BEFORE THE KAIPARA DISTRICT COUNCIL'S HEARING PANEL

IN THE MATTER OF	the Resource Management Act 1991 (**the Act**)
AND	
IN THE MATTER	An application for Private Plan Change 85 (**PC85**) -**MANGAWHAI EAST** by Foundry Group Limited (formerly Cabra Mangawhai Limited) and Pro Land Matters Company to rezone approximately 94-hectares of land at Black Swamp and Raymond Bull Roads, Mangawhai

---

STATEMENT OF EVIDENCE OF LEO DONALD HILLS ON BEHALF OF THE APPLICANTS

(Transportation)

16 December 2025

Jeremy Brabant

Barrister

Level 7, 50 Albert Street, Auckland Central

PO Box 1502, Shortland St, Auckland 1140

M: 021 494 506

E: jeremy@brabant.co.nz

INTRODUCTION

QUALIFICATIONS AND EXPERIENCE

1. My full name is Leo Donald Hills. I am a director of Commute Transportation Limited (**Commute**). Commute provides a wide-range of transport-related services to the private and public sector clients throughout New Zealand.

2. I have a Master of Civil Engineering (2000) and a Bachelor of Engineering with Honours (1996), both from the University of Auckland. I am a Chartered Professional Engineer (CPEng) and a Chartered Member of Engineering New Zealand (CMEngNZ).

3. I have over 29 years' experience as a specialist traffic and transport engineer. Prior to establishing Commute in 2015, I worked at:

    a. Traffic Design Group 1996 to 2004;

    b. Transit New Zealand (now NZTA) from 2004-2005; and

    c. Traffic Design Group from 2005-2014.

4. During my 29 years as a practicing traffic engineer, I have been engaged by local authorities and private companies/individuals to advise on traffic and development issues covering safety, management and planning matters of many kinds. I have been involved in numerous private plan change requests, especially in Auckland.

EXPERT WITNESS CODE OF CONDUCT

5. Although this is not a hearing before the Environment Court, I record that I have read and agree to and abide by the Environment Court's Code of Conduct for Expert Witnesses as specified in the Environment Court's Practice Note 2023. This evidence is within my area of expertise, except where I state that I rely upon the evidence of other expert witnesses as presented to this hearing. I have not omitted to consider any material facts known to me that might alter or detract from the opinions expressed.

PROJECT INVOLVEMENT

6. I have been engaged by Foundry Group Limited (formerly Cabra Mangawhai Limited) and Pro Land Matters Company (**Applicant**) in respect of Plan Change 85

(**PC 85**). I was engaged by the Applicant to assess the potential transport effects resulting from PC 85.

7. I was the reviewer of the 22 June 2025 updated Integrated Transportation Assessment (**2025 ITA**) which was authored by my colleague Tom Guernier. I was the co-author of the clause 23 responses, pertaining to transportation matters, (which were incorporated into the undated 2025 ITA) and have been involved in discussion regarding PC85 with Kaipara District Council transportation consultants. I am generally familiar with the area and have visited the project area on several occasions, most recently on 8 November 2025.

8. The purpose of my evidence is to outline my previous assessment in relation to the matters that are relevant to my area of expertise and to respond to both submitters and Council's s42a report.

SCOPE OF EVIDENCE

9. This statement of evidence will:

    a. Provide a summary of previous assessment undertaken for PC85;

    b. Assess potential traffic effects of PC 85;

    c. Respond to the submissions received on the PC 85;

    d. Comment on the s 42A report; and

    e. Set out my Conclusions.

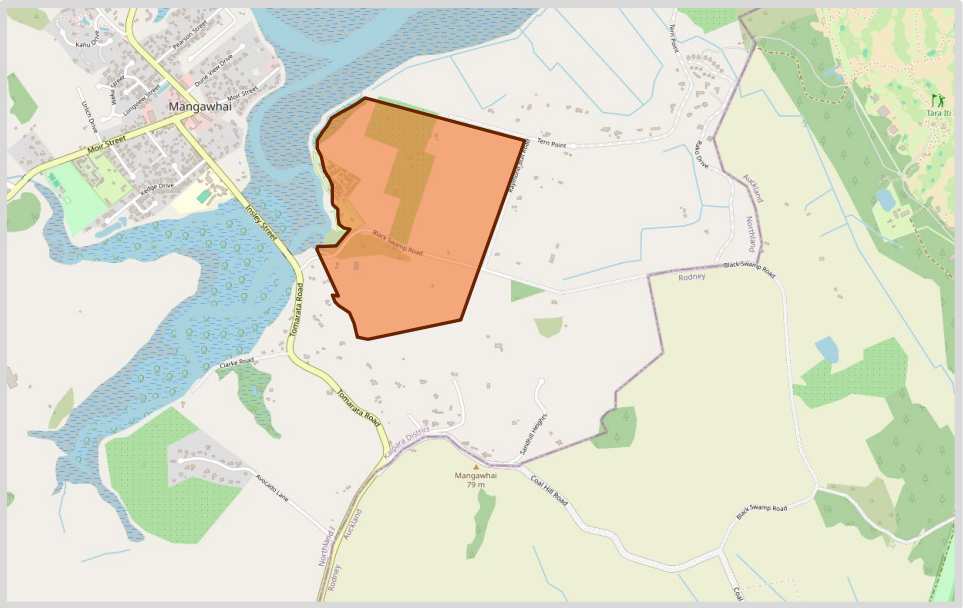
PREVIOUS ASSESSMENT

Site location / environment

10. The development site is located in Mangawhai, Northland, on the eastern side of the Mangawhai Harbour. The site comprises a block of land on either side of Black Swamp Road, referred to throughout this ITA as the northern and southern lots.

11. Figure 1 shows the location of the proposed PPC sites in relation to the surrounding road environment.

Figure 1: Site Location



12. Tomarata Road and Insley Street (which essentially link together) are both classified as Arterial Roads in the District Plan. These roads run in a general north-west to south-east alignment, transitioning from Insley Street in the north-west to Tomarata Road in the south-east at the Black Swamp Road intersection. In the vicinity of Black Swamp Road, Tomarata Road has an approximate carriageway width of 7.2 metres, accommodating one lane of traffic in each direction. There are no footpaths along either side of Tomarata Road, including at the Black Swamp Road intersection. Tomarata Road has a speed limit of 80km/hr which changes to 60km/hr south of Black Swamp Road intersection (Insley Street is 60km/hr).

13. Northland Transport Alliance recorded the vehicle volumes on Black Swamp Road in March 2021, between Tomarata Road and Raymond Bull Road, and found the daily vehicle volume to be 833 vehicle movements per day (vpd). Of note, the surveys undertaken as part of the ITA production indicated current (2024) volume in the summertime period indicate the daily volume increases to 1500-1800 vpd.

14. Manual traffic counts were undertaken on Thursday 18 January 2024 at the Black Swamp Road / Tomarata Road intersection and the Black Swamp Road / Raymond Bull Road intersection. The surveys were undertaken during the weekday morning commuter peak period (7:00 to 9:00 am) and the weekday evening commuter peak period (4:00 to 6:00 pm). The AM and PM peak hour survey results are shown in Figure 4-7 of the ITA[1].

[1] Integrated Transportation Assessment Report June 2024 Figure 4 to 7

15. Tube counts were also undertaken from Tuesday 16 January 2024 to Monday 5 February 2024 on Black Swamp Road near 35 Black Swamp Road. The survey period captured one public holiday (Auckland Anniversary Day on Monday 29 January 2024, and the weekend and Monday before Waitangi Day on Tuesday 6 February 2024.

16. From these counts, the daily volume generally peaks toward the end of the week, with a maximum recorded volume of 1,841 vpd. The 7-day average daily traffic rate for the survey period was 1,463 vpd. I note, on the day of the turning count survey (18 January), the daily volume recorded was 1,619 vpd and thus represents a higher than average period and (given the survey period occurred during the summer holiday period) I conclude this to be a higher volume day of the year.

17. I have undertaken a search of the road safety record using Waka Kotahi's (NZTA) Crash Analysis System (**CAS**) to identify all reported crashes near the site during the five-year period from 2020 to 2024 as well as all available data from 2025. The search focused on all reported crashes occurring on Black Swamp Road between Tomarata Road / Insley Street and Raymond Bull Road, as well as along Tomarata Road / Insley Street within 100 metres of the Black Swamp Road / Tomarata Road intersection.

18. The crash search revealed one crash, which occurred along Insley Street when the driver of a vehicle fell asleep at the wheel. The crash is classified as a minor injury crash. As will be described in my evidence I consider the development will add moderate additional traffic movements onto the local road network, and roads / intersections are proposed to be upgraded and sealed and thus safety generally improved.

Trip generation / assessment

19. As detailed in the 2025 ITA I consider the proposed development is estimated to generate in the order of 571 vph during the peak hours, and 5,949 vpd. I note that this estimate is based on a number of assumptions that are subject to change at the resource consent stage including approximately 788 dwellings, 6,370sqm retail and 10,600sqm industrial.

20. In terms of directional split, 95% of vehicles are assumed to travel to / from the west toward Black Swamp Road / Tomarata Road, where I have estimated traffic would then split to the west (Mangawhai village) and south (SH1 / Auckland) at a rate of approximately 40% and 55% respectively. The remaining 5% have been assumed to head to the east toward the beaches and golf courses.

21. I consider the intersection of Black Swamp Road / Insley Street is the key intersection for PC85. This intersection has been modelled using SIDRA intersection analysis programme, under existing 2024 survey volumes (referred to as 'Existing' scenario) with the PPC85 volumes added to form the 'Full development' scenario. Further, a base 30% growth has been applied to the existing volumes to represent 10 years of growth at 3% per annum.

22. The intersection has been modelled with additional levels of development (applying a straight increase to percent yield) to determine the level of development that can be added before the intersection reaches capacity (either level of service D or degree of saturation 0.95) and requires an upgrade.

23. The SIDRA results show:

    a. The intersection requires an upgrade to include a right turn bay from Tomarata Road into Black Swamp Road with essentially any additional traffic; and

    b. The complete development can comfortably be accommodated by the upgraded priority-controlled intersection described above; and

    c. With this upgrade, the intersection can cater for up to an additional 80% of the proposed development until the right turn out movements from Black Swamp Road reach capacity. At this stage the likely upgrade would be a single lane roundabout.

24. I also note that additional sensitivity testing has been undertaken following discussion with Council (Section 7 of the ITA). This sensitivity testing showed little difference in the modelling results.

Safe System Assessment

25. Section 8 of the ITA details the Safe System Assessment (SSA) I have undertaken. A SSA provides a structured tool used to qualitatively evaluate how proposed transport projects align in terms of safety. The SSA assessment does show a slight increase in score (from existing to future with PC85 and upgrade) however this increase is only minimal due to the proposed upgrade to the intersection (right turn bay and pedestrian provisions). I consider the overall score to be low.

Wider network

26. Given the proximity of the Mangawhai village, an assessment has been undertaken of the nearest major intersection to the site being the Moir Street/Insley Street roundabout.

27. In this regard, the Mangawhai Transport Study undertaken by Opus dated May 2018 did assess this intersection and concluded a single lane roundabout was appropriate (recently constructed). An extract of this assessment is shown in the 2025 ITA. It shows with a what I consider a "high growth" scenario, the single lane roundabout is still well below capacity in holiday peak period (high growth was assumed to be 7% growth per annum over 10 years).

28. This intersection services a wide catchment including Mangawhai Village, Mangawhai Heads and traffic coming from Kaiwaka. Based on the above findings PPC85 will have minimal comparable impact on the functioning of this intersection and consequently I consider that the Moir Street/Insley Street roundabout has sufficient capacity in the future to accommodate PPC85.

Proposed Network

29. The 2025 ITA (section 10) outlines the future road network. The future road network provides for a range of travel modes including cycling & walking, private vehicles and enables for future transport services.

30. The key upgrades identified within the PPC are as follows:

    a. Upgrade of Black Swamp Road to an urban standard along the subject site through to the Insley Street intersection.

b. New collector road commencing from a new roundabout on Black Swamp Road (near the eastern end of the PPC area travelling in both southern and northerly direction through the site). The southern collector road then loops back to Black Swamp Road.

c. Shared off-road (3m) path on the collector roads throughout the PPC area.

d. Provision of a separate 3m shared path (walking / cycling) on Insley Street connecting the PPC area with Mangawhai including existing schools and shopping areas.

e. Upgrade of the Insley Street Road / Black Swamp Road intersection to include a right turn bay.

31. In terms of timing, it is acknowledged that there is a certain amount of traffic increase enabled by activities that are established / establishing / or consented in the existing environment. Such activities include a garden centre at 45 / 45A Black Swamp and brewery at 25 Windsor Way. There is also a consented 20 lot subdivision on the land at 18B Black Swamp Road.

32. In addition to these existing environment activities, there is the opportunity for dwellings to establish on existing vacant sites, and it is expected (regardless of the PPC) that there would be some additional subdivision opportunities under the Operative District Plan and potentially the Proposed Kaipara District Plan.

33. On this basis, an existing environment traffic demand for the Site, without the plan change, has been estimated at 50 dwellings. The rules that therefore trigger the initial upgrades for the construction of a right turn bay and the construction of the walkway back to the village, has been set at 51 dwellings.

S42A REPORT

34. I have reviewed Council's Section 42A report dated 1 December 2025, prepared by Council's Consultant Planner, Mr Jonathan Clease. In general, Mr Clease has adopted the finding of Council's consultant traffic engineer (Mr Gerhard van der Westhuizen) in his review (Appendix 10 of the s42A report) dated 1 December 2025.

35. In this regard Mr Van der Westhuizen concludes (paragraph 8.3):

> *"To conclude, should my above recommendations be adopted, and provided the Hearings Panel is satisfied that the shared path (or some alternative) can feasibly be provided, I consider that there are no transport planning or transport engineering reasons to preclude the approval of the PC 85."*

36. I have considered each one of Mr Van der Westhuizen's recommendations and comment as follows.

Insley Street / Black Swamp Road / Tomarata Road intersection

37. Mr Van der Westhuizen's has recommended that the Insley Street / Black Swamp Road / Tomarata Road intersection be upgraded to a roundabout straight away, rather than retaining a priority-controlled layout (with full upgrade to include right turn bay).

38. In this regard, it appears Mr Van der Westhuizen is satisfied with the overall performance of this intersection (with PC85 traffic included) in terms of efficiency[2]. Rather, the reason for his recommendation for a roundabout over an upgraded priority intersection is on the grounds of safety. It appears that this recommendation is based on the Safe System Assessment (SSA), which I will comment on below, and a view that from the SSA assessment a roundabout is a safer option than a priority intersection.

39. I disagree that the Insley Street / Black Swamp Road / Tomarata Road intersection should be upgraded to a roundabout to mitigate the effects associated with PC85. As outlined in the SSA in the ITA, the proposed T-intersection in this location provides similar safety outcomes compared to the roundabout option and both options in my opinion produce low SSA scores (indicating safe operation).

40. I note that the proposed treatment of the intersection is well recognised and implemented across the Council and even State Highway network (nationally). The proposed design adopts elements from standard intersection treatment interventions and applies a cost-effective safe system-compliant upgrade. It is also consistent with other recent similar residential Plan Changes in the Kaipara region I have been involved with including PC84 (Tara Road and Moir Road intersection in

[2] Paragraphs 3.2 and 5.23 of Mr Van der Westhuizen's evidence.

Mangawhai) and PC81 (SH14 / Awakino Point Road) both of which had upgraded priority T intersections as their main access to the main arterial network.

41. I also note Mr Van der Westhuizen appears to recommend a roundabout due to the roundabout (with PC85) achieving the same SSA score as the existing intersection (without PC85) as he states "*a score consistent with the existing scenario indicates that the effects of the additional traffic have been appropriately addressed*[3]". In my opinion there is no requirement for any development / application to achieve the <u>same</u> level of efficiency or safety as the existing environment. If there was, essentially every application regardless of size would need to provide mitigation to intersections as every vehicle, in some way affects performance of intersections.

<u>The Moir Street / Insley Street roundabout</u>

42. Mr Van der Westhuizen's has recommended that the Moir Street / Insley Street roundabout near Mangawhai Village be reassessed by the applicant to confirm that it will have sufficient capacity to accommodate future traffic generated by the PC 85 development under 2034 traffic conditions.

43. In this regard, through the Cl23 responses and updated ITA, this intersection was assessed. It is noted that PC 84 (Mangawhai Hills) which has recently been zoned for residential use, did not include an assessment of this intersection due to the distance to this intersection and that the intersection has recently been upgraded to a roundabout. PC85 is further away from this intersection than PC84 (centre of the site is around 2km from the intersection) and PC85 provides a greater range of options that could avoid PC85 traffic going through the Insley Street / Moir Street intersection.

44. The Mangawhai Transport Study undertaken by Opus dated May 2018 did assess this intersection and concluded a single lane roundabout was appropriate (recently constructed). The modelling showed with a "high growth" scenario, the single lane roundabout is still well below capacity in holiday peak period (high growth was assumed to be 7% growth per annum over 10 years). I consider the modelling which looked at general growth in the area to upgrade the intersection to be the

[3] Paragraph 5.37 of Mr Van der Westhuizens evidence / review.

appropriate tool for assessing this intersection as there are a number of other developments / changes that also influence its performance.

45. I would also note there is limited opportunity between reviewing the s42a report and production of my evidence. I have however, in this time, undertaken an additional traffic survey and analysis of this intersection. This is set out below.

46. I have commissioned an additional survey of the Moir Street / Insley Street roundabout on 9 December 2025. I have added additional traffic from PC 85 to the intersection as follows:

    a. Traffic towards Mangawhai from the subject site added as per Figure 13 and 14 of the ITA;

    b. Of the traffic travelling towards Mangawhai, those using Moir Street / Insley Street intersection assumed to be 75% of the total traffic (the other 25% assumed to be travelling to the school or shops and not needing to travel through the Moir Street / Insley Street intersection); and

    c. The traffic at the Moir Street / Insley Street intersection distributed as per existing turning volumes.

47. The intersection has been modelled in SIDRA with and without the estimated traffic and SIDRA results shown in **Attachment A** of my evidence. The results show:

    i. The existing intersection shows minimal queuing and delay;

    ii. The additional PC 85 traffic has little change on the operation of the intersection with up to half a second additional delay and less than one additional vehicle queuing; and

    iii. With an additional 3% growth per annum for 10 years (30%), the intersections will still operate well within acceptable levels with Level of Service A or better and degree of saturation of 0.62.

Safe System Assessment (SSA)

48. Mr Van der Westhuizen has recommended scores for the SSA I completed as part of the ITA for the Black Swamp Road / Insley Street / Tomarata Road intersection

be adjusted to reflect a higher likelihood and severity of crashes for the proposed right-turn bay scenario.

49. In my opinion SSA assessments are inherently subjective and as such I still consider my original SSA to be appropriate. In particular I disagree with Mr Van der Westhuizen's review / criticism of my SSA assessment in that:

    a. In paragraph 5.33c, I consider that widening of the intersection with the right turn bay and the inclusion of upgraded shoulders and kerbs will reduce the likelihood of run-off road, head-on and intersection crashes.

    b. In regard to 5.33d, the posted speed limit of 60km/hr, which in my opinion is a lower speed environment. This leads to my conclusion that a severity score of "2" is appropriate which in terms of the Waka Kotahi Safe System audit guidelines 2022 states "*Should a crash occur, it is unlikely that it will result in a fatality or serious injury to any people involved*" rather than a "3" as Mr Van der Westhuizen prefers which the guideline states "*Should a crash occur, it is likely that it will result in a fatality or serious injury to any people involved*".

50. I agree with Mr Van der Westhuizen that SSA guidelines do not specify what score may be considered acceptable and a lower SSA score represents a safer outcome. However, with the SSA score ranging from 0 (safest) to 448, in my opinion all scores (regardless of assumptions) of between 52 and 108 represent an acceptable outcome.

Triggers

51. Mr Van der Westhuizen has recommended mitigation measures and infrastructure upgrades be triggered based on cumulative dwelling thresholds, such as 51 dwellings, rather than individual consents.

52. I agree with this recommendation.

Pedestrian and cycling connections

53. Mr Van der Westhuizen has recommended pedestrian and cycling connections be provided throughout the PC 85 area regardless of dwelling location rather than being limited to development fronting Black Swamp Road, to ensure full connectivity and safe access to Mangawhai Village.

54. I agree with this recommendation.

Structure Plan

55. Mr Van der Westhuizen has recommended:

"*the Structure Plan clearly identify all collector roads, including existing Black Swamp Road as a collector road within the PC 85 area, and distinguish existing and proposed walking and cycling infrastructure, extending connections along Black Swamp Road to the Gateway Roundabout. I also recommend that the Insley Street / Black Swamp Road / Tomarata Road intersection be specifically identified as a required upgrade location*"

56. In this regard I generally agree with Mr Van der Westhuizen and these have been included in the Proposed Infrastructure Upgrades plan (Aspire). Of note the term "collector" has not been included but rather its key components have been included.

Standard vs information requirements

57. Mr Van der Westhuizen has recommended the transport upgrades identified in the ITA report be addressed through a standard with discretionary activity status, rather than relying solely on Information Requirements.

58. I agree with this recommendation.

Cumulative thresholds

59. Mr Van der Westhuizen has recommended the timing of transport upgrades be coordinated with the cumulative dwelling thresholds.

60. I agree with this recommendation.

Walking and cycling

61. Mr Van der Westhuizen generally supports the proposed walking and cycling network, including footpaths on all roads, 3 m wide shared paths on collector roads, and connectivity to Mangawhai Village and shared path across Insley Street bridge. He notes that the Insley Street shared path will be critical to the success of the plan change, as it provides the only safe and direct walking and cycling connection between the PC 85 area and Mangawhai and without it, the plan change will not be supportable. I completely agree which is why I have

recommended it is constructed essentially when the "permitted" level of development is first reached (approximately 51 dwellings)[4].

Fire access

62. I (like Mr Van der Westhuizen) support FENZ's submission to include a matter of discretion requiring consideration of non-compliance with access standards (DEVX-SUB-S6), ensuring mitigation measures are implemented and emergency access clearance is provided. I also support Mr Van der Westhuizen's comment that existing Vehicles Access and Driveways standards (13.10.25) within the Kaipara Operative District Plan are appropriate (and thus no additional provisions are necessary).

RESPONSE TO SUBMITTERS

63. I have read the submissions received on PC85 that raise concerns relating to transport matters. I address the matters raised in submissions below:

    a. General congestion and safety concerns especially during peak periods with Black Swamp Road traffic volume increasing to 7,000–8,000 vehicle movements per day with no upgrades proposed;

    b. Intersection of Black Swamp and Insley Street becoming congested and the preference for roundabout over any other upgrade;

    c. Mangawhai Road -Tomarata Road is already inadequate over summer and every long weekend public holiday;

    d. School week at peak drop-off and pick up times traffic flow on Insley Street past the school and risk to school children;

    e. trucks associated with importation of fill;

    f. Ability to access the driveway at 4 and 4A Black Swamp Road;

    g. Lack of public transport; and

    h. Fire Access (**FENZ**).

[4] Table 7: Implementation Plan of ITA

Traffic Congestion

64. As I have discussed previously, I consider that the Black Swamp Road / Insley Street / Tomarata Road intersection requires an upgrade to include a right turn bay. With this upgrade, as well as the upgrade of Black Swamp Road, and provision of pedestrian / cyclist connections I have described earlier, I consider the complete development can comfortably be accommodated by the upgraded intersection.

Black Swamp Road / Insley Street / Tomarata Road intersection

65. As I have noted, I consider that the Black Swamp Road / Insley Street / Tomarata Road intersection requires an upgrade to include a right turn bay. While a roundabout can also be accommodated in the existing road reserve, I do not consider it to be required by PC85, but rather would only be required if the entire Site is developed in the order of 80% greater than anticipated.

Mangawhai Road -Tomarata Road

66. Mangawhai Road -Tomarata Road is one of the key routes from Mangawhai to the south (Warkworth / Auckland). It is designated as an arterial road in the District Plan and thus expected to carry significant levels of traffic. I do not consider it the responsibility of PC85 to upgrade mid-block arterial roads which cater for traffic from a number of different areas.

School traffic flow

67. I acknowledge that around school pick-up / drop-off time there is additional congestion around Mangawhai Beach School on Insley Street. This is common throughout New Zealand. The Site is some 2km from the subject site and does not warrant any particular mitigation relating to PC85 and Insley Street is also a main thoroughfare with traffic from a wide range of areas.

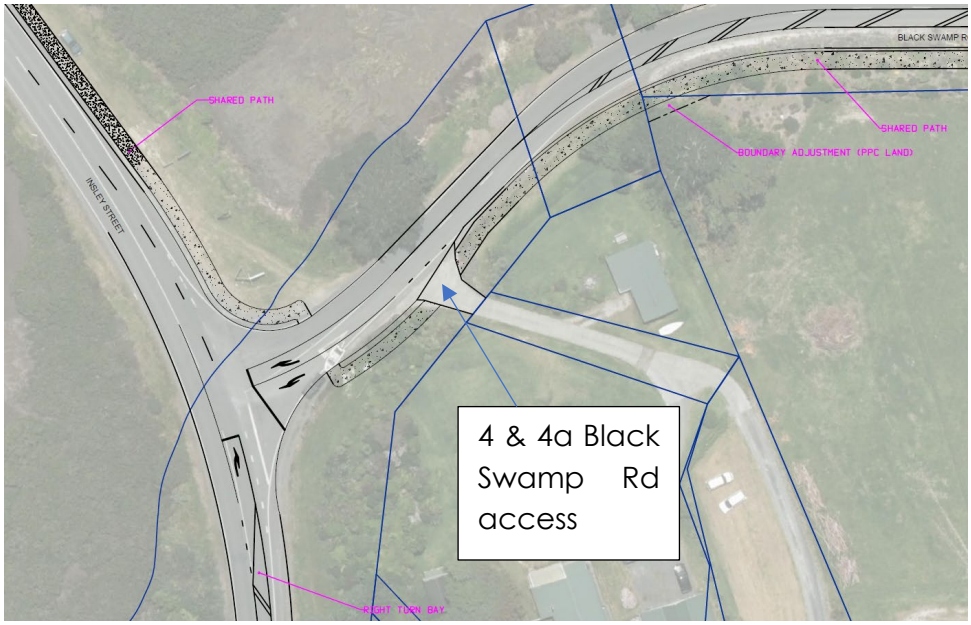
Importation of fill

68. Construction effects are typically assessed as part of resource consent processes. Resource consent is required for subdivision and land development within the PC85 area, and for sites within the Coastal Hazard overlay resource consent is required for filling to raise building sites. Subsequent resource consent processes can properly and more appropriately address construction traffic effects which I would expect can be mitigated through traffic management.

4 and 4A Black Swamp Road

69. The driveway serving No 4 / 4A Black Swamp Road is shown in Figure 2 below together with the proposed upgrade to the Black Swamp Road / Insley Street / Tomarata Road intersection (Appendix B of the ITA). This driveway is some 30m from the intersection and in my opinion will continue to operate safety and efficiently following PC85.

Figure 2: Site Location



Lack of public transport

70. I acknowledge the lack of public transport in Mangawhai. In this regard public transport is typically operated by local Council and requires a level of demand before becoming viable. While I would support any future public transport in the area, I do not consider it is the responsibility of PC85. Likewise PC85 will not preclude or limit the ability for public transport options to be used in the future.

Fire Access (FENZ)

71. I note the comments by FENZ re access. As I have noted earlier I (like Councils engineer) support FENZ's submission to include a matter of discretion requiring consideration of non-compliance with access standards (DEVX-SUB-S6), ensuring mitigation measures are implemented and emergency access clearance is

provided. I also consider that existing Vehicle Access and Driveways standards (13.10.25) within the Kaipara Operative District Plan to be appropriate (and thus no additional provisions are necessary). These provisions are in the Development Area provisions, given that the Operative District Plan is proposed to be superseded (in time) by the Proposed District Plan.

CONCLUSION

72. Based on the modelling and assessment outlined in the ITA and additional surveys and modelling I have undertaken, I consider that the full extent of development enabled by PC 85 can be appropriately supported by the existing road network (together with upgrades I have recommended), to maintain appropriate levels of safety and efficiency on the surrounding transport network.

73. I am generally in agreement with Council's reporting traffic engineer with the exception of the need to upgrade the Black Swamp Road / Insley Street intersection to a roundabout.

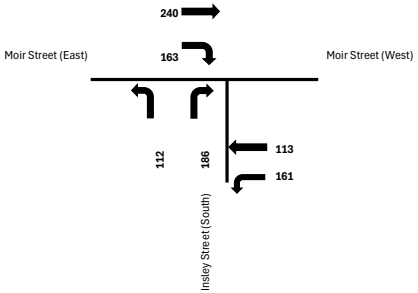
74. Overall, I consider that the PC 85 is acceptable and an appropriate use of the site from a traffic engineering / transportation planning perspective. With reference to the plan change as advanced by the Applicant, in my opinion there is no traffic engineering related reason to decline the plan change.

Leo Hills

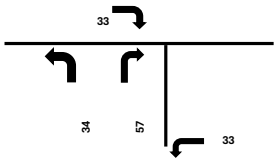
16 December 2025

APPENDIX A: Moir Street / Insley Street roundabout analysis

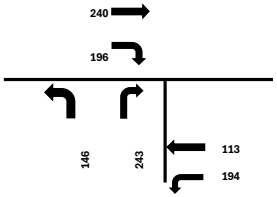
Existing Weekday Morning Peak Hour : 8:00am to 9:00 am



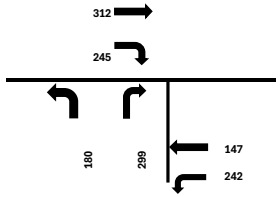
Additional : 8:00am to 9:00 am



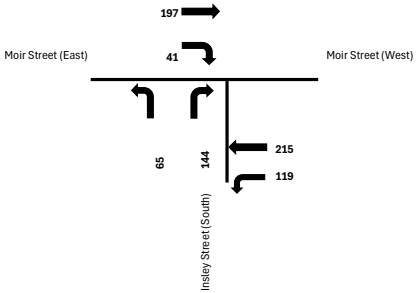
Total Weekday Morning Peak Hour : 8:00am to 9:00 am



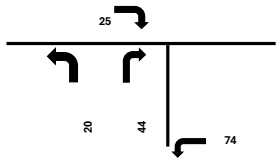
Total Weekday Morning Peak Hour (2034 + 30%) : 8:00am to 9:00 am



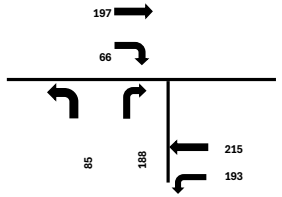
Weekday Evening Peak Hour : 4:15 to : 5:15pm



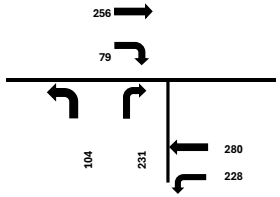
Additional : 4:15 to : 5:15pm



Total Weekday evening Peak Hour : 4:15 to : 5:15pm



Total Weekday evening Peak Hour (2034 + 30%) : 4:15 to : 5:15pm

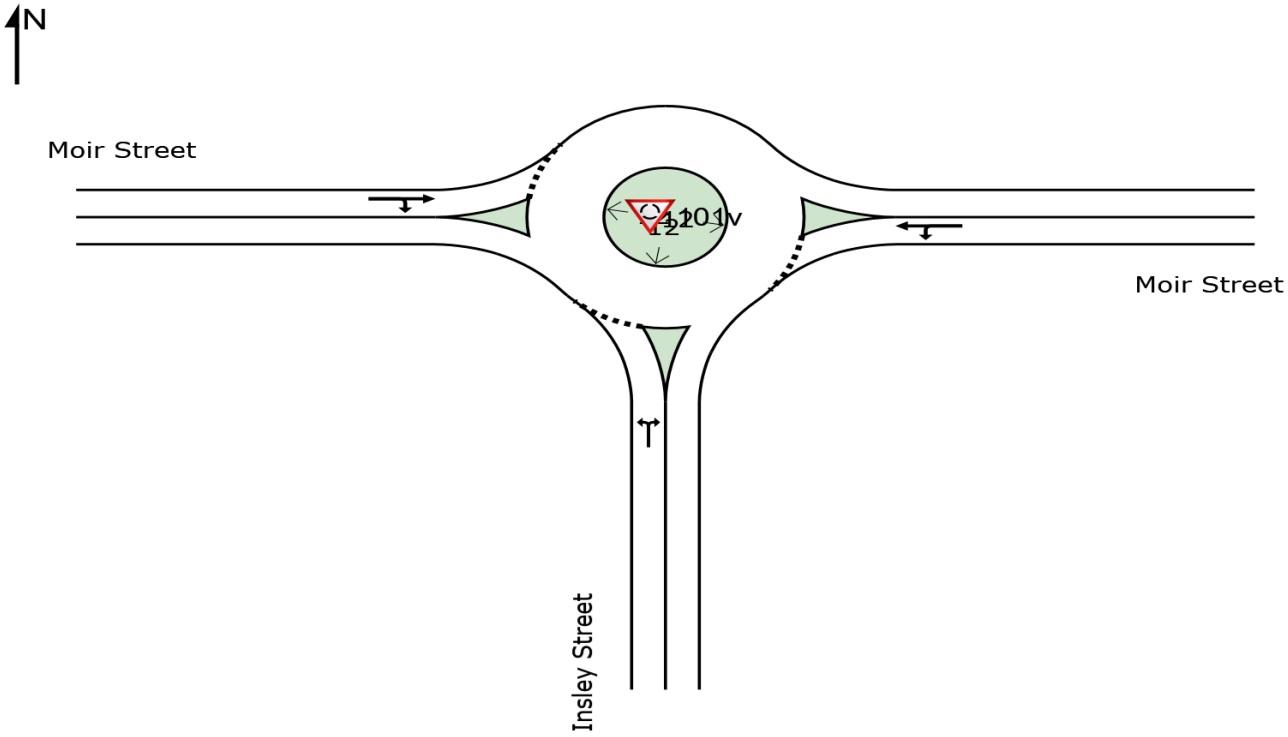


SITE LAYOUT

Site: 101v [AM Existing - roundbout existing (Site Folder: General)]

New Site
Site Category: (None)
Roundabout

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



Organisation: COMMUTE TRANSPORTATION | Licence: NETWORK / 1PC | Created: Monday, 15 December 2025 11:00:48 AM
Project: C:\Users\Modelling\COMMUTE TRANSPORTATON CONSULTANTS LTD\Projects 2800 - Documents\J002860 Cabra Mangawhai \hearing\Mangawhai.sip9

MOVEMENT SUMMARY

Site: 101v [AM Existing - roundbout existing (Site Folder: General)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Insley Street															
1	L2	All MCs	118	2.0	118	2.0	0.262	4.2	LOS A	1.9	13.2	0.39	0.55	0.39	44.9
3	R2	All MCs	196	2.0	196	2.0	0.262	7.9	LOS A	1.9	13.2	0.39	0.55	0.39	44.6
Approach			314	2.0	314	2.0	0.262	6.5	LOS A	1.9	13.2	0.39	0.55	0.39	44.7
East: Moir Street															
4	L2	All MCs	169	2.0	169	2.0	0.263	4.7	LOS A	1.8	13.1	0.47	0.49	0.47	45.7
5	T1	All MCs	119	2.0	119	2.0	0.263	4.8	LOS A	1.8	13.1	0.47	0.49	0.47	45.9
Approach			288	2.0	288	2.0	0.263	4.7	LOS A	1.8	13.1	0.47	0.49	0.47	45.8
West: Moir Street															
11	T1	All MCs	253	2.0	253	2.0	0.387	5.1	LOS A	2.9	21.0	0.54	0.55	0.54	45.0
12	R2	All MCs	172	2.0	172	2.0	0.387	8.7	LOS A	2.9	21.0	0.54	0.55	0.54	44.4
Approach			424	2.0	424	2.0	0.387	6.6	LOS A	2.9	21.0	0.54	0.55	0.54	44.7
All Vehicles			1026	2.0	1026	2.0	0.387	6.0	LOS A	2.9	21.0	0.48	0.53	0.48	45.0

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

Site: 101v [AM Existing - roundbout - with PC85 (Site Folder: General)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Insley Street															
1	L2	All MCs	154	2.0	154	2.0	0.337	4.3	LOS A	2.6	18.6	0.42	0.54	0.42	44.8
3	R2	All MCs	256	2.0	256	2.0	0.337	7.9	LOS A	2.6	18.6	0.42	0.54	0.42	44.5
Approach			409	2.0	409	2.0	0.337	6.6	LOS A	2.6	18.6	0.42	0.54	0.42	44.6
East: Moir Street															
4	L2	All MCs	204	2.0	204	2.0	0.308	5.0	LOS A	2.3	16.0	0.54	0.52	0.54	45.5
5	T1	All MCs	119	2.0	119	2.0	0.308	5.1	LOS A	2.3	16.0	0.54	0.52	0.54	45.8
Approach			323	2.0	323	2.0	0.308	5.0	LOS A	2.3	16.0	0.54	0.52	0.54	45.6
West: Moir Street															
11	T1	All MCs	253	2.0	253	2.0	0.451	5.8	LOS A	3.6	25.4	0.64	0.59	0.64	44.6
12	R2	All MCs	206	2.0	206	2.0	0.451	9.4	LOS A	3.6	25.4	0.64	0.59	0.64	44.1
Approach			459	2.0	459	2.0	0.451	7.4	LOS A	3.6	25.4	0.64	0.59	0.64	44.3
All Vehicles			1192	2.0	1192	2.0	0.451	6.5	LOS A	3.6	25.4	0.54	0.56	0.54	44.8

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

Site: 101v [AM Existing - roundbout - with PC85 + 30% (Site Folder: General)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Insley Street															
1	L2	All MCs	189	2.0	189	2.0	0.436	4.7	LOS A	3.8	26.7	0.54	0.56	0.54	44.6
3	R2	All MCs	315	2.0	315	2.0	0.436	8.4	LOS A	3.8	26.7	0.54	0.56	0.54	44.3
Approach			504	2.0	504	2.0	0.436	7.0	LOS A	3.8	26.7	0.54	0.56	0.54	44.4
East: Moir Street															
4	L2	All MCs	255	2.0	255	2.0	0.417	5.6	LOS A	3.4	24.0	0.66	0.57	0.66	45.2
5	T1	All MCs	155	2.0	155	2.0	0.417	5.7	LOS A	3.4	24.0	0.66	0.57	0.66	45.5
Approach			409	2.0	409	2.0	0.417	5.7	LOS A	3.4	24.0	0.66	0.57	0.66	45.3
West: Moir Street															
11	T1	All MCs	328	2.0	328	2.0	0.616	7.9	LOS A	6.4	45.8	0.81	0.70	0.89	43.8
12	R2	All MCs	258	2.0	258	2.0	0.616	11.5	LOS B	6.4	45.8	0.81	0.70	0.89	43.3
Approach			586	2.0	586	2.0	0.616	9.5	LOS A	6.4	45.8	0.81	0.70	0.89	43.6
All Vehicles			1500	2.0	1500	2.0	0.616	7.6	LOS A	6.4	45.8	0.68	0.62	0.71	44.3

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

Site: 101v [PM Existing - roundbout exiting (Site Folder: General)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Insley Street															
1	L2	All MCs	68	2.0	68	2.0	0.213	5.0	LOS A	1.3	9.4	0.49	0.60	0.49	44.5
3	R2	All MCs	152	2.0	152	2.0	0.213	8.7	LOS A	1.3	9.4	0.49	0.60	0.49	44.3
Approach			220	2.0	220	2.0	0.213	7.5	LOS A	1.3	9.4	0.49	0.60	0.49	44.3
East: Moir Street															
4	L2	All MCs	125	2.0	125	2.0	0.251	3.6	LOS A	1.8	12.8	0.22	0.40	0.22	46.3
5	T1	All MCs	226	2.0	226	2.0	0.251	3.7	LOS A	1.8	12.8	0.22	0.40	0.22	46.5
Approach			352	2.0	352	2.0	0.251	3.7	LOS A	1.8	12.8	0.22	0.40	0.22	46.4
West: Moir Street															
11	T1	All MCs	207	2.0	207	2.0	0.222	4.6	LOS A	1.5	10.6	0.43	0.48	0.43	45.6
12	R2	All MCs	43	2.0	43	2.0	0.222	8.1	LOS A	1.5	10.6	0.43	0.48	0.43	45.0
Approach			251	2.0	251	2.0	0.222	5.2	LOS A	1.5	10.6	0.43	0.48	0.43	45.5
All Vehicles			822	2.0	822	2.0	0.251	5.2	LOS A	1.8	12.8	0.35	0.48	0.35	45.6

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

Site: 101v [PM Existing - roundbout with PC85 (Site Folder: General)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Insley Street															
1	L2	All MCs	89	2.0	89	2.0	0.279	5.1	LOS A	1.9	13.3	0.52	0.60	0.52	44.5
3	R2	All MCs	198	2.0	198	2.0	0.279	8.8	LOS A	1.9	13.3	0.52	0.60	0.52	44.2
Approach			287	2.0	287	2.0	0.279	7.7	LOS A	1.9	13.3	0.52	0.60	0.52	44.3
East: Moir Street															
4	L2	All MCs	203	2.0	203	2.0	0.322	3.9	LOS A	2.5	18.0	0.32	0.42	0.32	46.1
5	T1	All MCs	226	2.0	226	2.0	0.322	4.0	LOS A	2.5	18.0	0.32	0.42	0.32	46.3
Approach			429	2.0	429	2.0	0.322	3.9	LOS A	2.5	18.0	0.32	0.42	0.32	46.2
West: Moir Street															
11	T1	All MCs	207	2.0	207	2.0	0.262	5.0	LOS A	1.8	12.9	0.50	0.52	0.50	45.3
12	R2	All MCs	69	2.0	69	2.0	0.262	8.5	LOS A	1.8	12.9	0.50	0.52	0.50	44.7
Approach			277	2.0	277	2.0	0.262	5.9	LOS A	1.8	12.9	0.50	0.52	0.50	45.1
All Vehicles			994	2.0	994	2.0	0.322	5.5	LOS A	2.5	18.0	0.43	0.50	0.43	45.3

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.