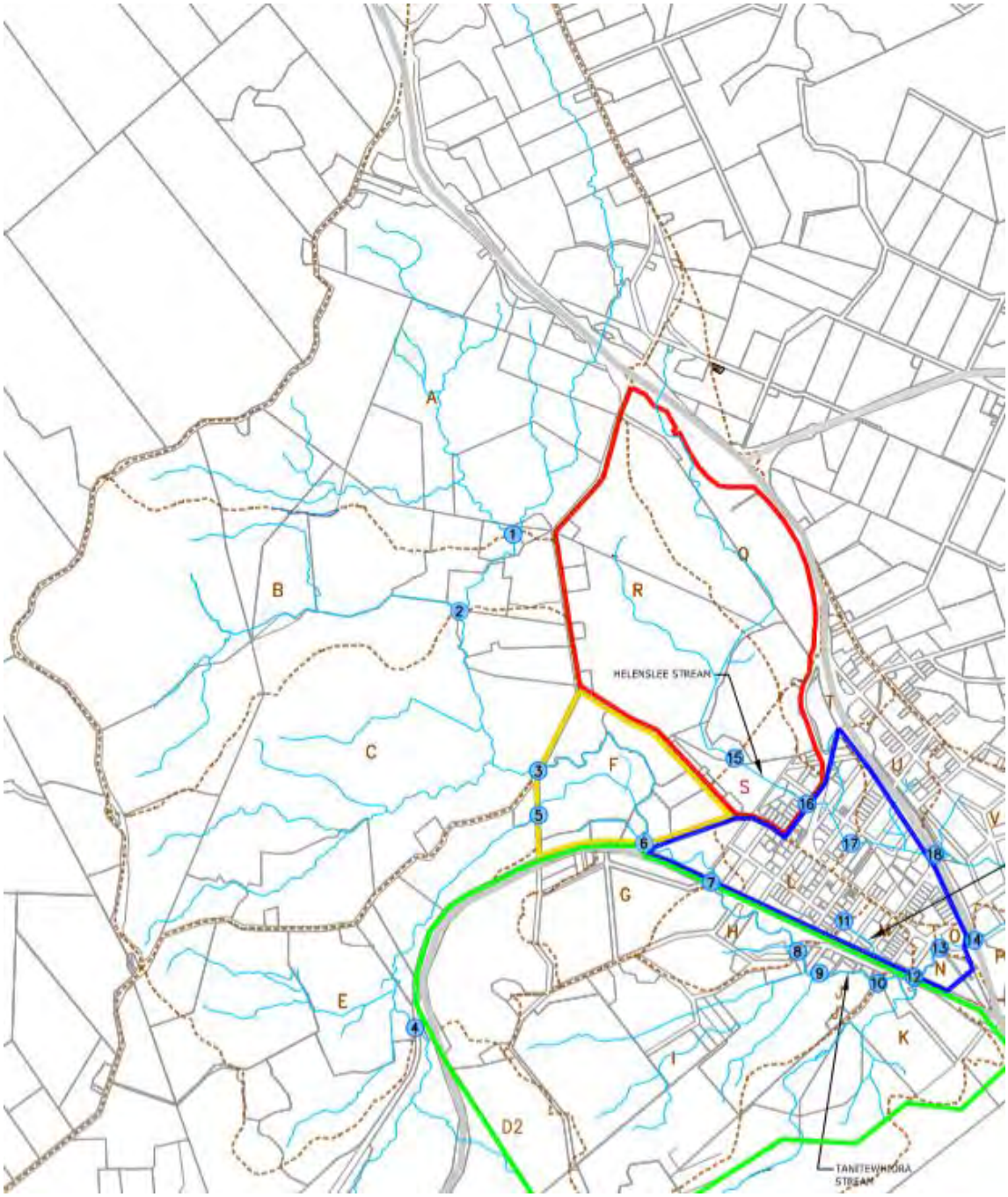


Figure 3: OLFP Plan Source: Pokeno Catchment Management Plan

The subject site is located within the Tanitewhiora stream catchment area. Stormwater discharge is to a local stream which is a tributary of the Tanitewhiroa stream. The local stream is classified as the immediate receiving environment for stormwater runoff, downstream discharge is to the Mangitawhiri swamp/wetland and ultimately the Waikato River.

The local stream flows to the bridge crossing on Munro Road, from which point OLFP continues to flow east. Further sub-catchments contribute to the OLFP before discharging into the Tanitewhiroa stream.

The Tanitewhiora stream has a waterfall approximately 4m in height, effectively separating the Mangatawhiri swamp/wetland and the Waikato River further downstream hydraulically from the structure plan area catchment.

Future development of the structure plan area is to maintain the entry/ exit points and the capacity of existing OLFPs and not cause an increase in risk or hazard to any upstream or downstream properties.

Future development levels will be designed to direct overland flow ("OLF") within the development area away from proposed buildings and maintain OLF capacity as per WDC requirements.

Future development is to maintain the function of OLFPs to safely convey flood waters and not increase the risk of flooding.

2.2 FLOOD PLAIN & FLOOD SENSITIVE AREAS

Waikato District Council IntraMaps does not identify any flood level, flood limit or flood risk hazard policies for the subject site. However, the Pokeno Stormwater Catchment Management Plan identifies pre-development flood plain/level areas within the low-lying eastern portion of the site.

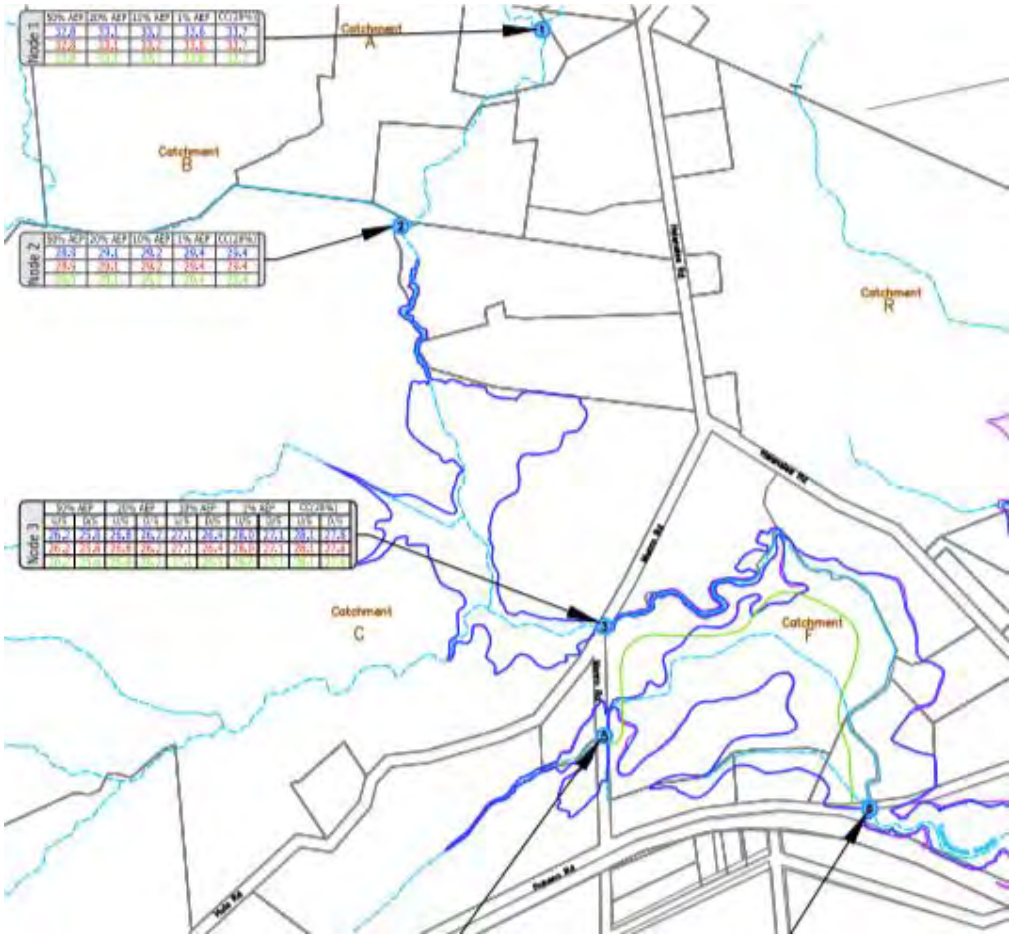


Figure 4: Flooding area Source: Pokeno Catchment Management Plan

The flood modelling associated with the above Pokeno Catchment Management Plan has been updated by WSP Opus in late 2017. WDC engaged WSP Opus to update the existing Pokeno 1d hydraulic model (HEC-RAS) into a 2d hydraulic model (TUFLOW) to allow more comprehensive assessment of cumulative effects of current and future developments (i.e. filling within the floodplain) on the existing/future drainage networks in the township of Pokeno[1].

The two scenarios assessed in the WSP Opus study were undertaken to assess the changes in the catchment hydrology and flooding through Pokeno resulting from the significant development over the last 5-7 years. The revised scenario represents the current level of development (completed prior to 2017/18). The modelling assumed that potential future developments (currently being completed and areas zoned for development potential) will include stormwater management devices (such as detention basins) to ensure no increase in downstream discharge from the sites.

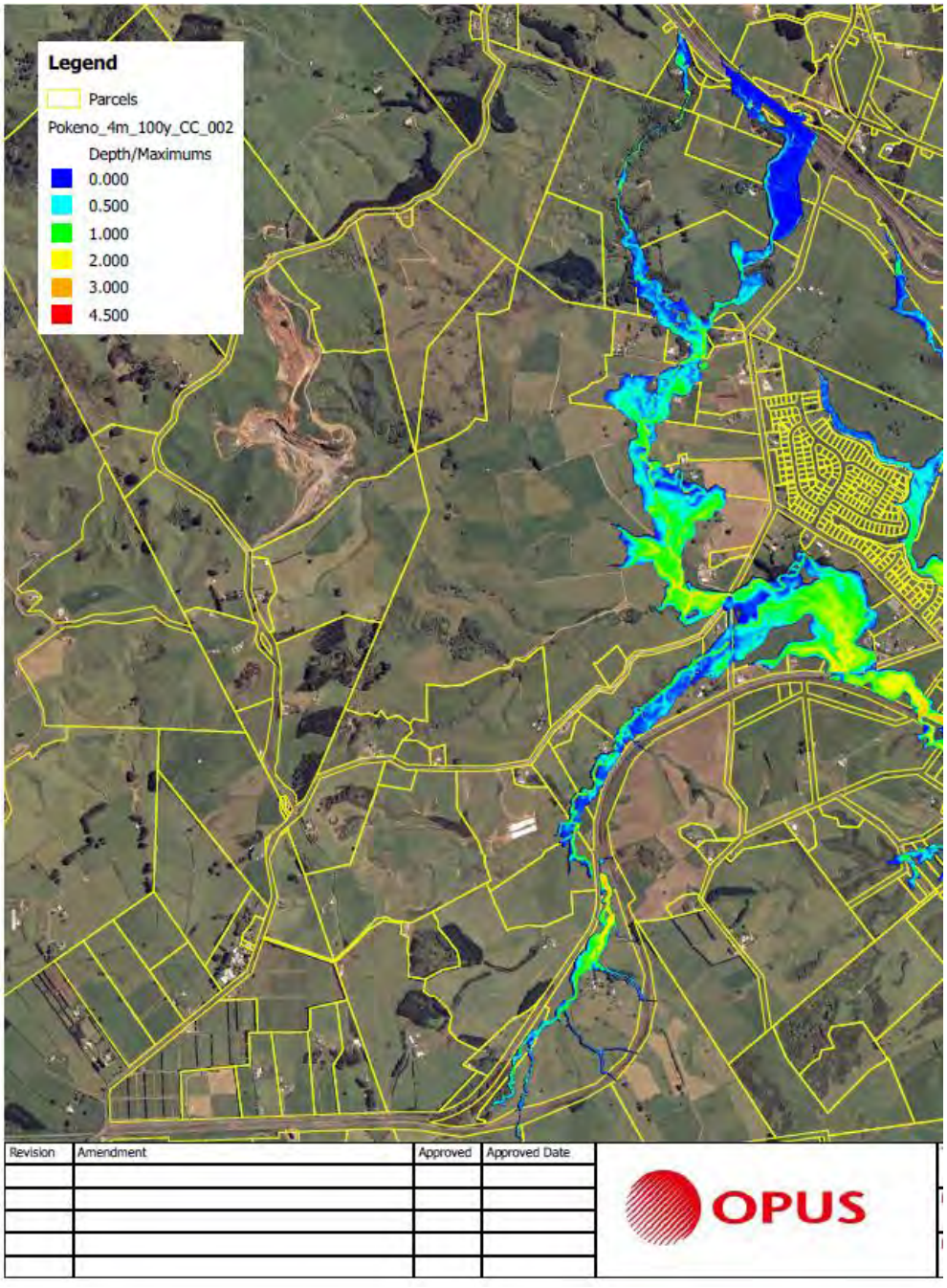


Figure 5: Updated 1:100 AEP Flood Plain Source: WSP OPUS

In accordance with Regional Infrastructure Technical Specifications ("RITS") requirements, new structures and buildings adjacent to the 1% annual exceedance probability ("AEP") floodplain and the use of these to accommodate vulnerable activities require minimum floor levels ("MFL's") to meet freeboard requirements.

The concept plan has been designed to avoid the revised 100-year AEP flood plain, with all development areas outside of this flood plain, please refer to appended plans within Appendix A.

Future development will, however, require specific MFL assessment to confirm the 100-year flood level and ascertain minimum floor levels in accordance with RITS requirements as per the table below (Figure 6).

Criteria	Design Parameter	When Required
Minimum Floor Levels	Freeboard requirements: 100 year ARI event plus minimum freeboard heights as per NZS 4404 Clause 4.3.5.2, as follows: "The minimum freeboard height additional to the computed top water flood level of the 1% AEP design storm should be as follows or as specified in the district or regional plan: **Freeboard** • Habitable dwellings (including attached garages) = 0.5m min height; • Commercial and industrial buildings = 0.3m min height; • Non-habitable residential buildings and detached garages = 0.2m min height. The minimum freeboard shall be measured from the top water level to the building platform level or the underside of the floor joints or underside of the floor slab, whichever is applicable."	Always.

Figure 6: Freeboard Requirements Source: RITS

Final design will ensure that finished floor levels will have adequate freeboard in accordance with District Plan and Building Code requirements. This will be assessed as part of any future resource consent application made to WDC.

3.0 EARTHWORKS

3.1 RECEIVING ENVIRONMENT

The subject site is located within the Tanitewhiora stream catchment area. Stormwater discharge is to a local stream which is a tributary of the Tanitewhiroa stream. The perennial stream is the immediate receiving environment for stormwater runoff, downstream discharge is to the Mangitawhiri swamp/ wetland and ultimately the Waikato River.

Environment Waikato has stated that wetlands were once widespread throughout the Waikato but now they are some of New Zealand's rarest and most at-risk ecosystems. The Waikato River is also recognised as an area of ecological significance. These receiving environments will need to be protected from the potential adverse effects associated with land development

Runoff from the proposed development area during earthworks will have to be treated to ensure that the receiving water's stormwater quality is not adversely affected.

Parts of the structure plan area are underlain by volcanic soil. Although there are expected to be a range of infiltration capacities, stormwater attenuation via soakage and infiltration is an opportunity to meet retention requirements, subject to further investigation.

The earthworks management method proposed for any future development within the structure plan area is to include a description of how the proposed management will address sediment control during construction.

3.2 EARTHWORKS AND SEDIMENT CONTROL

Earthworks will be undertaken as required throughout the structure plan area and will include excavations for drainage reticulation and formation of building platforms and roading areas.

Construction represents the period when the most significant impact on the downstream receiving environment can occur due to erosion and sedimentation from disturbed land. WDC will seek exemplar erosion and sediment control measures which will mitigate downstream impacts.

Proposed measures for erosion and sediment control are to be designed in accordance with the Waikato Regional Council's ("WRC's") Erosion and Sediment Control Guidelines for soil disturbing activities document and sediment control factsheets.

Silt control measures will need to be installed onsite prior to the earthworks commencing. All silt control measures will be checked and confirmed acceptable by the Engineer before works commence.

3.3 CONSENTING AND MONITORING

Resource consent will be required for all earthwork operations onsite and will require erosion and sediment control measures to be implemented and maintained in accordance with the approved Earthwork Drawings.

Any future earthworks proposed within the existing stream riparian areas or within the existing flood plain will require further resource consent approvals, earthworks design will need to ensure no loss of flood storage is associated with future development.

A geotechnical investigation will be undertaken by a suitably qualified Geotech Engineer to confirm the site is suitable for the development proposals. A completion certificate will be provided at the completion of the earthworks as required.

4.0 STORMWATER

4.1 CATCHMENT MANAGEMENT PLAN

The structure plan area is within the existing Pokeno Stormwater Catchment Management Plan ("PSWMP") area which covers approximately 1500ha.

The Catchment Management Plan ("CMP") will become outdated with the development of the structure plan area with a new CMP required encompassing the new rea of development. However, several key requirements from the existing CMP will be retained:

- Peak flood flows from future land use changes will need to be limited via mitigation measures from pre-development to post-development.
- The runoff from future development areas will have to be treated via water quality improvement measures to ensure that the receiving water's stormwater quality is not adversely affected.

A new CMP will be required in support of any future development application in the area to determine stormwater management requirements. The CMP should be undertaken by WDC or by a suitably qualified private consultancy on behalf of WDC. WDC have confirmed that a new CMP will be implemented in a timely manner to allow future development within the proposed timeframes of the District Wide Review.

The purpose of the new CMP will be to identify stormwater issues within the catchment; identify potential options to address these issues and set out recommendations for the long term stormwater management within the catchment which would form a basis for a stormwater discharge consent in support of the future development.

Future development of the structure plan area will need to be consistent with the new CMP and incorporate stormwater attenuation and stormwater quality methods into the design of the future Residential zone.

This report outlines the likely stormwater management measures to manage the effects of the stormwater environment resulting from the proposed development of the structure plan area. These measures will likely form the basis of any future CMP.

The proposed stormwater management methods are as follows:

- Wetland ponds to provide stormwater treatment of the water quality volume (1/3 of the 2 year, 24-hour rainfall).
- Wetland ponds to provide stormwater attenuation to limit post-development peak discharges for the 2 and 10-year frequency storms to their pre-development peak discharge release rates.
- Wetland ponds located offline from the existing watercourse and streams.
- Streams to be protected through planted riparian areas.
- Streams to be protected from the receiving environment by maintaining flow of the 'first flush' rainfall event (34.5mm or that calculated from first principals) released over a 24-hour period.
- Onsite measures to provide soakage, retention, and detention.
- Raingardens for public roads to provide stormwater treatment and retention.
- Existing flood plain areas to retain existing flood volumes.

Future development will require specific design in accordance with the guidelines of Waikato District Council 's RITS and be in accordance with Waikato Regional Council guidelines.

4.2 STORMWATER RETICULATION

Stormwater management is currently provided by swales within the roading corridors, existing stormwater farm ponds and low-lying areas. Waikato District Council IntraMaps identifies a public stormwater network adjacent to the south-western perimeter of the structure plan area (within the existing urban area), however, the existing network is not designed to cater for the proposed future development.

There is an existing local stream which is a tributary of the Tanitewhiroa stream located within the structure plan described in Section 1.3 Topography. The existing stream will act as the key stormwater discharge point for portions of the development area. Areas which do not fall to the tributaries will require public extensions to the local stream or other tributaries of the Tanitewhiroa stream. The existing stream passes under Munroe Road bridge pictured in Figure 6 below.

Figure 7: Munro Road Bridge Source: Pokeno Catchment Management Plan

The WDC RITS sets out design and construction standards for stormwater and requires all development to be provided with a means of stormwater disposal.

Stormwater disposal will be via a proposed stormwater pipe network which will be designed to have capacity for the 10-year storm from the proposed development and will be subject to Engineering Approval form WDC as part of any future Resource Consent application.

The proposed stormwater network will provide suitable stormwater connection points for the future development of the structure plan area, an indicative stormwater network has been designed and is appended to this Report.

4.3 STORMWATER CAPACITY

WRC requires stormwater hydrology mitigation for all new impervious areas proposed as part of any future development. Specific stormwater controls regarding attenuation and retention are to be detailed with future development and will control stormwater discharge downstream to an acceptable level. The likely stormwater attenuation methods are as follows:

- Wetland ponds to provide stormwater treatment and attenuation
- Onsite measures to provide soakage, retention, and detention.
- Raingardens for public roads to provide stormwater treatment and retention.

It is envisaged by adhering to these controls downstream aquatic biodiversity within streams will be protected. Attenuation will also avoid increasing flood risk to the existing downstream properties.

A full updated CMP will need to accompany any future development of the area to determine stormwater management requirements. It is considered that a combination of the above attenuation methods will provide for future development as required.

Future development will require specific design in accordance with the guidelines of WDC's RITS and be in accordance with WRC guidelines.

4.4 STORMWATER QUALITY

The high risk receiving environment emphasises the importance of how stormwater runoff from development areas is managed. High stormwater discharge quality is required to protect the downstream receiving environment.

Future development is to incorporate Water Sensitive Design approaches focusing on reducing or eliminating stormwater runoff generation through source control and utilising natural systems and processes to manage stormwater quality effects.

All future trafficable surfaces including roading networks, accessways, manoeuvring and carparking areas proposed as part of future development of the structure plan area will require stormwater quality treatment.

Trafficable surfaces will require treatment as per WRC requirements. The primary water quality objective of the treatment is to remove 75% of total suspended solids on a long-term average basis. The likely stormwater quality treatment methods are as follows:

- Wetland ponds to provide stormwater treatment and attenuation.
- Raingardens for public roads to provide stormwater treatment and retention.

It is considered that objectives will be achieved via the utilisation of a combination of wetland ponds, raingardens, and filtration devices to achieve the best practical stormwater management outcome.

Due to the topography of the site, the proposed ponds are in some instances required to be within the 100-year flood plain. The ponds have been located outside of this flood plain where this is practically possible to achieve. In instances where the ponds are located within this flood plain, minor re-contouring will ensure that there is no loss of storage capacity within the flood plain.

Construction of future buildings will require source control of roof runoff with the use of non-zinc roofing materials, the design and construction of which will be subject to future Building Consent approval from WDC.

4.5 STAGE 1

Stage 1 (650 lots) will require full stormwater management as detailed within sections above. Stormwater management for Stage 1 will primarily be via offline stormwater wetland ponds which will provide attenuation and treatment before discharging to the existing watercourse flowing through the southern portion of Stage 1.

Due to the nature of the topography, stormwater runoff from Stage 1 is divided into three sub-catchments (Catchments 1, 2 and 3 - in part) and will require three ponds to service the discharge. The engineering drawings identify suitable areas which can accommodate the stormwater wetland ponds and flood storage.

The existing flood plain is contained within the low-lying areas of Stage 1 which accommodate the pre-development flood volume. The flood plain volumes are to be retained with any future development. Areas will likely need to be modified as required to maintain flood volumes and achieve stormwater quality management requirements.

The stormwater wetland ponds will be designed in accordance with WRC requirements and will be vested as a public asset with WDC as part of any future subdivision application. Final design

will be subject to Engineering Approval including operation and maintenance guidelines. Final design will consider pre-development runoff, any downstream flooding issues, climate change and will be in accordance with the full CMP for the structure plan area.

Stormwater management will also incorporate onsite measures to provide soakage, retention and detention as required. Raingardens will also be incorporated to treat runoff from public roads.

The proposed internal stormwater pipe network will be designed to service the proposed residential development and will discharge to the wetland ponds. The proposed network is to have capacity for the 10-year storm and will be subject to Engineering Approval form WDC.

4.6 STAGE 2

Stage 2 (450 lots) will require full stormwater management as detailed within sections above. Stormwater management for Stage 2 will primarily be via offline stormwater wetland ponds which will provide attenuation and treatment before discharging to the existing watercourse flowing south along the eastern boundary of Stage 2.

Stormwater runoff from Stage 2 is divided into two main sub-catchments (Catchments 4 and 5) and will require two ponds to service stormwater discharge. A small portion of Stage 2 is also serviced by ponds within Stage 1 (Catchment 3).

Stormwater quality management will also incorporate onsite measures to provide soakage, retention and detention as required. Raingardens will also be incorporated to treat runoff from public roads.

Proposed larger lots located higher in the catchment may require full onsite stormwater management. A reduction of stormwater attenuation may be applied if the larger lots provide increased tree planting which would decrease stormwater runoff.

4.7 STAGE 3

Stage 3 (350 lots) will require full stormwater management as detailed within sections above. Stormwater runoff from Stage 3 is divided into 2 main sub-catchments (north - Catchment 6, and south – Catchment 7).

Stormwater management for Stage 3 (north) will primarily be via an offline stormwater wetland pond which will provide attenuation and treatment before discharging to the existing watercourse.

Stormwater management for Stage 3 (south) will require full onsite stormwater management, as there is no suitable location for an offline pond, given the topography and location of stream. A reduction of stormwater attenuation may be applied if the larger lots provide increased tree planting which would decrease stormwater runoff.

4.8 CONCLUSION

The stormwater management methods proposed will be in accordance with an updated catchment management plan of the area which will be formed in consultation with Waikato Regional and District councils.

The CMP will identify stormwater issues within the catchment; identify potential options to address these issues; and set out recommendations for the long term stormwater management within the catchment which would form a basis for a stormwater discharge consent and to support rezoning and development.

Future development will incorporate a Water Sensitive Design approach focusing on reducing or eliminating stormwater runoff generation through source control and utilising natural systems and processes to manage stormwater quality effects.

5.0 WASTEWATER

5.1 WASTEWATER RETICULATION

WDC IntraMaps identifies a public wastewater network adjacent to the south-western perimeter of the structure plan area (within the existing urban area). This existing downstream network is not designed to cater for the proposed future development.

Wastewater discharge for existing urban areas of Pokeno is via existing public gravity reticulation to the Market Street Pump station, with ultimate discharge to the Pukekohe Wastewater Treatment Plant via an existing rising main.

The development of the structure plan area will require a new comprehensive wastewater network design including the installation of new infrastructure connecting the structure plan area to the existing downstream network.

The new wastewater network will be consistent with the WDC RITS which sets out design principles for wastewater and requires any development project to be provided with a means of wastewater disposal.

All new infrastructure within the development areas will be designed to have capacity to cater for the Maximum Probable Development ("MPD") of the structure plan area in accordance with WDC RITS guidelines and will be subject to Engineering Approval. The proposed network will provide suitable wastewater connection points for the future development of the structure plan area.

5.2 WASTEWATER NETWORK CAPACITY

Network capacity has been investigated with WDC who have confirmed that there are potential capacity issues (at present) associated with future development of the structure plan area.

The Market Street pump station is currently near maximum capacity, any future development is likely to increase the frequency and volume of the annual overflow from the pump station. Therefore, a new pump station will be required for the development of the structure plan area.

The existing 280mmØ rising main from Pokeno to Tuakau, and the downstream network form Tuakau to the Pukekohe wastewater treatment plant, does not have capacity for wastewater flows from the development of the structure pan area. Upgrades to the downstream network will therefore be required to allow the development of the structure plan area.

The Pukekohe wastewater treatment plant is currently undergoing capacity upgrades which will upgrade the wastewater network capacity for Pokeno and will cater for future development of the structure plan area.

Further investigation is currently being undertaken by WDC and will determine what upgrades are necessary for the future development of the structure plana area, along with the Wider Pokeno area, inclusive of additional Industrial Trade Waste demands. The GHD draft long-term wastewater and water strategy for Pokeno which is to be issued mid July 2018 will outline key upgrades and timings.

For the purpose of this report it is anticipated that the wastewater plant upgrades will be completed prior to the development of the structure plan area. This has been confirmed in correspondence with WDC.

5.3 STAGE 1

The Stage 1 area (650 lots) will require full domestic wastewater disposal as per sections above. Wastewater disposal for the full structure plan area will be via a proposed pump station sized for the MPD of the area.

The engineering drawings identify the location of the pump station. The location of the pump station is at the low point of the catchment and has access from the adjacent public roads for maintenance. The pump station will be vested as a public asset and be operated and maintained by Waikato District Council.

It is envisaged that the pump station will connect to a new rising main on Pokeno Road which will be installed on the same alignment as the existing network rising main (additional rising main) or be a replacement of the existing network rising main.

The pump station will connect to the network rising main at the closest point to the site via Munro Road and 'plug' into the existing network. The pump will have telemetry with the other main pump stations in the area so pumping and discharge would not coincide with other pumps.

The pump station storage tanks will be designed to have capacity to hold peak wet weather flows allowing pumping of wastewater discharge downstream at a decreased average rate during off-peak times.

The design of the pump station and rising main and will be in accordance with the WDC RITS and be subject to Engineering Approval from WDC.

Downstream network capacity is to be confirmed with WDC before any future development is confirmed and alternative solutions investigated where necessary.

5.4 STAGE 2

The Stage 2 area (450 lots) will require full domestic wastewater disposal as per the required upgrades, detailed for Stage 1 above. WDC have informed capacity issues associated with the existing network, Further investigation with WDC will determine what upgrades are necessary with each stage of the future development.

5.5 STAGE 3

The Stage 3 area (350 lots) will require full domestic wastewater disposal as per the required upgrades, detailed for Stage 1 above. WDC have informed capacity issues associated with the existing network, Further investigation with WDC will determine what upgrades are necessary with each stage of the future development.

5.6 CONCLUSION

The development of the structure plan area will require a new comprehensive wastewater network design including the installation of new infrastructure connecting the structure plan area to the existing network.

WDC have confirmed that there are capacity issues associated with the existing network. Further investigation with WDC will determine what upgrades are necessary with each stage of the future development.

The forthcoming GHD report, which outlines the draft long-term wastewater and water strategy for Pokeno will provide guidance around the required upgrades to support the growth of Pokeno, including the structure plan area.

6.0 WATER SUPPLY

6.1 WATER RETICULATION

WDC IntraMaps identifies a public water network adjacent to the eastern perimeter of the structure plan area (within the existing urban area).

There is an existing 150mmØ watermain which runs on the eastern boundary of Helenslee Road which contains Fire Hydrants at regular intervals to service the residential development to the east. There is an existing 300mmØ bulk watermain located at the corner of Helenslee Road and Hillpark Drive approximately 700m from the structure plan area.

The development of the structure plan area will require a comprehensive water network upgrade including the installation of new infrastructure connecting the future urban area to the existing network. The WDC RITS sets out the design principles for potable water supply and firefighting service and requires adequate lot connections for all future development lots.

All new infrastructure will be designed to have capacity to cater for the MPD of the structure plan area in accordance with WDC RITS guidelines and will be subject to Engineering Approval. The proposed network will provide suitable water connection points for the future development of the structure plan area

6.2 WATER NETWORK CAPACITY

Network capacity has been investigated with Waikato District Council who have informed potential capacity issues associated with future development of the structure plan area.

Further investigation is currently being undertaken by WDC and will determine what upgrades are necessary for the future development of the structure plana area. The GHD draft long-term wastewater and water strategy for Pokeno which is to be issued mid July 2018 will outline key upgrades and timings.

6.3 FIRE FIGHTING SERVICE

Firefighting service is currently provided by Fire Hydrants located on the public network and/or via water storage in stormwater ponds where no public network is available, and service required.

The Watercare Code of Practice for Land Development and Subdivision sets out the design principles for potable water and firefighting supply and requires assessment against SNZPAS 4509:2008 NZ Fire Service Fire Fighting Water Supply Code of Practice.

The firefighting water supply classification for residential development in suburban areas is FW2. Any future residential development would need to meet the following water supply requirements:

- A primary water flow of 12.5 litres/sec within a distance of 135m;
- An additional secondary flow of 12.5 litres/sec within a distance of 270m;
- The required flow must be from a maximum two hydrants operating simultaneously; and
- A minimum running pressure of 100kPa

Flow rates and pressures are to be tested to confirm minimum requirements for the water supply classification stipulated in SNZPAS 4509:2008 can be achieved for all future buildings.

6.4 STAGE 1

The Stage 1 area (650 lots) will require full water supply and firefighting service as per sections above. Water supply for the Residential 1 area will likely be via public network extensions from the existing 3000mmØ watermain located on Helenslee Road. It is likely that a new 250mmØ

main will be extended through the Stage 1 area along the principal roads and loop back to Helenslee road.

The proposed 250mmØ primary main will allow for future lot connections and provide a suitable network to extend secondary 150mm and 100mm diameter mains from to service all lots proposed in the residential development.

The proposed water supply network will be designed in accordance with the WDC RITS and be subject to Engineering Approval from WDC.

It is envisaged that the existing network will have capacity for Stage 1; however, network capacity is to be confirmed with WDC before any future development is confirmed and alternative solutions investigated where necessary.

6.5 STAGE 2

The Stage 2 area (450 lots) will require full water supply and firefighting service as per sections above. Further public network extensions from the proposed Stage 1 watermain may be acceptable to service Stage 2 and 3 areas, however, further network upgrades are likely required to service these stages.

WDC have informed capacity issues associated with the existing network. Further investigation with WDC will determine what upgrades are necessary with each stage of the future development.

Proposed larger lots located higher in the catchment may require full onsite potable water and/or firefighting supply if hydrant pressure cannot be achieved. A consent notice on each title within these areas will ensure future users and land owners will understand the water supply constraints and requirements, as to ensure SNZPAS 4509:2008 can be achieved.

6.6 STAGE 3

The Stage 3 area (350 lots) will require full water supply and firefighting service as per sections above. Further public network extensions from the proposed Stage 1 watermain may be acceptable to service Stage 2 and 3 areas, however, further network upgrades are likely required to service these stages.

WDC have informed capacity issues associated with the existing network. Further investigation with WDC will determine what upgrades are necessary with each stage of the future development.

Proposed larger lots located higher in the catchment may require full onsite potable water and/or firefighting supply if hydrant pressure cannot be achieved. A consent notice on each title within these areas will ensure future users and land owners will understand the water supply constraints and requirements, as to ensure SNZPAS 4509:2008 can be achieved.

6.7 CONCLUSION

The development of the structure plan area will require a new comprehensive water network design including the installation of new infrastructure connecting the structure plan area to the existing network.

WDC have confirmed that there are capacity issues associated with the existing network. Further investigation with WDC will determine what upgrades are necessary with each stage of the future development.

The forthcoming GHD report – which outlines the draft long-term wastewater and water strategy for Pokeno – will provide guidance around the required upgrades to support the growth of Pokeno, including the structure plan area.

7.0 OTHER SERVICES

Existing service networks are present in the surrounding area and Telecommunications, Power and Gas are available for the proposed development.

It is anticipated that network upgrades/ extensions may be required to support future residential development which will be undertaken as required.

Services will be connected to the proposed development as per respective Service agreements. Telecommunications in the area are managed by Chorus, Power is managed by Counties Power and there is no known Gas reticulation within the area.

Counties Power and Chorus have been informed of the development. A strategic meeting has been held with Counties Power, who are aware of future timing and demands.

8.0 CONCLUSIONS

This document sets out how the structure plan area of Pokeno West is to be developed and will form the basis for proposed key service infrastructure associated with the future development of the site.

Future development will incorporate a Water Sensitive Design approach focusing on reducing or eliminating stormwater runoff generation through source control and utilising natural systems and processes to manage stormwater quality effects.

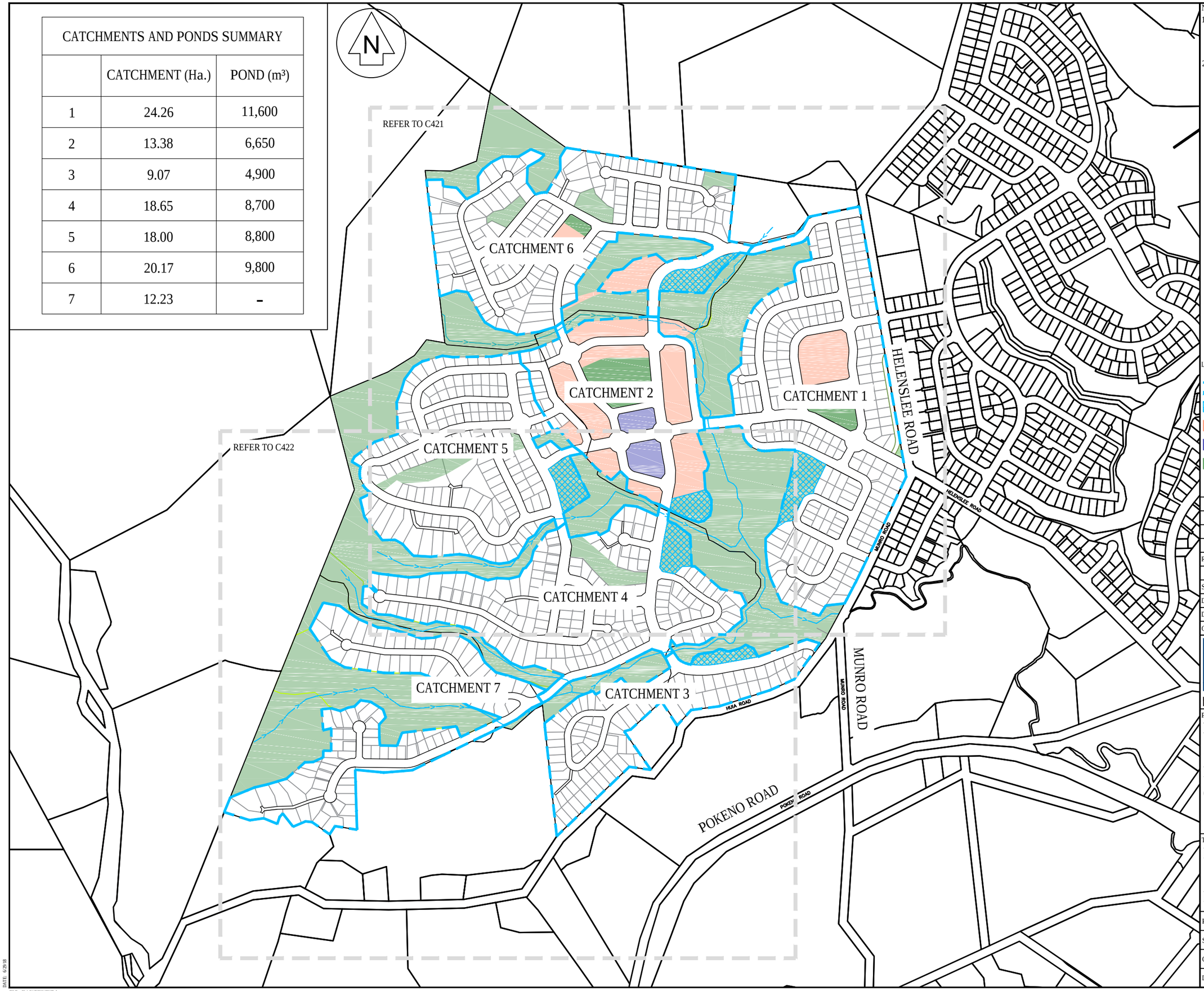
The development of the structure plan area will require a new comprehensive wastewater and water supply network design including the installation of new infrastructure connecting the structure plan area to the existing network.

WDC have confirmed that there are capacity issues associated with the existing network. Further investigation with WDC will determine what upgrades are necessary with each stage of the future development.

The forthcoming GHD report – which outlines the draft long-term wastewater and water strategy for Pokeno – will provide guidance around the required upgrades to support the growth of Pokeno, including the structure plan area.

APPENDIX A – ENGINEERING DRAWINGS

CATCHMENTS AND PONDS SUMMARY		
	CATCHMENT (Ha.)	POND (m³)
1	24.26	11,600
2	13.38	6,650
3	9.07	4,900
4	18.65	8,700
5	18.00	8,800
6	20.17	9,800
7	12.23	-



Notes

1. Stormwater lines and ponds are indicative only for the purposes of pre-feasibility studies. Developed designs are to be provided in future stages.
2. Stormwater ponds to be 1.5m deep with slope at 1:3 (rise:run) on the sides

Legend

- STREAM
- CATCHMENT BDY
- PROP POND
- MED DENSITY
- TOWN CENTRE
- RESERVE

Ref	Revisions	By	Date

	By	Date
Survey	GIS	-
Design	AO	06/18
Drawn	JZ	06/18
Checked	WM	06/18

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Project

POKENO WEST
53 MUNRO ROAD
FOR
CHENSHIU

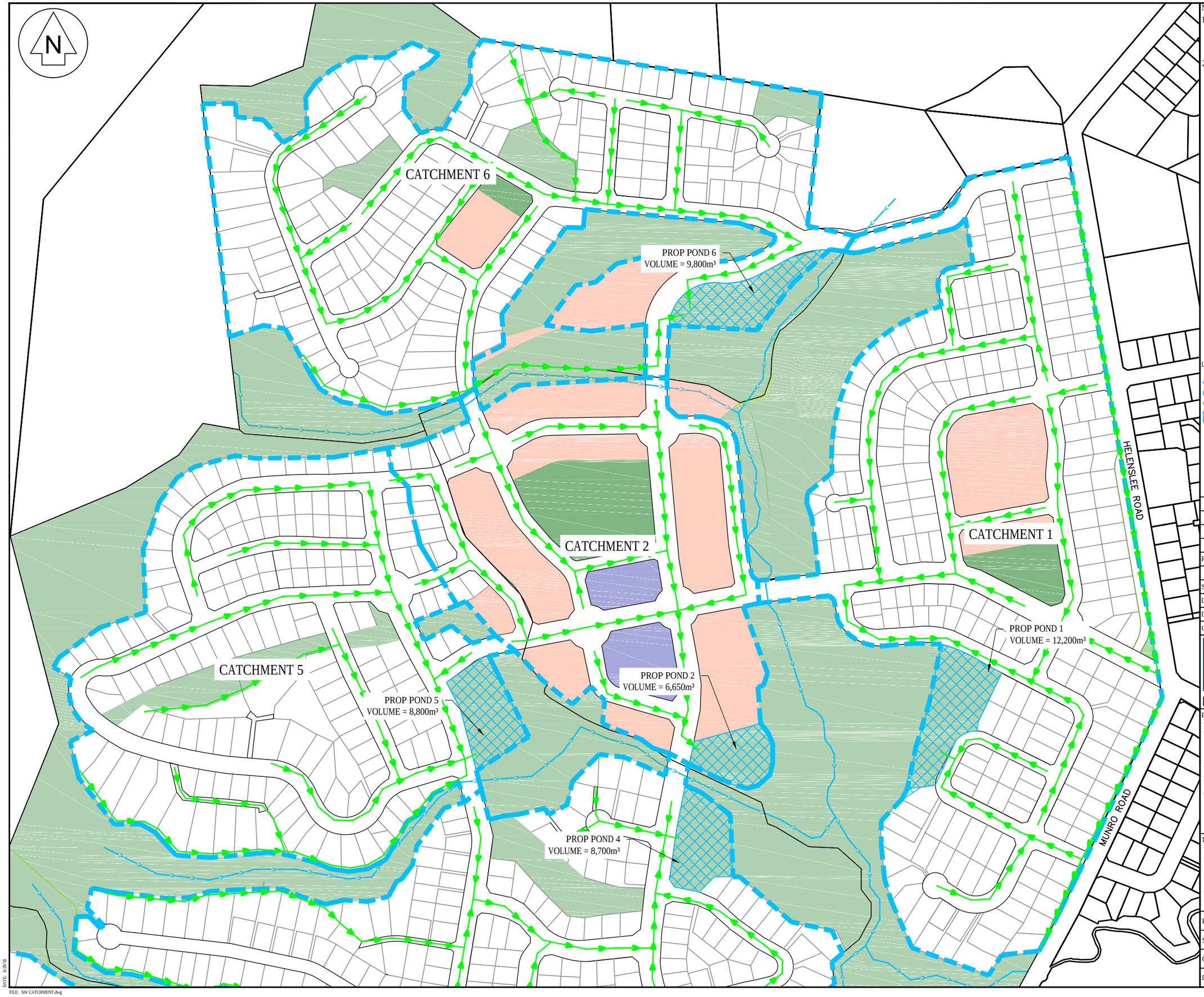
Title

PROPOSED
SW MANAGEMENT
PLAN

Project no.	101034		
Scale	1:8000 @ A3		
Cad file	101034-SW		
Drawing no.	C420	Rev	A

DATE: 6/29/18

FILE: SW CATCHMENT.dwg



Notes

1. Stormwater lines and ponds are indicative only for the purposes of pre-feasibility studies. Developed designs are to be provided in future stages.
2. Stormwater ponds to be 1.5m deep with slope at 1:3 (rise:run) on the sides

Legend

- STREAM
- CATCHMENT BDY
- PR SW
- PROP POND

Ref	Revisions	By	Date

	By	Date
Survey	GIS	-
Design	AO	06/18
Drawn	JZ	06/18
Checked	WM	06/18

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FOR
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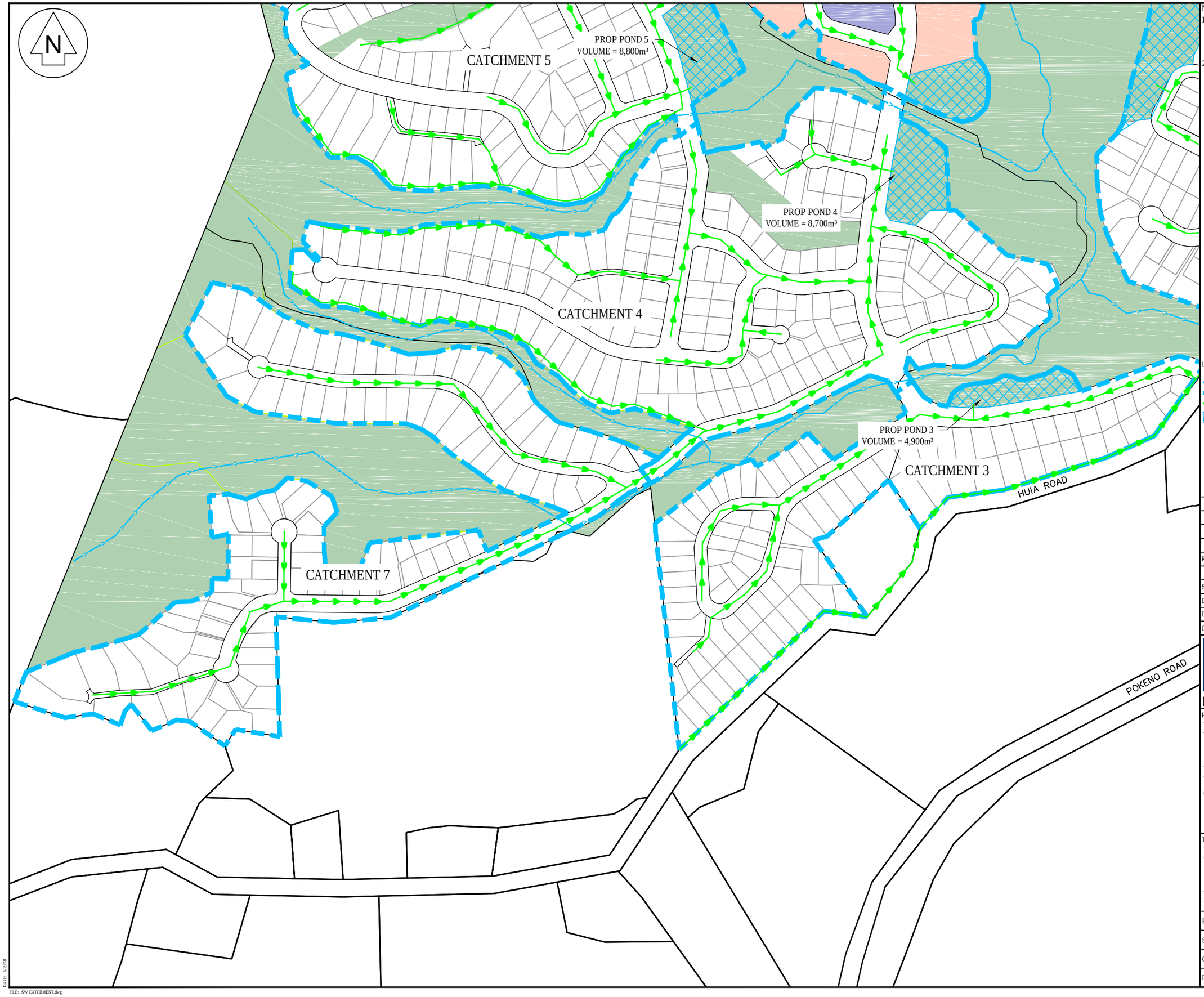
Title

PROPOSED
SW MANAGEMENT
PLAN

Project no.	101034
Scale	1:4000 @ A3
Cad file	101034-SW
Drawing no.	C421 Rev A

DATE: 6/20/18

FILE: SW CATCHMENT.dwg



Notes

1. Stormwater lines and ponds are indicative only for the purposes of pre-feasibility studies. Developed designs are to be provided in future stages.
2. Stormwater ponds to be 1.5m deep with slope at 1:3 (rise:run) on the sides

Legend

- STREAM
- CATCHMENT BDY
- PR SW
- PROP POND

Ref	Revisions	By	Date

	By	Date
Survey	GIS	-
Design	AO	06/18
Drawn	JZ	06/18
Checked	WM	06/18

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53 MUNRO ROAD
FOR
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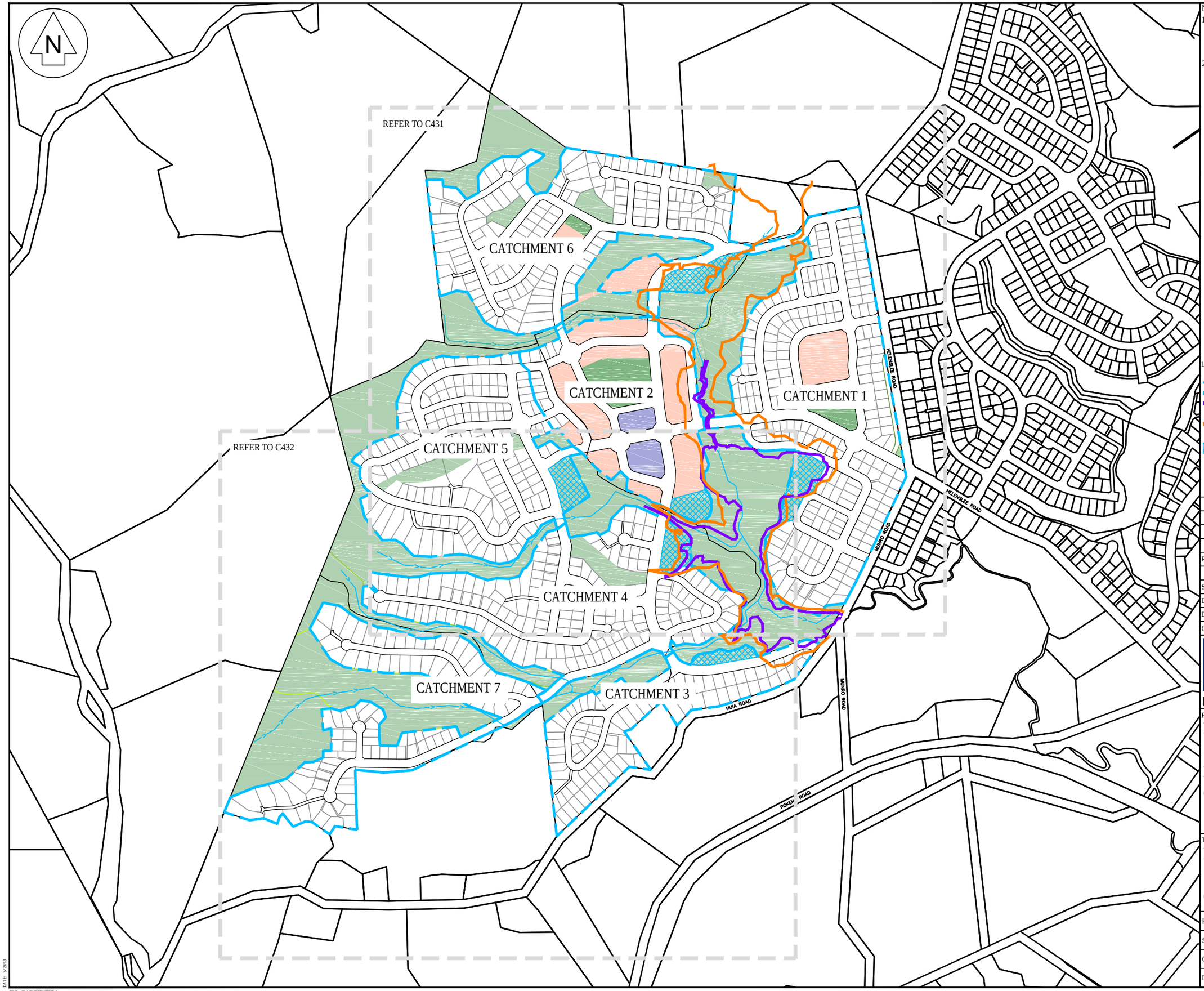
Title

PROPOSED
SW MANAGEMENT
PLAN

Project no.	101034		
Scale	1:4000 @ A3		
Cad file	101034-SW		
Drawing no.	C422	Rev	A

DATE: 6/29/18

FILE: SW CATCHMENT.dwg



Notes

1. Stormwater lines and ponds are indicative only for the purposes of pre-feasibility studies. Developed designs are to be provided in future stages.
2. Stormwater ponds to be 1.5m deep with slope at 1:3 (rise:run) on the sides

Legend

- STREAM
- CATCHMENT BDY
- 100YR FLOOD EXTENT (COUNCIL)
- 100YR FLOOD EXTENT (WSP-OPUS)
- PROP POND

Ref	Revisions	By	Date

	By	Date
Survey	GIS	-
Design	AO	06/18
Drawn	JZ	06/18
Checked	WM	06/18

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Title

PROPOSED
SW FLOODING
OVERVIEW

Project no.	101034		
Scale	1:8000 @ A3		
Cad file	101034-SW		
Drawing no.	C430	Rev	A

DATE: 6/20/18
FILE: SW CATCHMENT.dwg

N

CATCHMENT 6

CATCHMENT 2

CATCHMENT 1

CATCHMENT 5

HELENSLEE ROAD

MUNRO ROAD

Notes

1. Stormwater lines and ponds are indicative only for the purposes of pre-feasibility studies. Developed designs are to be provided in future stages.
2. Stormwater ponds to be 1.5m deep with slope at 1:3 (rise:run) on the sides

Legend

- STREAM
- CATCHMENT BDY
- 100YR FLOOD EXTENT (COUNCIL)
- 100YR FLOOD EXTENT (WSP-OPUS)
- PROP POND

Ref	Revisions	By	Date

	By	Date
Survey	GIS	-
Design	AO	06/18
Drawn	JZ	06/18
Checked	WM	06/18

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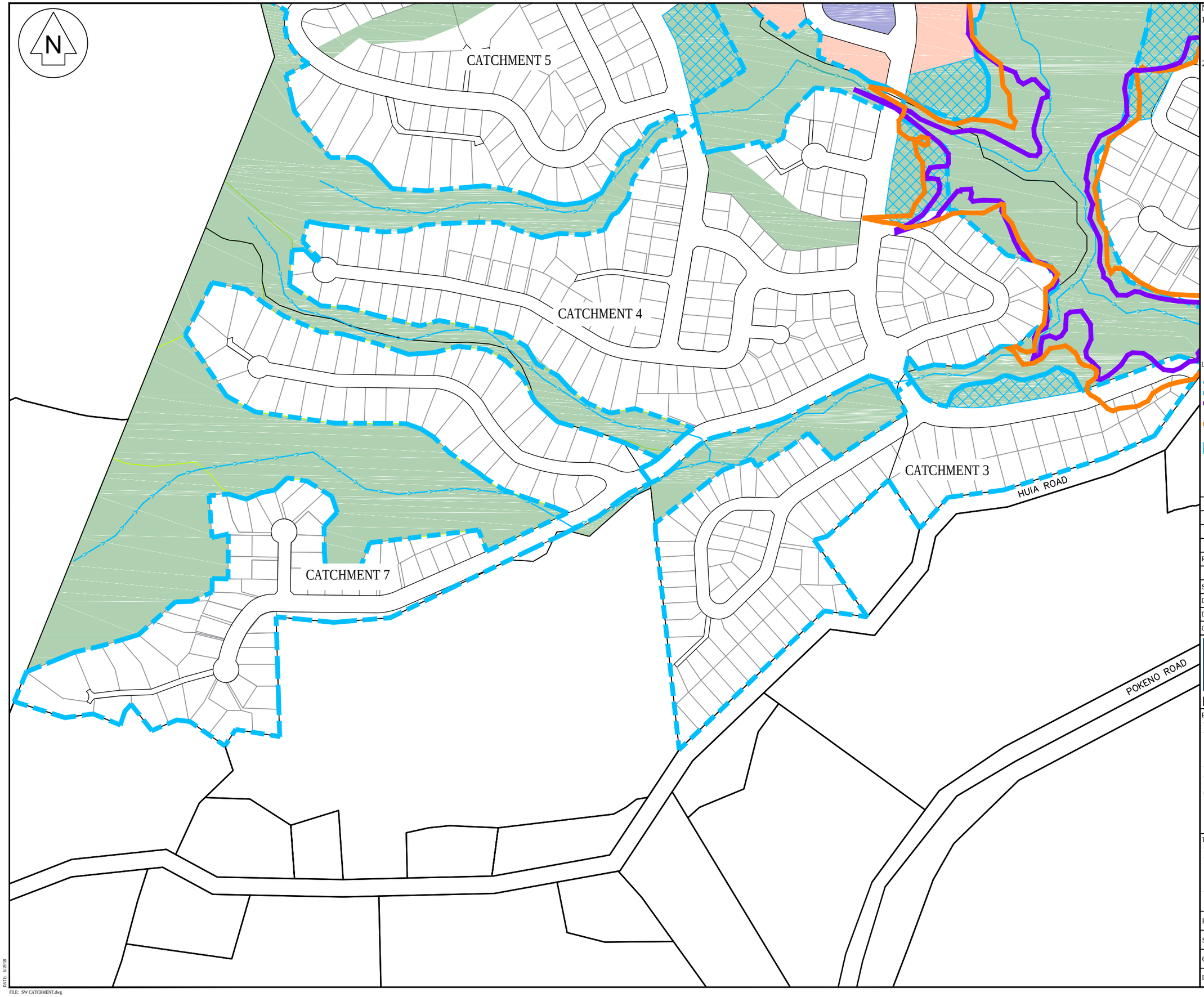
Title

PROPOSED
SW FLOODING
PLAN

Project no.	101034		
Scale	1:4000 @ A3		
Cad file	101034-SW		
Drawing no.	C431	Rev	A

DATE: 6/29/18

FILE: SW CATCHMENT.dwg



Notes

1. Stormwater lines and ponds are indicative only for the purposes of pre-feasibility studies. Developed designs are to be provided in future stages.
2. Stormwater ponds to be 1.5m deep with slope at 1:3 (rise:run) on the sides

Legend

- STREAM
- CATCHMENT BDY
- 100YR FLOOD EXTENT (COUNCIL)
- 100YR FLOOD EXTENT (WSP-OPUS)
- PROP POND

Ref	Revisions	By	Date

	By	Date
Survey	GIS	-
Design	AO	06/18
Drawn	JZ	06/18
Checked	WM	06/18

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Title

PROPOSED
SW FLOODING
PLAN

Project no.	101034		
Scale	1:4000 @ A3		
Cad file	101034-SW		
Drawing no.	C432	Rev	A

DATE: 6/29/18

FILE: SW CATCHMENT.dwg

SUMMARY OF LOTS	
STAGE	LOTS
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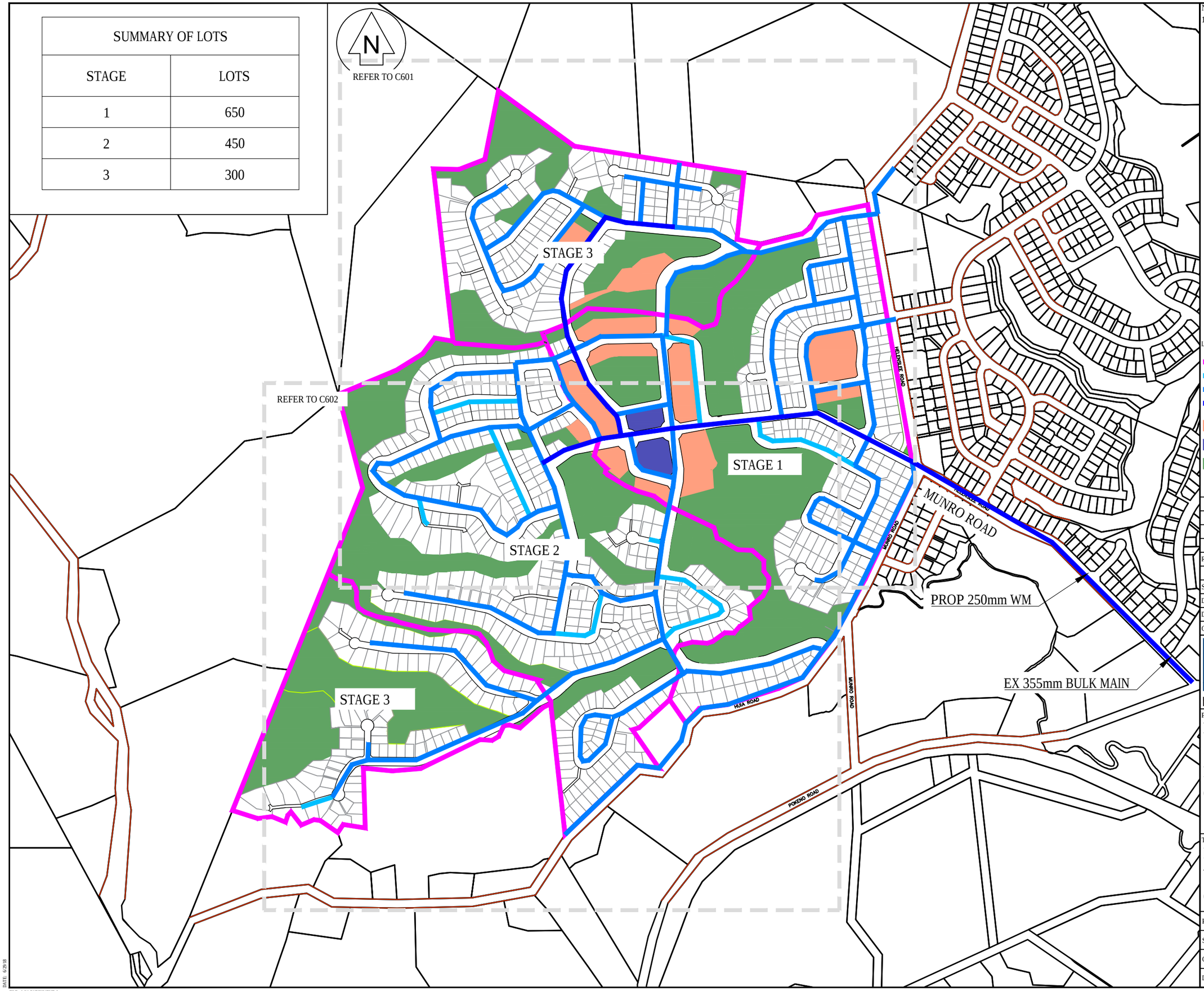
2	450
3	300



Notes

1. Watermains are indicative only for the purposes of pre-feasibility studies. Developed design are to be provided in future stages.

Legend

- STAGING BDY
- PROP 100mmØ WM
- PROP 150mmØ WM
- PROP 250mmØ WM
- MED DENSITY
- TOWN CENTRE
- RESERVE

Ref	Revisions	By	Date

	By	Date
Survey	GIS	-
Design	AO	06/18
Drawn	JZ	06/18
Checked	WM	06/18

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POKENO WEST
53 MUNRO ROAD
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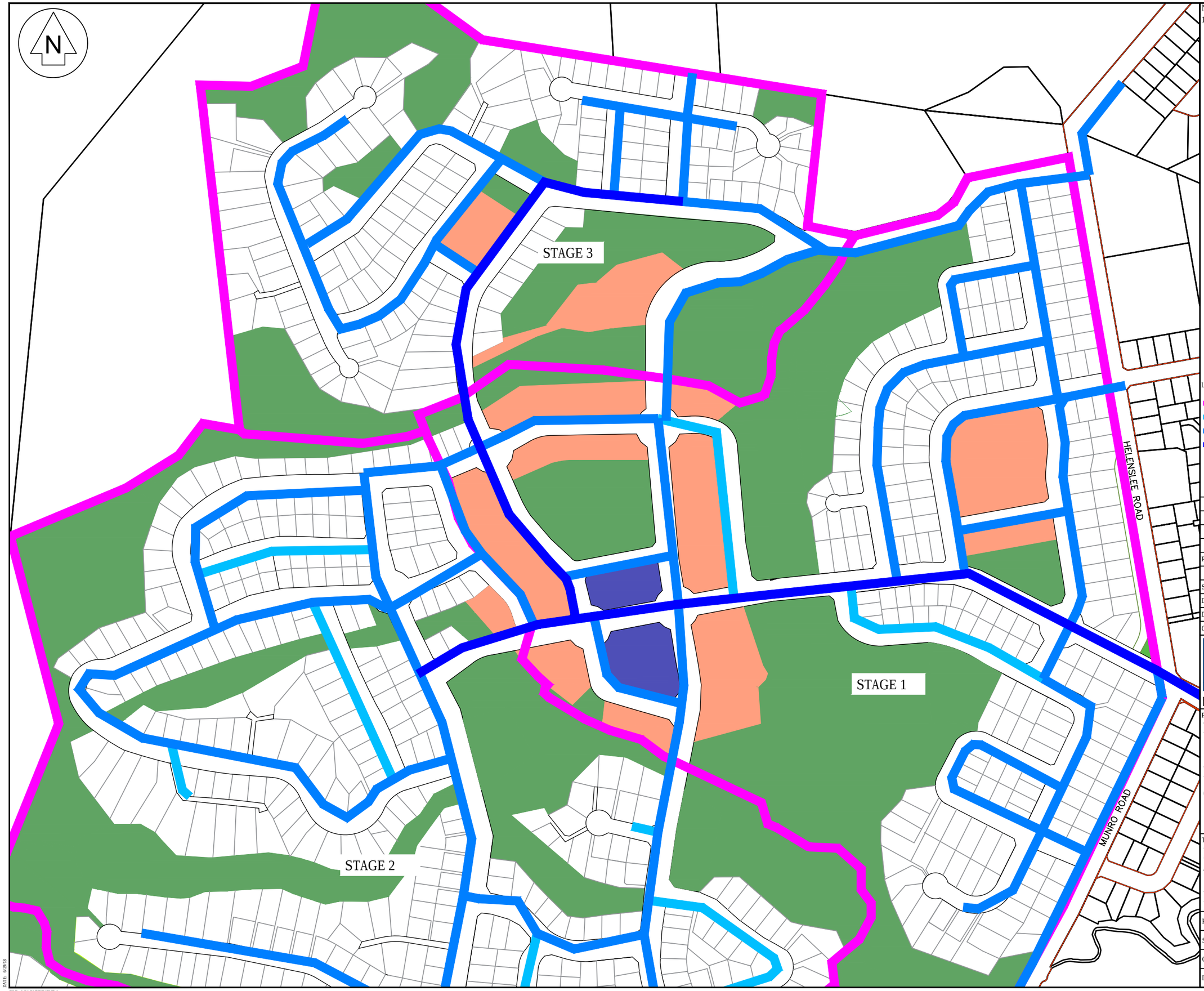
Title

PROPOSED
WATERMAIN
OVERVIEW

Project no.	101034		
Scale	1:8000 @ A3		
Cad file	101034-WM		
Drawing no.	C600	Rev	A

DATE: 6/20/18

FILE: WM CATCHMENT.dwg



Notes

1. Watermains are indicative only for the purposes of pre-feasibility studies. Developed design are to be provided in future stages.

Legend

- STAGING BDY
- PROP 100mmØ WM
- PROP 150mmØ WM
- PROP 250mmØ WM

Ref	Revisions	By	Date

	By	Date
Survey	GIS	-
Design	AO	06/18
Drawn	JZ	06/18
Checked	WM	06/18

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POKENO WEST
53 MUNRO ROAD
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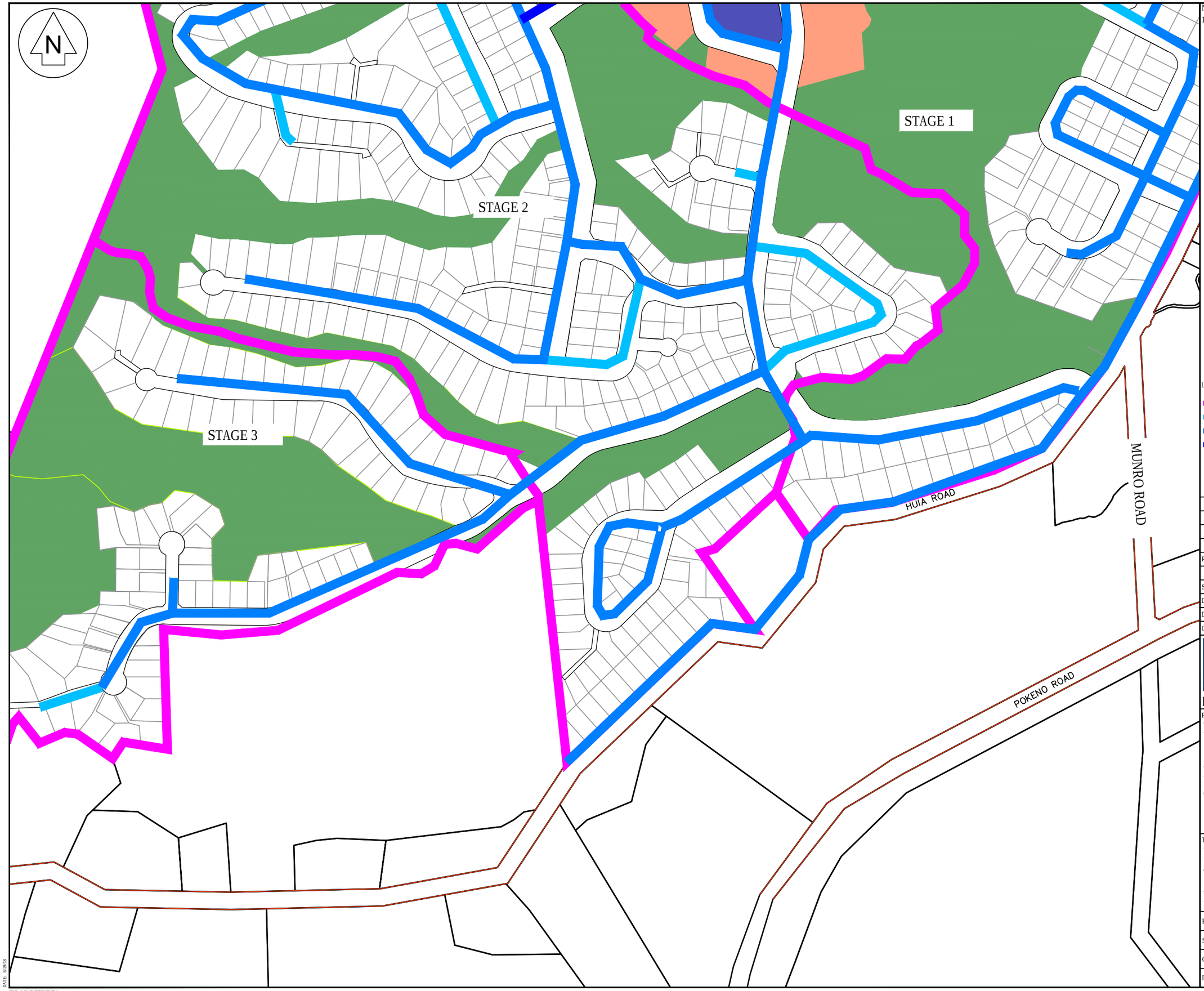
Title

PROPOSED
WATERMAIN
PLAN

Project no.	101034		
Scale	1:4000 @ A3		
Cad file	101034-WM		
Drawing no.	C601	Rev	A

DATE: 6/29/18

FILE: WM CATCHMENT.dwg



Notes

1. Watermains are indicative only for the purposes of pre-feasibility studies. Developed design are to be provided in future stages.

Legend

- STAGING BDY
- PROP 100mmØ WM
- PROP 150mmØ WM
- PROP 250mmØ WM

Ref	Revisions	By	Date

	By	Date
Survey	GIS	-
Design	AO	06/18
Drawn	JZ	06/18
Checked	WM	06/18

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53 MUNRO ROAD
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Title

PROPOSED
WATERMAIN
PLAN

Project no.	101034		
Scale	1:4000 @ A3		
Cad file	101034-WM		
Drawing no.	C602	Rev	A

DATE: 6/29/18

FILE: WM CATCHMENT.dwg

SUMMARY OF LOTS	
STAGE	LOTS
1	650
2	450
3	300

N

REFER TO C501

REFER TO C502

STAGE 1

STAGE 2

STAGE 3

STAGE 3

HELENSLEE ROAD

MUNRO ROAD

HUIA ROAD

POKENO ROAD

EX 280 HDPE RISING MAIN

Notes

1. Wastewater lines are indicative only for the purposes of pre-feasibility studies. Developed design are to be provided in future stages.
2. All lines are to be 150mmØ uPVC SN16 unless otherwise specified

Legend

- STAGE BOUNDARY
- INDICATIVE WASTEWATER
- MED DENSITY
- TOWN CENTRE
- RESERVE

Ref	Revisions	By	Date

	By	Date
Survey	GIS	-
Design	AO	06/18
Drawn	JZ	06/18
Checked	WM	06/18

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Project

POKENO WEST
53 MUNRO ROAD
FOR
CHENSHIU

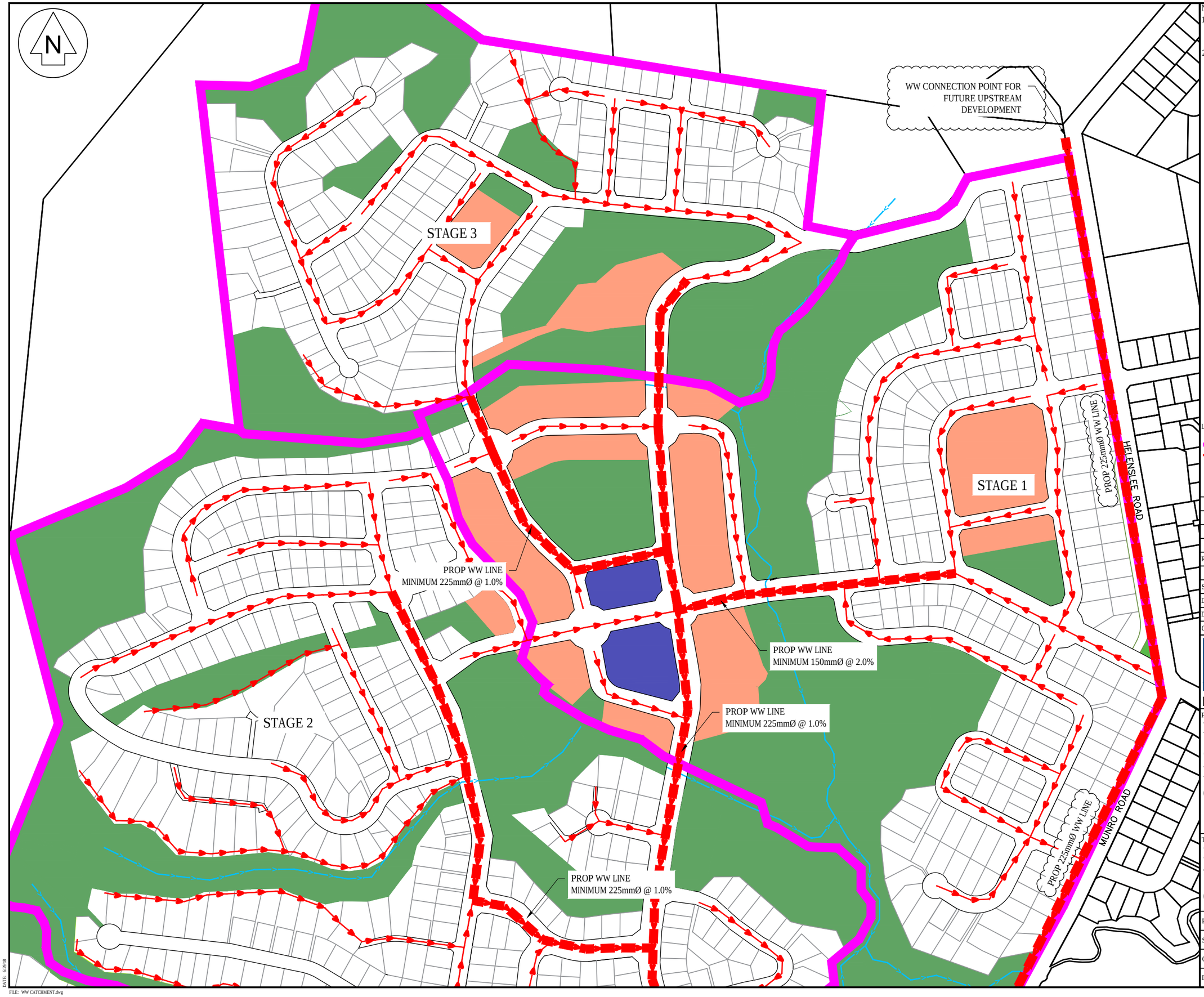
Title

PROPOSED
WASTEWATER
OVERVIEW

Project no.	101034		
Scale	1:8000 @ A3		
Cad file	101034-WW		
Drawing no.	C500	Rev	C

DATE: 6/20/18

FILE: WW CATCHMENT.dwg



Notes

1. Wastewater lines are indicative only for the purposes of pre-feasibility studies. Developed design are to be produced during future stages.
2. All lines are to be 150mmØ uPVC SN16 unless otherwise specified

Legend

STAGE BOUNDARY
INDICATIVE WASTEWATER

Ref	Revisions	By	Date

	By	Date
Survey	GIS	-
Design	AO	06/18
Drawn	JZ	06/18
Checked	WM	06/18

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Project

POKENO WEST
53 MUNRO ROAD
FOR
CHENSHIU

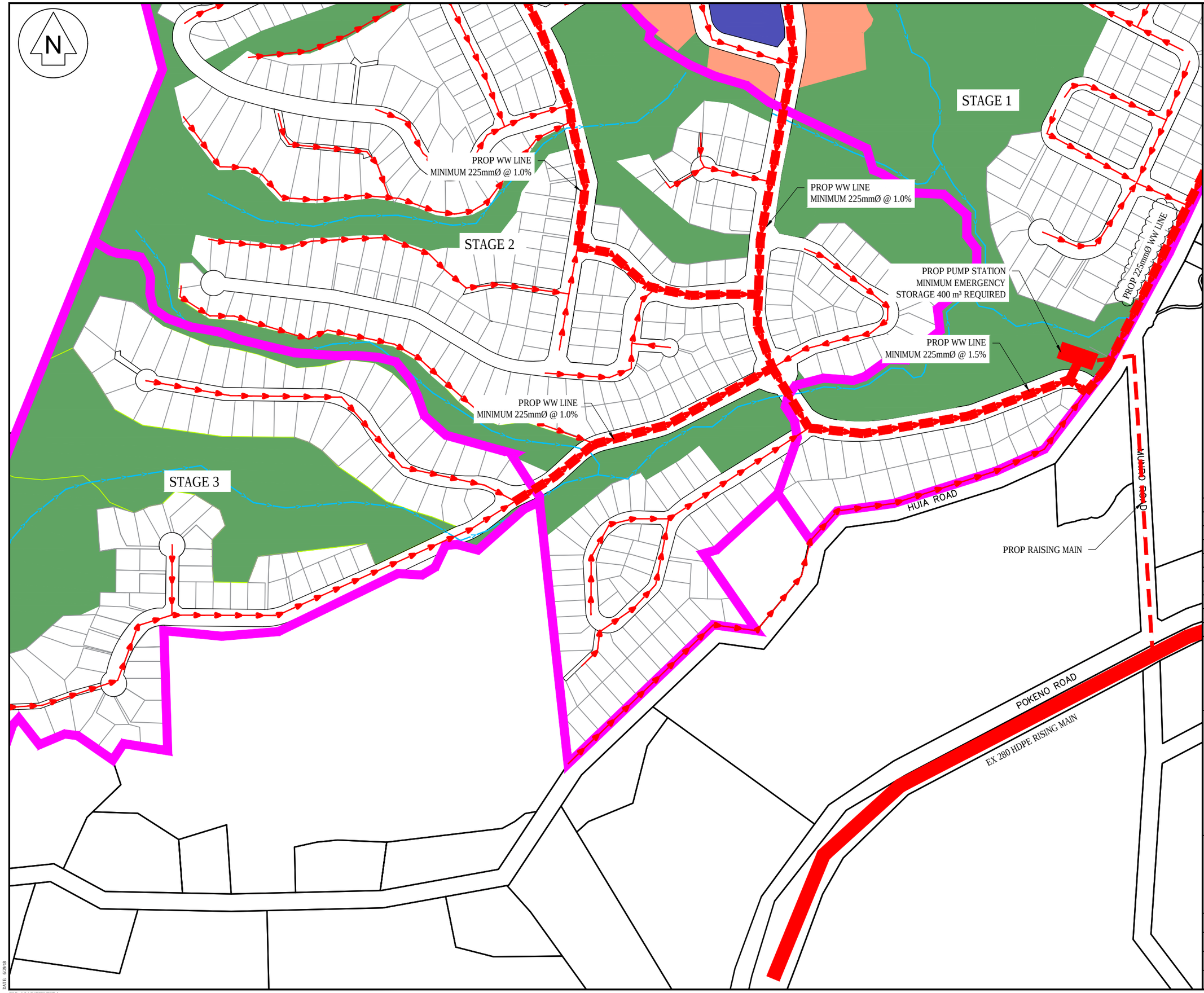
Title

PROPOSED WASTEWATER OVERVIEW

Project no.	101034
Scale	1:4000 @ A3
Cad file	101034-WW
Drawing no.	C501 Rev C

DATE: 6/20/18

FILE: WW CATCHMENT.dwg



Notes

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2. All lines are to be 150mmØ uPVC SN16 unless otherwise specified

Legend

STAGE BOUNDARY
INDICATIVE WASTEWATER

Ref	Revisions	By	Date

	By	Date
Survey	GIS	-
Design	AO	06/18
Drawn	JZ	06/18
Checked	WM	06/18

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Project

POKENO WEST
53 MUNRO ROAD
FOR
CHENSHIU

Title

PROPOSED
WASTEWATER
OVERVIEW

Project no.	101034		
Scale	1:4000 @ A3		
Cad file	101034-WW		
Drawing no.	C502	Rev	C

DATE: 6/28/18

FILE: WW CATCHMENT.dwg