TRANSPORTATION 2023 CONFERENCE
THINK PIECE PAPER

This paper has been peer reviewed

School Pick up Spaces – How many are needed?

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INTRODUCTION

Areas for people to be picked up and dropped off are common features of schools, leisure centres, hospitals, bus stations, even theatres. They allow those visiting a facility to be dropped off by a driver who does not need to exit their vehicle. When associated with bus stations, these areas are sometimes also known as 'Kiss and Ride', while in schools, the acronym PUDO, for Pick Up and Drop Off is commonly used in relation to the pick up and drop off activity at the beginning and end of school.

PUDO areas in schools in particular require careful design due to the presence of children. Therefore, safety considerations, and both physical (tana tinana) and social (taha whānau) health drive the design of school PUDO areas.

While PUDO areas are an established part of the transport considerations at schools, the size and design of these areas varies considerably, depending on the specific site considerations and constraints, nature of school, and desired outcomes. However, little guidance exists in New Zealand as to the design requirements for PUDO areas. This paper sets out some recent findings about the usage of PUDO areas in different settings, considers the implications of different PUDO provision, and provides advice for practitioners considering PUDO design for schools.

POLICY FRAMEWORK

District Plans traditionally required a certain amount of parking spaces for different developments, following the model of predicting the requirements for car parking, and requiring developments to provide a suitable amount of parking. Providing too little parking could result in parking on street which could potentially disrupt the efficiency or safety of the street network.

The National Policy Statement on Urban Development 2020 (NPS-UD) confirms that parking requirements in District Plans in Tier 1, 2, and 3 urban environments will be removed. Designated sites (such as schools) are not covered by the NPS-UD and will continue to have minimum car parking requirements in future (unless a Notice of Requirement removes them).

PUDO areas are not covered in the NPS-UD guidance and therefore the policy framework for school parking largely sits outside the District Plan consenting framework.

CURRENT KNOWLEDGE – PARKING AT SCHOOLS

Many schools include car parking areas for staff, and visitor parking is also often provided either for caregivers, contractors or others visiting the school. This visitor parking at primary schools, and particularly that parking utilised by caregivers to pick up and drop off children at the start and end of the school day is the focus of this paper. Pick up and drop off activities at or near schools are focused during time periods immediately before and after schools open and close for the day, and can create traffic congestion and safety concerns due to the concentration of movements in a concise time period.

The types of visitor parking provided at or near schools include:

Dedicated short stay PUDO areas within schools.

These areas are often designed to allow easy manoeuvrability in and out of spaces, so are often configured in parallel with kerbs. Often, there are restrictions on use (which may differ according to the time of day) including limitations on how long drivers can wait in them, or inability to leave the vehicle. An example of this type of PUDO area is seen at Hobsonville Point Primary school as illustrated in Figure 1 and Figure 2.

Areas designated for PUDO are often used for visitor or coach parking at times when not required for pick up or drop off activities.

Figure 1 - Hobsonville Point Primary School PUDO area

Figure 2 - Parking Restrictions. Hobsonville Point Primary School PUDO area

On street short stay areas

These areas may have timed restrictions on the street outside of schools which may or may not relate to school hours. Examples are Pembroke School in Oamaru (Figure 3) where spaces are timed irrespective of the hour of the day, Mount Albert Primary School in Auckland (Figure 4), where on street restrictions exist at certain times on school days. Queenstown Primary School includes a P15 zone outside, in addition to a PUDO zone which operates as P60 except at pick up and drop off times.

Figure 3 - On Street Parking Restrictions - Pembroke School, Oamaru

Figure 4 - Mount Albert Primary School Parking Restrictions

On-site defined visitor spaces

On-site parking spaces may be specifically allocated for visitors within sites. These are typically separated from PUDO spaces to avoid confusion.

DETERMINING DEMAND FOR PUDO AREAS

A number of factors will dictate demand for PUDO areas. These are examined below.

School / Demographic Features

1. School Catchment

School catchment areas may be defined, and / or affected by the presence of neighbouring schools. This may restrict the number of students on the school roll, and will affect the methods by which students can potentially travel to school. For example, a rural school with a geographically large catchment is unlikely to see many students walking or cycling to school.

2. School Type (Age groups)

Travel behaviours differ by age group. While the mode of travel to school may be the same, younger children are typically chaperoned to the door of the classroom by a caregiver, while older children may walk independently from the gate or near to the school gate. Therefore, younger children (typically in year groups 0-2) will be chaperoned on foot from a parked vehicle, while older children (roughly Year 3 and above), if dropped off at the school will walk to their classroom independently. What this means is that PUDO areas may not be used by the caregiver of a younger child, if localised rules are in place preventing them from leaving their vehicle. Instead, these caregivers would park somewhere else, and walk to and from their vehicle with their child.

3. Children per vehicle

Siblings in a family, or carpooling with friends, may mean that multiple children are dropped off from a single vehicle. This may mean that one vehicle in a PUDO area could be used to pick up or drop off more than one child.

Behavioural Factors

4. Modal split of caregivers picking up and dropping off children

Caregivers may choose to drive to collect a child, or they may walk, take public transport or cycle to collect a child. The modal split of those collecting and dropping off children affects the demand for vehicular PUDO areas.

5. Dwell time in PUDO spaces

How long a caregiver waits in a PUDO space will dictate how much turnover a PUDO space can accommodate during a pick up or drop off period.

6. Pick up and drop off time period

The time period during which caregivers may choose to pick up or drop off a child may depend on a number of factors, including the school bell times and other errands (for example, needing to travel onwards to a workplace in the morning). There will however be a peak period during which travel is focussed.

7. Variation between mornings and afternoons

Trip generation rates differ between morning and afternoon. Research Report 467 (A Milne, S Rendall, S Abley, 2011) indicates lower peak flow in the afternoon peak period (3pm-4pm) by up to around 30% (depending on geography, school size and type) compared with the morning peak (8am – 9pm).

Management Factors

8. Parking availability in and near to school

The presence or availability of parking in and near to the school may encourage or discourage caregivers from using a PUDO facility and/or may affect their behaviour in terms of their arrival time to pick up or drop off their child so as to avoid congestion. Similarly, on-street parking spaces on the streets around the school can affect this behaviour.

9. Presence of travel plan features/management of pick up/drop off areas

Schools may choose to actively manage pick up and drop off behaviour. They may actively encourage walking and cycling to school, for example through the provision of a walking school bus. Schools may also actively manage PUDO use, for example, by setting out times or locations

for student cohorts to be collected. Such management plans may affect the behavioural factors detailed above.

SURVEYED USAGE OF PUDO AREAS

Observational Surveys

Observational surveys were undertaken of PUDO areas at a number of primary schools in Auckland, Christchurch and Queenstown Lakes District to provide empirical data in support of usage of PUDO areas. The surveys were undertaken as follows:

Table 1 School Sites Surveyed

School	Approx Roll	Yrs	Area Type	Survey Dates	Observed	Survey Method
Gladstone Primary School, Mount Albert, Auckland	750	1-6	Urban	Thurs.19 Dec. 2019, Fri. 6 March 2020, Mon. 16 March 2020.	Surveys were undertaken on Monaghan Avenue, where pick up and drop off spaces are marked on street, and accommodate around 20 vehicles. Students per vehicle was also observed.	In person
Albany Primary School, Albany, Auckland	700	0-6	Urban	Tues. 15 Dec. 2020.	Observations of the behaviour of the dedicated pick up and drop off area immediately outside the school (which accommodates around five vehicles) were made	In person
Wigram Primary School, Wigram, Christchurch	375	1-6	Urban	Weds.31 March 2021.	Observations of parking demand were undertaken on the two streets around the school, Kittyhawk Avenue and Curtis Avenue.	In person
Silverdale Primary School, Silverdale, Auckland	800	1-6	Urban	Mon.16 March 2020	Observations of the dedicated PUDO area which accommodates around 15 vehicles during the PM peak were made.	In person
Hāwea Flat Primary School, Lake Hāwea, Queenstown Lakes	300	0-8	Rural	Weds. 6 July 2022	Observations of the unsealed car park area serving the school (which accommodates around 58 spaces), and nearby road frontage	Drone
Queenstown Primary School, Queenstown, Queenstown Lakes	650	0-8	Urban	5 July 2022	Observations of the PUDO area (13 spaces) and adjacent P15 parking area (12 spaces) on Robins Road were undertaken.	Drone

While PUDO areas vary in size and shape, there are consistent and transferable factors which can be observed in relation to their operation. Based on observations of the site visits undertaken, the following observations were made:

Number of children per vehicle

This was surveyed at Gladstone Primary during the AM peak period. Of the surveyed vehicles (25), 36 students were observed, resulting in the average students per vehicle being 1.4. While the sample is limited, the observation is consistent with observations of primary schools as detailed in Research Report 467 (A Milne, S Rendall, S Abley, 2011).

Dwell time in PUDO spaces in AM peak

This was surveyed at Gladstone Primary on two separate days, and Queenstown Primary. The results from Gladstone Primary are shown in Table 2. Of the surveyed vehicles (43), the longest surveyed wait time was 90 seconds, and the shortest was 12 seconds. The average dwell time was 38 seconds. This means that a vehicle arriving in a PUDO area would pause for an average of 38 seconds to allow a student to disembark before driving off. This excludes manoeuvring time into or out of the space.

Table 2 - AM peak dwell time in PUDO spaces – Gladstone Primary

Date	**Thursday 19 December 2019**		**Friday 6 March 2020**				
Sample (secs)	15	12	21	28	90	12	18
	45	57	59	38	16	60	73
	82	54	35	30	12	44	15
	54	25	14	20	18	54	25
	24		37	55	18	55	50
	32		35	90	20	12	
	26		786	34	31		
Average (secs)	39		37				
Overall Average (secs)	38						

At Queenstown Primary while individual vehicles were not observed, an average dwell time of 46 seconds in the AM peak was calculated.

It was noted that pick ups and drop offs also occurred in the adjacent P15 spaces at Queenstown Primary. These spaces are marked as P60 except at pick up and drop off times, and it was observed that around 40% of vehicles overstayed the 15 minute restriction during the AM peak period.

Dwell time in PUDO spaces in PM peak

This was surveyed at Albany Primary and Queenstown Primary. The PUDO area at Albany Primary is small, accommodating at most five or six vehicles, and the exit is constrained by the operation of the nearby Bass Road/Albany Highway traffic signals which block back, however, observation of the time from arrival in the PUDO area to joining the queue to depart was surveyed as well as the overall dwell time in the area.

This PUDO area was actively managed, with a staff member announcing the arrival of a car to alert the appropriate child to go and meet their caregiver, which appeared to speed up operation. While it was difficult to observe fully unconstrained pick up and drop off activity, the results of the survey (Table 2) show that in the PM peak the average dwell time for this sample, where unconstrained by wider congestion, is similar to the AM peak average, at 36 seconds.

Table 3 - Sample Dwell Times - Albany Primary, PM Peak

Sample Car no.	Dwell time from arrival to being ready to depart	Dwell time from arrival to successfully leaving PUDO area
1	32secs	32 secs
2	6 secs	98 secs
3	39 secs	93 secs
4	23 secs	80 secs
5	68 secs	79 secs
6	63 secs	-
7	26 secs	130 secs
8	30 secs	120 secs
9	40 secs	125 secs
Average	**36 seconds**	**95 seconds**

At Queenstown Primary the PUDO area operates as a drive-through area, and is adjacent to P15 parking. There are around 25 spaces outside the school in PUDO or P15. In the PM peak many caregivers were (contrary to rules) observed to park and walk into the school to collect children. Caregivers were also observed arriving before bell time, and staying in the PUDO area until the end of school. The average length of time spent in the PUDO before 3pm was therefore 26 minutes since this included waiting time. After 3pm when some cars departed, the dwell time for vehicles reduced to around two minutes. In contrast, in the P15 area the average dwell time was 33 minutes. Clearly, a markedly different operation was observed at Queenstown Primary to that at the actively managed pick up at Albany Primary.

Parking demand in AM and PM peak

In order to calibrate the relative demand for vehicular travel to PUDO in the AM and PM peak, results of surveys undertaken in the AM and PM peaks for schools have been compared in Table 4.

This was surveyed at Wigram Primary, Silverdale Primary, Queenstown Primary and Hāwea Flat Primary. At Queenstown Primary the adjacent P15 areas are included in the analysis since it was evident that these were also being utilised for pick up and drop off purposes.

Table 4 - Parking Demand in PUDO areas

School	Locations Surveyed	Total AM Vehicles Observed	Total PM Vehicles Observed	PM as % AM
Wigram Primary	Two locations adjacent to the school were surveyed, i.e. Kittyhawk Avenue and Curtis Street.	165	85	51%
Silverdale Primary	Observations of PUDO area outside school	110	59	54%
Queenstown Primary	PUDO zone and P15 zone outside school	143	88	61%
Hāwea Flat Primary	Camp Hill Road car park	70	38	54%

Overall based on the four sites observed, PM vehicular demand is approximately 51-61% of AM demand.

It is notable that Silverdale Primary, with the largest school roll, did not exhibit the largest number of vehicular arrivals.

Pick up and Drop off Time period

The time period during which pick ups and drop offs were observed to occur was surveyed at Gladstone Primary, Albany Primary, Silverdale Primary, Wigram Primary, Hāwea Flat Primary and Queenstown Primary (Table 5).

AM Peak

It is noted that most primary/intermediate schools allow students to arrive at school up to 30 minutes before the bell for the start of school day.

PM Peak

It is noted that while surveys started at the close of the school day, often schools were observed to have cars waiting. The times illustrated below represent the time period over which caregivers were observed to be collecting or dropping off children from school.

Table 5 - Observed Pick up and Drop off Time Period

School		AM Peak				PM Peak		
	Bell Time	Start Time	Finish Time	Duration (mins)	Bell Time	Start Time	Finish Time	Duration (mins)
Silverdale Primary School	8.35	8.15	8.50	35	3.00	2.45	3.25	40
Wigram Primary School		8.10	9.10	60		2.45	3.30	45
Gladstone Primary School						3.00	3.20	20
Albany Primary School						3.05	3.25	20
Hāwea Flat Primary School	9.00	8.20	9.15	45	3.00	2.25	3.00	35
Queenstown Primary School	9.00	8.30	9.25	55	3.00	2.25	3.25	60

While the exact duration of pick up and drop off activities varies slightly, it appears that the peak is more spread during the morning. For some of the surveyed schools, during the PM peak, all of the pick up and drop off activities were completed within around half an hour of the school bell times.

Where detailed counts have been undertaken, at Silverdale, Queenstown and Hāwea Flat schools, a profile of vehicles arriving is provided in Figure 5, **Error! Reference source not found.** and **Error! Reference source not found.** respectively. This shows that while AM drop off behaviour is variable between the schools, there is evidence that cars arrive prior to the bell time or are present in the car park before bell time in the PM peak at all schools.

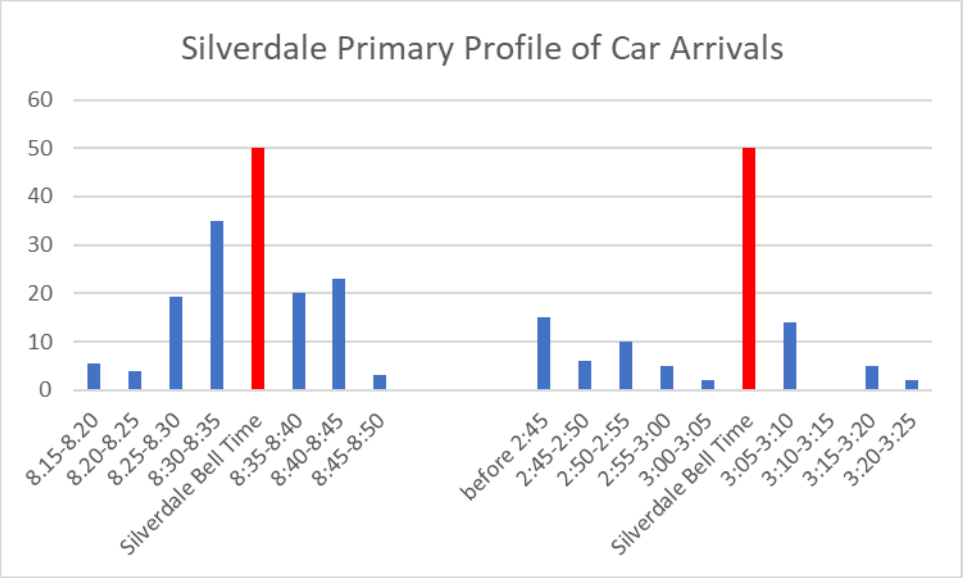

Figure 5 - Silverdale Primary AM and PM Profile of Car Arrivals

It is notable that the Queenstown Primary pick up period in the afternoon peak is extended over almost an hour (see Figure 6). This reflects site observations that caregivers arrived well ahead of bell time and that the PUDO area was at capacity until 3pm when it started flowing freely.

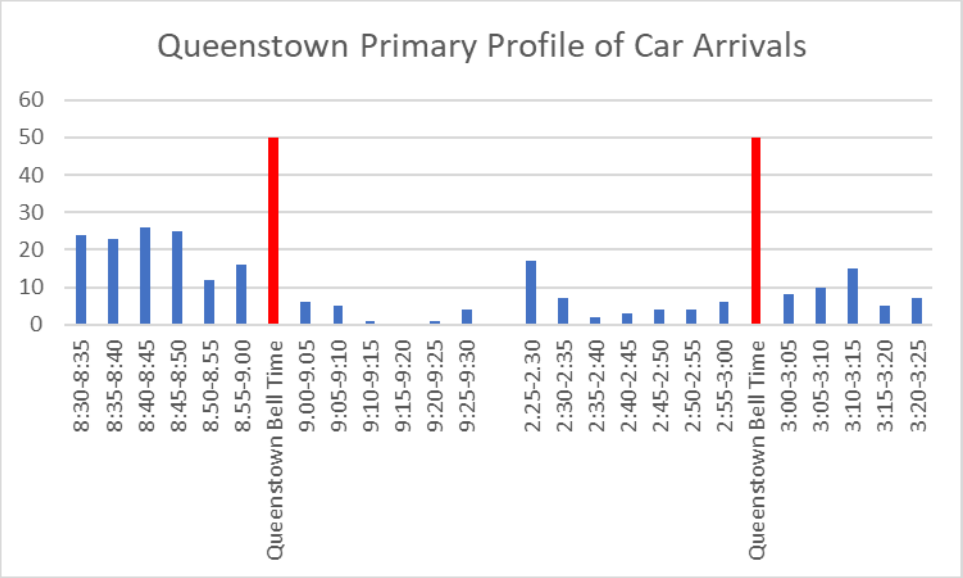

Figure 6 - Queenstown Primary AM and PM Profile of Car Arrivals

At Hāwea Flat Primary, a rural school, it is noticeable that in both time periods, drop offs and pick ups occurred almost exclusively before the bell. The AM drop off period shows a lead in time of up to 40 minutes prior to bell time, while the pick up period is compressed to only 30 minutes and all vehicles appear to have arrived before the bell time.

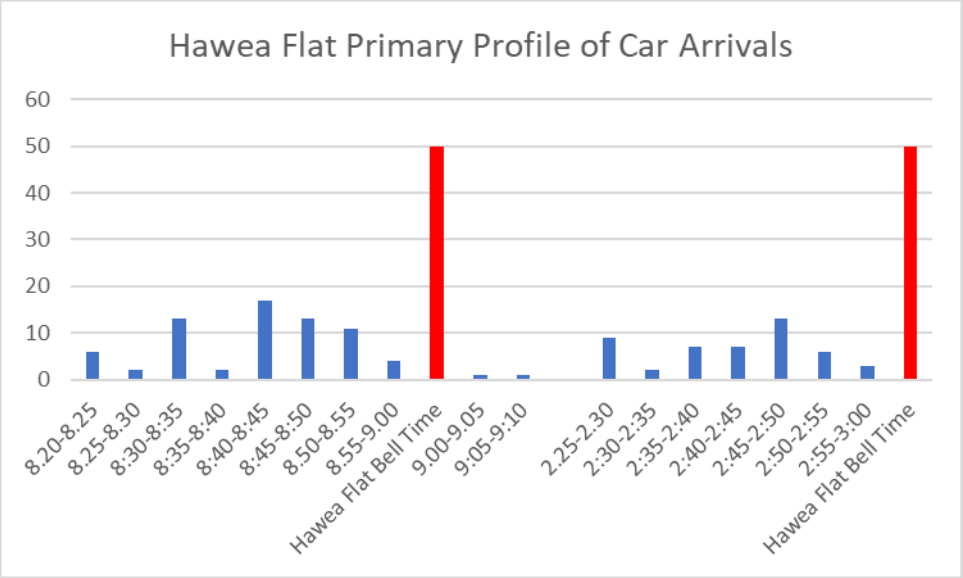

Figure 7 - Hāwea Flat Primary AM and PM Profile of Car Arrivals

EXTRAPOLATING TRENDS TO DESIGN

As detailed above, nine separate factors can influence the demand for a PUDO area. Using knowledge of these factors, it is possible to calculate the required PUDO spaces in a new PUDO area to accommodate projected demand, noting that many of the factors are interlinked. This process is described below, noting that better accuracy would be achieved through localised surveys.

The dispersed peak period in the morning means that the PUDO area is unlikely to be filled. Instead, the afternoon peak period will be the design period. The process would be as follows:

1. Identify the type of school (age group) and roll.
2. Identify the projected modal split for the school. This can either be based on survey data for similar schools if available or using Household Travel Survey / Census data.
3. Calculate the percentage of the roll travelling by car.
4. Reduce this by 1.4 to represent average children per vehicle.
5. Reduce trip generation in the PM peak in accordance either with Research Report 467 or localised surveys.
6. Divide the number of vehicles required to use the PUDO area by the calculated dwell time (around 38-45 seconds per vehicle), and assume the PUDO area starts off full.
7. Assume a peak period during which all vehicles will need to egress the area.

PUDO DESIGN LIMITATIONS

While, as described in this paper, it is possible to utilise surveyed information to deduce, design and provide the PUDO requirements for a school, this approach would be to ignore certain wider factors, which we will discuss in turn. There are three potential problems with allowing the demand for PUDO to dictate design for a PUDO area.

1. Efficient Use of Land and Resources

The Resource Management Act 1991, Part 7 (b) (RMA, 1991) notes that persons exercising functions and powers under it shall have particular regard to the efficient use and development of natural and physical resources.

PUDO areas by their very nature are used only for picking up and dropping off children at the start and end of the school day. During the remainder of the day, land set aside for PUDO may be

utilised either as coach parking or visitor parking which results in better land utilisation. However, providing all of the PUDO that is projected to be required will inevitably result in over-provision of parking, since given a free rein, most caregivers would inevitably wish to be present at the close of school each day rather than waiting for earlier caregivers to collect their child and depart, which would result in multiple uses of the same space. Even assuming multiple uses of the same space, if there is no alternative use of the PUDO area during the day, it could be argued that providing PUDO areas for a peak period activity alone is an inefficient use of space. Either way, questions should be raised about the best use of the land available, especially if alternatives to driving (such as public transport, or safe walking and cycling routes) are available.

One alternative consideration is whether on-street parking is available in the vicinity of the site which could be used for school PUDO. This may be a more efficient way to provide this service, although it is necessary to be mindful of providing safe walking routes to and from the school, and ensuring parked vehicles on street obey parking rules.

Designers should also be aware that problems can arise due to the high numbers of cars all arriving simultaneously at school finish time. While fortunately school closing time typically does not coincide with the network peak, there are often localised congestion effects due to vehicles manoeuvring which can be exacerbated or alleviated through the design of PUDO areas.

It should be noted that travel behaviour can be very different between rural and urban schools. Whereas alternatives such as public buses and active travel are realistic alternatives where catchments are compact, in rural areas safe walking and cycling routes may not be available and careful consideration about safe and adequate provision for car parking, balanced with potential for rural school bus use, should be made.

2. Active Mode Encouragement

In May 2022 New Zealand's first Emissions Reduction Plan (ERP) was issued. This plan details how Aotearoa New Zealand will transition to a low-emissions economy. Transport is a key part of this plan, and measures to encourage and improve travel choices by improving access to walking, cycling and use of public transport are a key focus. Over-provision of PUDO could undermine the ERP's sought outcomes by encouraging caregivers to drive children to and from education.

An additional concern of providing a substantive PUDO area is that it normalises driving behaviour at a young age. This is particularly true where the PUDO area is prominently located at the front of the school, which suggests that it is the most important method for children to travel to school. Normalising use of alternative modes of transport from primary age gives children the opportunity to experience different transport modes and understand that active travel in particular is a valid alternative.

In urban areas particularly, school catchments are often small, and may be walkable. While young children may need to be met from a school, it is possible for them to be met and walked or cycled home. Providing a full complement of PUDO space (in accordance with demand) may actually have the effect of encouraging more vehicular PUDO if it is known to be easy to access the PUDO area. By either locating the PUDO area in a less prominent location, limiting access to the PUDO area by constraining space availability and/or restricting use, or even providing no PUDO at all (if on-street parking is available), the school can support and encourage use of alternative modes.

3. Safety in Design

The final concern with PUDO areas is the need for safe design. Inevitably where children are walking, there will be a concern to avoid conflict with moving vehicles. PUDO areas have the effect of concentrating all driving behaviour in one location, close to where students also congregate. Typically PUDO areas operate as drive-throughs, and while there would be a kerb side for children to exit from, inevitably on occasion children may choose to exit vehicles on the circulatory side of

the vehicle. Safe speeds can be encouraged through design, for example, use of speed humps through the circulatory areas, and designated crossing areas, but risk cannot be completely eliminated.

There is an additional tension in that particularly in the morning peak, caregivers may often be dropping off a child on the way to work, which adds a time pressure to their manoeuvres. Where possible, PUDO areas should be designed to avoid children needing to cross from one side to another without a safe crossing facility. Where this is unavoidable, designated areas of the PUDO could be assigned to age cohorts, such that the younger children would be exposed to least risk.

Finally, for younger children in particular, caregivers will often wish to accompany their child to the classroom door for personal safety reasons. For these students, a PUDO area where caregivers are not allowed to exit their vehicle will not be suitable. Some schools may choose to provide dedicated 'park and walk' areas separate to their PUDO areas with longer durations of stay. These spaces could double as time-restricted spaces, however, as observed at Queenstown Primary, effective monitoring and enforcement may be necessary to ensure that vehicles do not overstay and undermine the effectiveness of the PUDO area.

CONCLUSION AND RECOMMENDATION

PUDO areas are often a point of tension in schools. There is often a desire or pressure to provide more PUDO to avoid conflicts at school bell times, and it is possible to utilise survey information to calculate the PUDO requirements for a particular site. This may be useful in certain circumstances, for example where walking to and from a school site is impractical, such as in a rural location. However, in some locations, for example where catchments are small, where ample on-street parking is available, or where walking and cycling facilities are well developed, a lesser amount of PUDO and/or restrictions on its use would have the effect of encouraging use of alternative modes and would align better with the sought outcomes of the ERP.

Normalising active mode use at a young age brings the opportunity for setting lifelong good habits. Where PUDO is necessary, particularly in rural areas, careful design, and in particular seeking opportunities to minimise the need for children to cross drive-through PUDO areas can help to minimise safety conflicts in schools.

Further research into the data included in this paper, including modal split at a number of schools with varied PUDO facilities would seek to cement some of the principles in this paper.

REFERENCES

Ministry for the Environment (2020) *National Policy Statement on Urban Development.* NZ Government.
A Milne, S Rendall, S Abley. (2011). *Research report 467 National travel profiles part B: trips, trends and travel prediction.* NZ Transport Agency.
RMA. (1991). *Resource Management Act.* NZ Government.
Ministry for the Environment (2022) *Aotearoa New Zealand's First Emissions Reduction Plan.* NZ Government.

AUTHOR CONTRIBUTION STATEMENT

This paper is the original work of Josephine Draper. I further acknowledge the contribution of colleagues Kate Brill, Daisy-Bea Scrase and Penny Gray who gathered survey data at various schools and developed the methodologies outlined in this paper.