Flat Bush School NOR

Response to Auckland Council Transport Queries

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The purpose of this memo is to respond to Auckland Council's requests for further information in regard to the ITA for a proposed primary school at 121 Murphys Road in Flat Bush. The RFIs provided by *Arrive* dated 3 March 2023 are set out in bold, followed by Abley's response.

T1. Please either provide alternative sources of traffic volume projections and/ or assumptions in the area; or; provide sensitivity analysis using traffic volumes 20% higher than the ITA estimate.

As requested, we have rerun the model with 20% higher traffic from Murphys Park Drive. This increase in traffic will only affect the proposed left turn school access on Murphys Road. The SIDRA model with the 20% traffic increase shows the school access will operate at a LOS of D, with an average delay of 31 seconds. This is considered acceptable as some delay is expected at school peak time. Murphys Road movements continue to operate at a LOS of A, so any queues or delay will be contained on-site.

The SIDRA output for the sensitivity test is provided below:

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: Murphys Rd South															
2	T1	All MCs	706	0.0	706	0.0	0.362	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	49.8
Approach			706	0.0	706	0.0	0.362	0.1	NA	0.0	0.0	0.00	0.00	0.00	49.8
East: School Exit															
4	L2	All MCs	600	0.0	600	0.0	0.944	31.4	LOS D	15.9	111.2	0.97	2.17	4.42	31.9
Approach			600	0.0	600	0.0	0.944	31.4	LOS D	15.9	111.2	0.97	2.17	4.42	31.9
North: Murphys Rd North															
8	T1	All MCs	814	0.0	814	0.0	0.417	0.2	LOS A	0.0	0.0	0.00	0.00	0.00	49.8
Approach			814	0.0	814	0.0	0.417	0.2	NA	0.0	0.0	0.00	0.00	0.00	49.8
All Vehicles			2120	0.0	2120	0.0	0.944	9.0	NA	15.9	111.2	0.27	0.61	1.25	43.9

Figure 1 SIDRA output for School Access on Murphys Road - Sensitivity test additonal 20% traffic

T2. Please provide the total number of vehicle trips generated by the school, broken down into on-site PUDO, remote-PUDO and other for the main analysis and sensitivity analysis.

Please see below a breakdown in the number of vehicles/trips estimated at each of the vehicle drop off locations. The calculations assume a 1.4 student car occupancy. The 'Other remote PUDO locations' includes locations where parents may drop off their child at a safe location and the child walks the rest of the way to school. These locations will often be routes where there are no roads to cross and other

families walking. A good example of this would be at the corner of Hodges Road and Picturesque Drive where students can walk from Hodges Road to the school without the need to cross a road. This allows caregivers to continue their journey without the need to interact with school traffic.

Please note that these numbers represent the masterplan roll for the school, which will take several years to reach. There is potential that Murphys Road will have been upgraded by other parties by the time the school reaches masterplan roll.

Table 1 Number of trips at each PUDO location

Time	On-site School PUDO	Picturesque Drive Remote PUDO	Other remote PUDO locations (Multiple)
Mornings	40% 357 vehicles 714 trips	15% 134 vehicles 268 trips	10% 126 vehicles 252 trips
Afternoons	35% 313 vehicles 626 trips	15% 134 vehicles 268 trips	10% 126 vehicles 252 trips

T3. Please either provide additional data to corroborate the assumed use of the remote PUDO; or; provide analysis assuming the remote PUDO accounts for less than 14% of travel.

As discussed in the ITA, we consider that the Picturesque Drive remote PUDO and other remote PUDO locations will be significantly more attractive than Car & Walk options at other schools for several reasons, including:

- There is no right turn onto Murphys Road from the school site meaning that drivers have a circuitous journey home if they are using the school on-site PUDO.
- The remote PUDO is also a safe location where many students/families will be walking to/from school providing a friendly pedestrian environment.
- There are no roads to cross between the Picturesque Drive PUDO and the school.
- It will likely only be the caregivers that choose to travel south on Murphys Road that will use the school PUDO.
- Very few schools have **formal** remote PUDO locations and they still achieve the relative high Car & Walk modal[1] share.
- Walking school buses will be setup between Picturesque Drive PUDO and the school which will further encourage use. If congestion occurs at the school PUDO, this will further encourage a high use of remote PUDOs.
- It is proposed the designation has a Travel Plan condition that can be very clearly set up to deliver on these targets, in consultation with AT/AC.

[1] TravelWise data 2020 – 14% average Car & Walk modal share

We are not aware of any other datasets, other than the TravelWise data, that can further corroborate the Car & Walk modal share. However, the constraints in the road network for the Flat Bush school make the remote PUDO a convenient and efficient option. It should be noted that the majority of schools do not have formal remote PUDO locations, but still we have a high (14%) Car & Walk modal share. We consider that the formalised remote PUDO on Picturesque Drive and the use of other remote locations will easily achieve a 25% usage.

In addition to the above, the modelling shows that the local transport network and the school access onto Murphys Road will still operate at an acceptable level if the remote PUDO locations only achieved a 14% modal share.

Auckland Transport are actively encouraging remote PUDO locations at schools to remove traffic congestion away from the school gate; and to encourage active modes for at least part of the student's trip. The high Car & Walk modal share that has been achieved in recent years has proved that this aspiration is achievable. We consider our proposal for a formal PUDO location aligns very well with AT's aspirations. The implementation of the proposed infrastructure, along with encouragement and education measures, is commendable and should be encouraged as an achievable solution to congestion around the school gate.

T4. Please provide assessment of the after-school period.

We have created a model for the Murphys Park Drive / Road 2 intersection for the afternoon school peak. Both the school access onto Murphys Road and the MPD / Road 1 intersection will have a solid median to restrict right turning, so the only intersection of interest is MPD / Road 2.

The trip distribution for the afternoon peak is provided in Figure 2. The afternoons will likely see less vehicles turning left out of the school access and more vehicles using Road 2 to circle back to the residential catchment area. The trip distribution assumed for the afternoons is provided below.

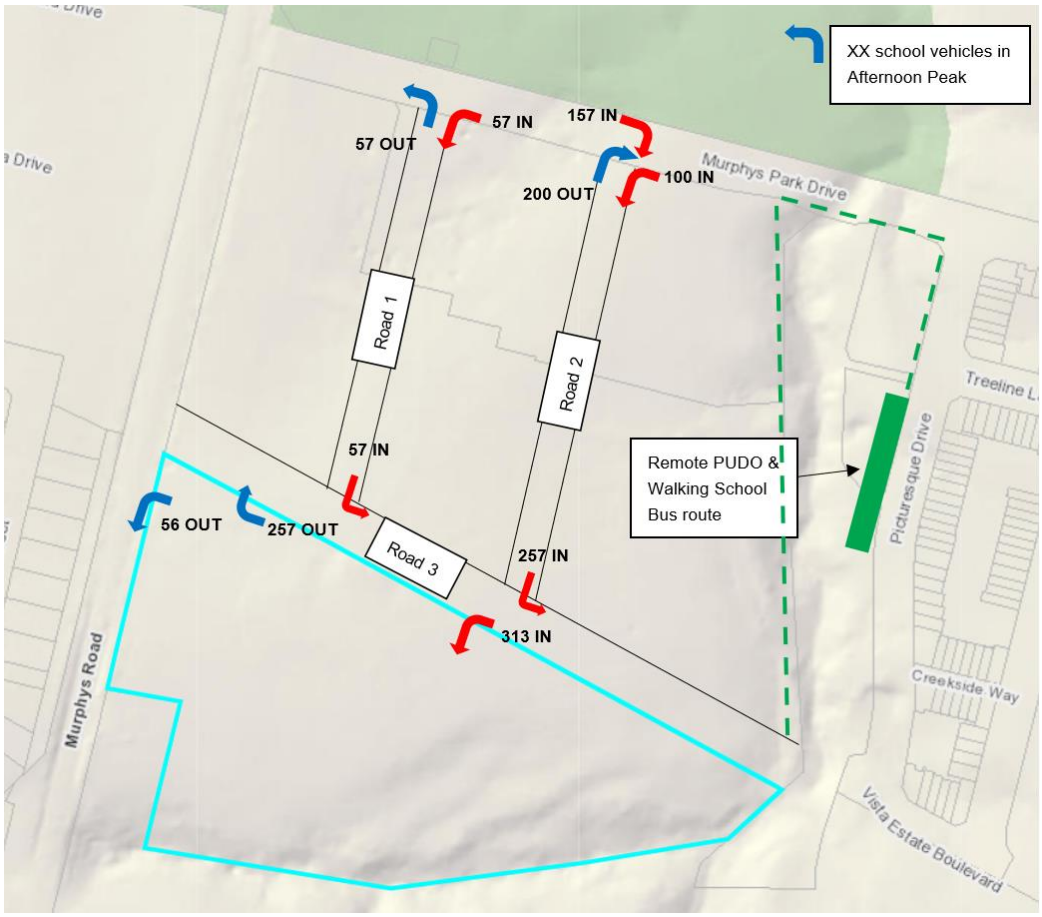

Figure 2 Trip distribution in the afternoons

The SIDRA model for the Murphys Park Drive / Road 2 intersection has a LOS of A for traffic flows on Murphys Park Drive including the right turn into Road 2. The right turn out of Road 2 experiences a LOS of C, with an average delay of 17 seconds (Figure 3). A 50% Peak Flow Factor has been applied to mimic the school peak over a 30 minute period. The operation of the intersection in the afternoon school peak is acceptable and no mitigation is required.

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: Road 2															
1	L2	All MCs	45	0.0	45	0.0	0.767	11.1	LOS B	6.5	45.6	0.82	1.31	1.96	39.9
3	R2	All MCs	400	0.0	400	0.0	0.767	17.3	LOS C	6.5	45.6	0.82	1.31	1.96	39.7
Approach			445	0.0	445	0.0	0.767	16.7	LOS C	6.5	45.6	0.82	1.31	1.96	39.7
East: Murphys Park Drive East															
4	L2	All MCs	200	0.0	200	0.0	0.242	4.6	LOS A	0.0	0.0	0.00	0.23	0.00	47.4
5	T1	All MCs	262	0.0	262	0.0	0.242	0.1	LOS A	0.0	0.0	0.00	0.23	0.00	48.6
Approach			462	0.0	462	0.0	0.242	2.0	NA	0.0	0.0	0.00	0.23	0.00	48.1
West: Murphys Park Drive West															
11	T1	All MCs	123	0.0	123	0.0	0.367	0.3	LOS A	2.4	16.6	0.57	0.68	0.65	46.2
12	R2	All MCs	342	0.0	342	0.0	0.367	8.0	LOS A	2.4	16.6	0.57	0.68	0.65	45.0
Approach			465	0.0	465	0.0	0.367	5.9	NA	2.4	16.6	0.57	0.68	0.65	45.3
All Vehicles			1373	0.0	1373	0.0	0.767	8.1	NA	6.5	45.6	0.46	0.74	0.86	44.1

Figure 3 SIDRA output for MPD/Road 2 intersection in the afternoons

T5. Please provide analysis and assessment of the Murphys Road/ Murphys Park Road intersection.

The trip distribution for school traffic shows that approximately 52 vehicles will travel through the Murphys Road / Murphys Park Drive intersection after dropping their children at school (see Figure 13 in the ITA). Using the assumptions from the ITA, approximately half of the 52 vehicles will be coming from the southern end of the catchment that might otherwise use Reboubt Road (if they weren't visiting the school). This results in 26 vehicles potentially using the Murphys Road / Murphys Park Road intersection as a result of the school.

There is an estimated 2,220 vehicles driving through the Murphys Road / Murphys Park Drive intersection in the morning peak. The estimated 26 additional vehicles assumed to be using the intersection as a result of the school makes up 1% of the total traffic. It is not considered reasonable to request an assessment of the intersection given the negligible effect created by the proposed school.

T6. Please provide an evaluation of the impact of the proposed school on the local streets in the area near the school and the remote PUDO.

All the local roads have been recently constructed and have a 6m carriageway with indented parking bays. This is important to note as kerbside parking will not narrow the road down to one-way flow as is often the case in other areas of Auckland. In addition to this, all traffic calming devices are vertical and do not narrow the width of the carriageway. Therefore, all of the local roads can comfortably cater for two-way flow. Despite this, we will encourage a one-way flow for the use of the remote PUDO, through the School Travel Plan, as outlined in Appendix A in the ITA. No congestion is expected as a result of right turning into the local road intersections as there will be no opposing traffic (i.e. very little traffic generated by the housing on the street).

As above, school traffic using Roads 1, 2 and 3 will also have very low traffic opposing the school movements. The majority, if not all of the traffic using Road 3 will be school traffic, with only one housing development having access onto Road 3. School traffic exiting Roads 1 and 2 will not encounter any delay entering Road 3, therefore there is no reason for congestion. The only traffic movement where opposing traffic may cause congestion is where Road 1 and 2 intersects with Murphys Park Drive. Sidra models have been provided at these two intersections which demonstrate that the operation of the intersections perform at an acceptable level of service.

T7. Please provide an estimate, supported by data, of the parking demand generated by the school at each location in the before-school and after-school periods.

As part of previous studies, Abley has undertaken school surveys[2] to better understand the number of PUDO spaces required to accommodate the morning and afternoon peaks. The following parameters, derived from the school surveys, have been used to ascertain the demand for PUDO spaces as listed below:

- An average vehicle dwell time of 38 seconds (derived from school PUDO surveys)
- An average number of students is 1.4 students per vehicle (derived from school PUDO surveys)
- A 20 minute drop-off peak in the mornings – the majority of schools allow a 30 minute window for student drop off before the school bell rings – we have assumed a 20 minute time period as a conservative approach and allowing for some bunching.

[2] See Enclosed Sheet for School Suvey datasets

The assumptions listed above have been used to calculate the demand for PUDO spaces at school start and finish times.

AM Peak

With a dwell time of 38 seconds per vehicle and an average of 1.4 students per vehicle, this equates to 1 parking space catering for 2.3 students per minute. With a morning peak of 20 minutes this equates to 46 children per PUDO space.

Table 2 provides the number of students estimated to be dropped off at each of the PUDO locations, and the associated number of parking spaces required for each location.

Table 2 Parking demand at PUDO locations

Location	No of students	PUDO Demand (No. of parking spaces)	PUDO Supply (No. of parking spaces)
School grounds on-site PUDO	40% 500 students	11 parking spaces	~16 parking spaces
Picturesque Drive Remote PUDO	15% 190 students	4 parking spaces	Greater than 4 parking spaces will be provided[3]
Other remote PUDO locations (Multiple)	10% 125 students	3 parking spaces	Greater than 3 parking spaces are available at locations where children can safely walk to school from a (informal) drop off point.

Table 2 demonstrates that all locations where PUDO is expected to occur, a surplus of parking spaces will be provided. This is a conservative assessment using a shorter 20 minute drop off period.

PM Peak

Demand in the afternoon peak when students are being picked up from school is more difficult to cater for as caregivers may arrive early and need to wait for children to walk from the classroom.

It is not considered practical to provide enough PUDO spaces to cater for the relatively high volumes of vehicles that require carparks for the 10 minute peak right on school finish time. There are more practical ways to manage this demand through the school travel plan. Examples of tools that can be used include staggering pick-up times over a 20-minute period; staggering walking school buses to the remote PUDO location, or allocating parking zones where caregivers and students organise a pick-up location in advance. The measures that will work best for Flat Bush school will be worked through when the Travel Plan is produced.

The school drop off time in the morning peak coincides with the network peak. It is therefore more pertinent to manage the transport effects on the road network during the busy morning peak. However, school finish time is less of a concern as there is considerably less traffic on the roads in the inter-peak.

[3] There is ample space (150m+) along Picturesque Drive to construct parking bays. The exact number of parking spaces will be determined at OPW stage.

No arterial roads will be affected, and it is a very short period of time where some congestion may occur on local roads. This is considered acceptable and par for the course for schools.

AC raised a contradiction in the ITA that refers to the presence of queueing on Road 3. To clarify, there is not expected to be any queueing on Road 3 due to a surplus (to demand) of on-site PUDO parking spaces; and the SIDRA model for the proposed access onto Murphys Road does not indicate a queue that would spill out onto the road network. The reference to a median island on Road 3 to manage queues is a simple measure to increase stacking space if queueing were to occur on Road 3.

T8. Please clarify the expected extent of queueing at each of the PUDO locations in the before-school and after-school periods.

There will be an excess of PUDO parking spaces at each of the PUDO locations to cater for demand (see Table 2). We also applied a shorter drop off window to ensure a conservative approach. Therefore, minimal queuing is expected at the PUDO locations in the morning peak. The afternoon peak may see some queuing, however this will be managed by the School Travel Plan by introducing measures as described above in T7 to minimise any congestion.

T9. Please provide an assessment of the effects of PUDO queuing on the operation of the local road network (at both PUDO locations).

As discussed in T6, the local roads are all wide enough to accommodate two-way flow, with no opposing traffic to cause delay at the local intersections. There is potential for some queueing at the intersections with Murphys Park Drive and the proposed school access onto Murphys Road. These intersections have been modelled and are all expected to experience an acceptable level of queueing as set out in the ITA.

ENCLOSED:

PUDO School Surveys

There is little data available on the demand for pick up drop off (PUDO) trips for schools. Abley undertook surveys at Gladstone Primary School in Mt Albert to understand the demand on a school PUDO. The purpose of the surveys at Gladstone School was to gather data on the vehicle dwell time and the average student occupancy per vehicle. This data was used to determine how many PUDO spaces may be required to meet demand in the morning peak.

Surveys were undertaken at Gladstone Primary School in Mt Albert on Thursday 19 December 2019 and Friday 6 March 2020, at school start and finish times. Data was collected on the number of students per private vehicle and the dwell time of vehicles using the PUDO.

Key survey findings:

- The average vehicle dwell time for drop offs in the morning was 38 seconds.
- The average number of students was 1.4 students per vehicle.

Figure 4 and Figure 5 present the raw data from the surveys.

Figure 4 Dwell time at Gladstone School in AM

Gladstone School PUDO Dwell Time (seconds) Thursday 19 December 2019 AM Peak			Gladstone School PUDO Dwell Time (seconds) Friday 6 March 2020 AM Peak			
15			21	28	90	
45			59	38	16	
82			35	30	12	
54			14	20	18	
24			37	55	18	
32			35	90	20	
26			76	34	31	
12			12	18	55	
57			60	73	50	
54			44	15	12	
25			54	25		
Average					**38**	**seconds**

Figure 5 No of students per vehicle in AM

Gladstone School Number of students per vehicle Thursday 19 December 2019 AM Peak		
1	2	
1	1	
1	2	
1	1	
1	2	
2	1	
1	2	
1	2	
1	2	
2	2	
1	1	
2	1	
2		
Average	**1.4**	**students per vehicle**