Technical Memorandum

To	Department of Planning, Industry and Environment (DPIE) C/o Andrew McSwan (Mace Group)	**From**	Hayden Calvey, Cardno
Date	6 August 2021		
Project	Samuel Gilbert Public School (SGPS)	**Discipline**	Traffic and Transport
Subject	Drop-off / Pick-up & Parking Review for Modification Application		

1 Introduction

Cardno has been engaged by SINSW to provide traffic consultancy services for the approved redevelopment of Samuel Gilbert Public School (SGPS), located in Castle Hill NSW.

In general, the approved redeveloped consists of the following:

- Two new three storey buildings accommodating:
  - New Library
  - New Administration
  - 23 new permanent teaching spaces
- Alterations to existing Library Building to convert it to new permanent teaching spaces
- Alterations to the existing Administration Building to convert it to new permanent teaching spaces
- New Hall Building with separate entrance for out of school hours and community use
- New central axis
- Removal of demountable teaching spaces
- Increase in students from circa 750 to some 1,000

The application was subject to assessment as a State Significant Development (SSD, number 9274) and was granted approval by Department of Planning, Industry and Environment (DPIE) on 15 February 2020.

As part of the approval, the redevelopment is to modify the current drop-off / pick-up (DOPU) arrangement on Ridgecrop Drive to be split between Ridgecrop Drive and Gilbert Road as per the recommendations contained within the Traffic Impact Assessment (TIA) dated 6 May 2019 (TSA). This is generally shown in **Figure 1-1**. In addition to the DOPU arrangement, an additional four on-site car parking spaces were to be provided.

The parking analysis contained with the TIA identified a demand for some 37 vehicles and equivalent kerbside length of 230m. Based on the new Ridgecrop Drive DOPU zone of some 140m identified in the TIA, need for an additional 90m based on the analysis can be accommodated by the available 132m on the Gilbert Road frontage.

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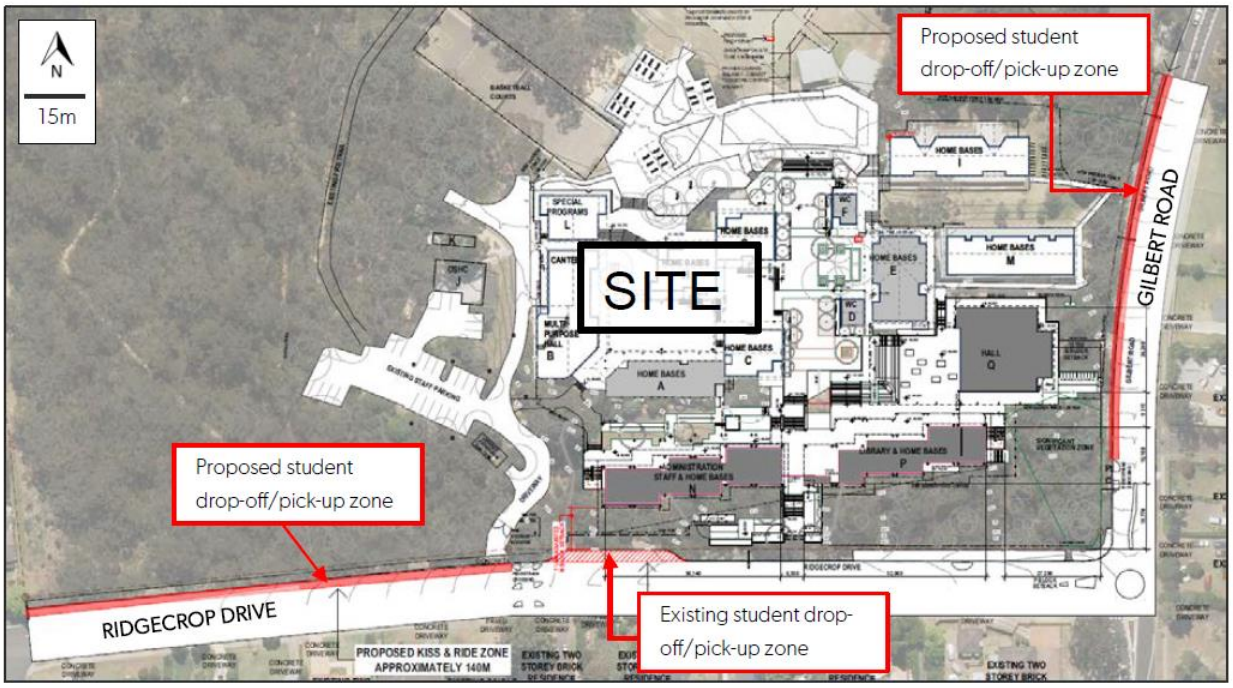
Figure 1-1 Approved Kiss ‘n Drop Modifications



This traffic statement sets out reasoning to modify the DOPU zone envisaged under the SSD approval and is the subject of the proposed modification application

2 Existing Kiss ‘n Drop Review

Cardno has undertaken a review of the existing DOPU zone activity on 17 August 2020 during the morning and afternoon peak hours. As is typical with most schools and reflected by the operation of the current DOPU zone at SGPS, the afternoon parking results in greater congestion impacts due to parent vehicle’s length of stay and arrival in advance of the afternoon finish time.

The activity within Ridgecrop Drive DOPU zone in the afternoon is described below.

- The existing indented zone has capacity for some 3-4 parallel parked vehicles
- The existing indented zone is fully occupied in advance of the afternoon bell (some 10-15minutes prior)
- Other parent vehicles will park in Galahad Crescent waiting for the afternoon bell before proceeding to pick up their child from the indented zone.
- Immediately before the afternoon bell time, vehicles will queue at the raised crossing hold line waiting for the indented zone to begin operating with parents collecting children and leaving.
- A queue from the crossing hold line will propagate quickly back to the Galahad Crescent / Ridgecrop Drive intersection to the west (some 140m in length).
- Based on the observed movements, majority of vehicles within this queue were associated with the school DOPU zone. Vehicles associated with residents or other would appear to bypass this queue by navigating to Excalibur Avenue to the norther section of Ridgecrop Drive.

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The glaring issue with the Rdigecrop Drive DOPU zone is the ability to only load (or service) 3-4 cars at any one time. Based on the propagation of queuing, this is insufficient for the current school demand.

3 Review of Kiss 'n Drop SSD Analysis

The Kiss 'n Drop methodology contained within the May 2019 report is based on a first principles analysis informed by assumptions made at the time. The methodology and assumptions are shown below for reference:

"Based on a future school population of 1,000 students and assuming that the existing travel characteristics remain unaltered (i.e. average vehicle occupancy rate = 1.2 child per vehicle and 80% of students travel to/from school by car), the proposed development could generate up to 445 vehicles over an hourly period ((1000 x 80%/1.2)/1.5 hours) associated with student pick-up/drop-off activity. This is equivalent to approximately 7.4 vehicles per minute (i.e. 445 vehicles/60 minutes).

Further to the above, based on our observations of current school operations, the average length of stay for parents/guardians during the student drop-off/collection process is approximately five (5) minutes. In this regard, the proposed development could be expected to generate a maximum short term parking demand/queue of up to 37 vehicles, corresponding to student drop-off/collection activity during school start and finish periods. Based on Figure 2.5 of AS2890.1-2004, the minimum length for a parallel parked vehicle ranges between 5.9m – 6.2m. As such, a peak parking demand of approximately 37 vehicles could potentially require a kiss and drop bay length of around 220 – 230m.

It is noted that there is opportunity within the northern side of Ridgecrop Drive along the southern site frontage to the west of the existing pedestrian crossing (of approximately 140m in length) and the western side of Gilbert Road along the eastern site frontage (of approximately 132m in length) to install additional kiss & ride facilities to accommodate the abovementioned pick-up/drop-off demand associated with the subject proposal (i.e. total kiss & ride length of 272m (140 + 132))."

The methodology adopted above is not incorrect, however the provision of some 37 DOPU spaces for a school of 1,000 is significant and may hinder the success of the schools Green Travel Plan and shift to sustainable transport options.

The suggested lengths of 140m to the west of the wombat crossing on Ridgecrop Drive appears to impact an existing traffic calming device within the parking lane and extends across the Galahad Rd intersection. The legal parking length between the traffic calming device and the crossing is some 105m in the afternoon.

With this in mind, it is reasonable to review the DOPU zone provision in more detail.

Firstly, as previously stated, the current indented DOPU zone operation is significantly deficient such that the immediate provision of approximately 105m to the west of the existing wombat crossing in Ridgecrop Drive will increase the number of concurrent vehicles that can collect students from 3-4, to 17-18 spaces, or an increase by a factor of 4.5. To simplify this, the current queue that propagates in Ridgecrop Drive is almost equivalent to the proposed new DOPU zone such that this queue would generally be totally removed. In theory, this queue (assuming most are waiting to use the existing DOPU zone) would be shifted to the parking lane in Ridgecrop Drive and remove the current congestion.

Secondly, the use of Gilbert Road as a DOPU zone has associated risks that is not currently being experienced. Gilbert Road carries higher traffic volumes than Ridgecrop Drive as evident in the site visit and traffic surveys undertaken in the SSD. Traffic along Gilbert Road is generally constant and based on the gradient and location of the Ridgecrop Drive / Gilbert Road roundabout and pedestrian signals, generally results in motorists accelerating up the hill. There are safety concerns raised with regard to the high turn over parking and the ability for pedestrians to safely re-enter the Gilbert Road traffic flow. There is also potential for parking manoeuvres associated with a Gilbert Road DOPU zone resulting in queuing back to the pedestrian signals and roundabout to the south.

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Currently, the Gilbert Road frontage is utilised by long term staff parking (categorised as low turnover parking). The DOPU parking is categorised as higher turnover whereby parent vehicles will be looking for sufficient gaps in the Gilbert Road traffic flow to re-enter the northbound traffic. This higher turnover of pull-in and pull-out manoeuvres may result in increased probability of rear-end crashes or impacts with parked cars. Ridgecrop Drive presents itself as a safer road for the purpose of drop-off/pick-up activities based on this potential increase in crashes associated with a Gilbert Road DOPU zone.

4 Recommended Kiss ‘n Drop Arrangement

Cardno is of the view that the introduction of the new Ridgecrop Drive DOPU zone of some 105m, or an increase by 4.5 times above the current provision, will significantly improve this operation such that the need for additional Kiss ‘n Drop parking is unlikely and not in line with achieving sustainable transport shifts. Therefore, the first approach would be to implement the new Ridgecrop Drive DOPU zone and evaluate the system prior to introducing any additional locations.

With regard to the demand analysis, Cardno has undertaken sample surveys of the student cohort to establish current travel modes in the month of September 2020. It is however noted that the questionnaire has been undertaken during a period of time where COVID-19, and government restrictions, which may inhibit and change people’s choice of transport mode. The questionnaire obtained by Cardno does however identify that only some 12% of respondents identified a change in their travel behaviour due to COVID-19. Of the 12%, majority of responses are in relation to location of pick-up/drop-off (but not the activity of pick-up/drop-off), use of entry gates and Out of School Hours (OOSH) care with some responses in relation to using private car instead of public transport. With this in mind, based on the responses, it would appear that COVID-19 at the time of the survey and observations has had little impact on private vehicle use for SGPS.

Key results of the survey are as follows:

- Morning car occupancy equates to 1.51 students per vehicle, with 79% of students driven by car
- Of those driven in the morning, approximately 95% arrive in the 8:00-9:00am window
- Of those driven, 71% are dropped off whilst the remaining are accompanied to school grounds
- Afternoon car occupancy equates to 1.47 students per vehicle, with 70% of students driven by car
- Of those driven in the afternoon, approximately 90% depart in the 2:45-3:45pm window
- Of those driven, 58% are collected at the kerbside whilst the remaining are greeted at school gates / outside the car.

Further to the above, dwell times for vehicles performing drop-off/pick-up manoeuvres differs in the AM compared to the PM. Based on experience and evidence of other schools, the average morning dwell time is more likely to be some 1.5 minutes whilst the average afternoon is closer to 3 minutes on average. This differs to the blanket 5 minutes adopted within the May 2019 TIA.

Adopting the methodology contained in the approved TIA, the above parameters have been adopted and results summarised below.

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Table 4-1 Revised Queue Analysis based on SSD Application

Category	SSD Approved TIA	Cardno Revised Analysis	
		AM Analysis	PM Analysis
Student Cohort	1000		
Vehicle Occupancy	1.2	1.51	1.47
Car Mode	80%	79%	70%
Percentage within the Hour	66.7%	95%	90%
Vehicles per Hour	1000 x 80% = 800 student by car 800 / 1.2 = 667 vehicles 667 x 0.667 = 445 vehicles in the hour	1000 x 79% = 790 students by car 790 / 1.51 = 523 vehicles 523 x 0.95 = 497 vehicles in the hour	1000 x 70% = 700 students by car 700 / 1.47 = 476 vehicles 476 x 0.90 = 428 vehicles in the hour
Arrival Rate per Minute	445 / 60 = 7.4 vehicles per minute	497 / 60 = 8.3 vehicle per minute	428 / 60 = 7.1 vehicle per minute
Service Time	5 minutes	1.5 minutes	3 minutes
Resulting number of Vehicles	7.4 x 5 = 37 vehicles	8.3 x 2.5 = 13 vehicles	7.1 x 3 = 22 vehicles

Based on more recent information and detailed criteria, the demand of 22 vehicles is some 15 vehicles less than the May 2019 TIA. This methodology assumes a flat distribution in the arrival and departure times of vehicles.

If however considering a Poisson distribution in accordance with Austroads Guide to Traffic Management queueing theory and a M/M/C (where c = number of servers or car spaces in this instance), the results differ. This approach is considered to be more detailed and will also considers the split between dropping off / picking up and those parents whom accompany (or meet) their child to outside of the vehicle (which **Table 4-1** does not account for this).

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Table 4-2 Revised Queue Analysis based on Austroads

Category	AM Analysis	PM Analysis
Student Cohort	1,000	
Vehicle Occupancy	1.51	1.47
Car Mode	79%	70%
Percentage within the Hour	95%	90%
Percentage Kerbside Dropping-Off / Picking-Up	71%	58%
Vehicles per Hour	1000 x 79% = 790 students by car 790 x 71% = 561 drop offs 561 / 1.51 = 371vehicles 371 x 0.95 = 352 vehicles in the hour	1000 x 70% = 700 students by car 700 x 58% = 406 kerbside pick-up 406 / 1.47 = 276vehicles 276 x 0.90 = 249 vehicles in the hour
Service Time	1.5 minutes	3 minutes
Spaces to Achieve Probability of less than 5% of a queue forming	14 spaces	19 spaces

The results show that to achieve a probability of queue less than 5%, a total of 19 spaces should be provided to service the drop-off / pick-up demand. This would assume that all 249 vehicles assessed are seeking to use the DOPU zone rather than utilising available kerbside parking where it is available and in the event the DOPU zone is fully occupied.

The Ridgecrop Drive DOPU zone is approximately 17-18 spaces in length (105m). The existing Ridgecrop Drive DOPU zone (albeit the current indented location which is short term in the morning and unrestricted in the afternoon) provides a further 3-4 spaces, bringing a total of 20 to 22 spaces along Ridgecrop Drive. This level of kerbside parking for the drop-off / pick-up activity also achieves the revised analysis shown in which **Table 4-1.**

Discussions with Council have resulted in the preference for the Ridgecrop Drive DOPU zone, no change to the existing Ridgecrop Drive DOPU zone and removal of the Gilbert Road DOPU zone that was previously proposed.

Furthermore, the car mode share of 70% will be targeted as part of the schools Green Travel Plan (GTP). Targets within the GTP aim to reduce the private car use down to 58% which would reasonably reduce the demand in the proposed DOPU zone.

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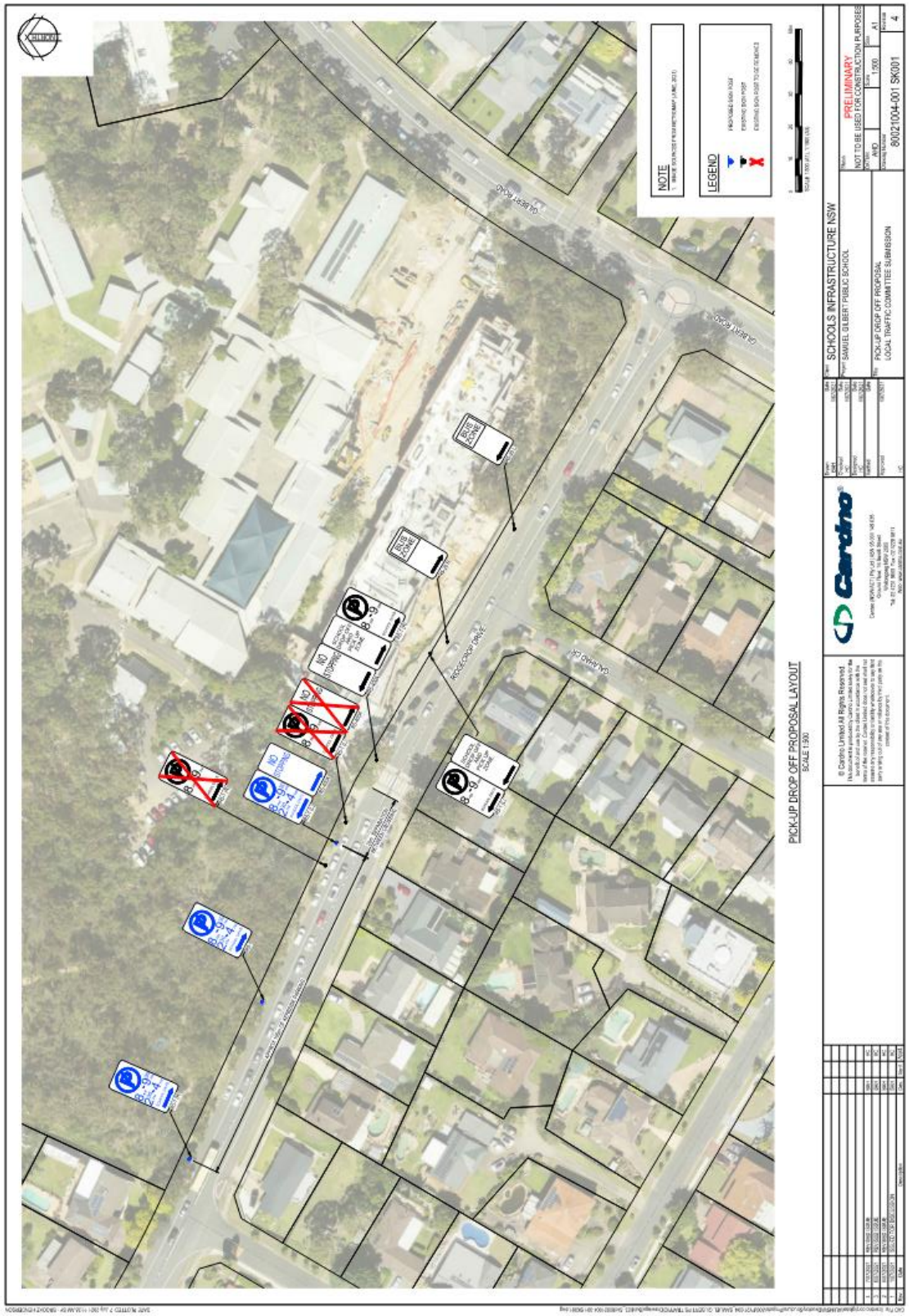
Figure 4-2 Proposed Parking Arrangement



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5 Council Consultation Outcomes

The DOPU arrangement has been discussed with Hills Shire Council on 11 March 2021 (Andrew King, Manager – Infrastructure Planning) and again on 2 July 2021 and subsequent emails (Angela Vernicos, Road Safety Officer) in the lead up to a submission to The Hills Local Traffic Committee (LTC).

During discussions on both occasions it was agreed that the Gilbert Road DOPU zone was unsuitable, and support was given to providing the DOPU zone only from Ridgecrop Drive. It is noted that Council have identified an alternate location in lieu of the Gilbert Road location, being Excallibur Avenue. This would require footpath provision from the school boundary to the kerbside location. Cardno believes that given the significant improvement in the DOPU arrangements, the traffic congestion and queueing will be alleviated dramatically and the level of improved efficiency in Ridgecrop Drive kerbside collection will unlikely mean additional short term parking is required above what is now proposed.

The subsequent kerbside parking arrangement on Ridgecrop Drive, submitted to LTC, is shown in **Figure 4-2**. It is also relevant to note that the verge adjacent to the DOPU zone will be modified to provide a flat concrete area between the current footpath and back-of-kerb as requested by Council.

6 Other Considerations / Impacts

The traffic modelling undertaken as part of the SSD application focused on the two roundabout intersections of Ridgecrop Drive and Gilbert Road (north and south locations).

The southern roundabout was assessed to operate at Level of Service (LoS) 'A' and 'D' in the AM and PM peak respectively. The modelling assessment adopted a conservative approach of applying 100% of the net traffic increase onto Ridgecrop Drive at the southern roundabout. By removing the Gilbert Road DOPU zone the modelling assessment and outcomes would remain unchanged.

It is acknowledged that vehicles seeking to access the existing Ridgecrop Drive DOPU zone do so by either circulating Galahad Crescent or by performing a U-turn manoeuvre on Ridgecrop Drive near Galahad Crescent at its western location. This movement currently occurs, and would have continued to occur under the approved SSD arrangement. The improved DOPU zone in Ridgecrop Drive improves the safety of this segment of road by removing the queuing and congestion currently being experienced. Furthermore, the schools Operational Transport and Access Management Plan (OTAMP) and GTP aim to improve operation efficiency of traffic and reduce private vehicle dependency in order to reduce vehicular impacts on the surrounding network (amongst other things).

7 Summary

Cardno has reviewed the SSD documentation, attended SGPS and obtained student survey responses as part of our assessment of the consent conditions.

Ridgecrop Drive experiences extensive congestion due to the glaring issue with the Ridgecrop Drive DOPU zone and its ability to only load (or service) 3-4 cars at any one time. Based on the propagation of queuing, this is insufficient for the current school demand.

Based on Cardno's review of the SSD DOPU analysis, SSD approval, understanding of the Green Travel Plan requirements, site observations and student survey, it is recommended that the 272m of DOPU zone required and spit between Ridgecrop Drive and Gilbert Road is reduced to some 105m in length and contained to Ridgecrop Drive only.

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