Traffic Analysis Review of Proposed Project:

Rocketship Charter School

Redwood City, CA

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Prepared by:

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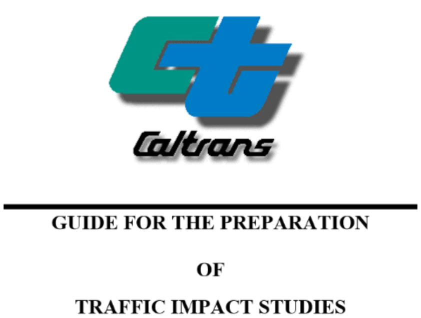
Introduction

This letter report summarizes the findings of PRISM Engineering regarding the traffic impact study prepared by Hexagon, as well as our observations in the field of real world traffic and parking, etc., and concerns as it relates to school uses in this industrially zoned area.

Existing Conditions and Surroundings

The intersection of Woodside Road (SR 84) at Bay Road calculates to LOS C conditions using the Highway Capacity Manual (HCM) 2010 methodology. PRISM Engineering counted the traffic turning movements at this location, and ran the industry standard HCM analysis using Synchro software. This similar calculation result was shown in Table 3 of the Hexagon traffic impact study for the project. This calculation would be correct if it were not for the fact that this intersection is only 600 feet away from another intersection, Woodside at Broadway which is also at LOS F conditions (calculated as LOS E in a vacuum). LOS F conditions also exist at the US 101 freeway ramp intersections. This LOS F condition at the freeway ramps translates back all the way to the Bay Road intersection, and beyond, as observed in the field. There is actually an observable LOS F condition at the Woodside and Bay Road intersection during the am peak hour because of blockage of traffic backing up from the US 101 interchange. This results in the northbound traffic on Woodside having a stop and go condition. Traffic does not freely flow through this intersection. I observed in the field while counting the traffic at Woodside and Bay that the northbound approach was at LOS F conditions because of this, and that the northbound approach was 42% of the total traffic at this intersection. Because the intersection is so close to Broadway and also to the US 101 freeway ramp intersections, these can only be accurately calculated using a traffic operations microsimulation methodology, which was beyond the scope of our study (this would require much more data collection for all intersections, and the building of a microsimulation model).


Caltrans

GUIDE FOR THE PREPARATION

OF

TRAFFIC IMPACT STUDIES

In the *CALTRANS GUIDE FOR THE PREPARATION OF TRAFFIC IMPACT STUDIES*, it specifically stipulates that the only kind of traffic analysis that is correct for closely spaced intersections on its surface street facilities is detailed microsimulation analysis, which was NOT done in the Hexagon traffic analysis. Caltrans states:

"When a State highway has saturated flows, the use of a micro-simulation model is encouraged for the analysis"

I can definitively state that, based on my actual observations of traffic operations of this intersection in the field during the am peak hour, that LOS F conditions are significantly present. 42% of the traffic (the northbound approach) are delayed significantly, and waiting more than one signal cycle to get through. This is an LOS F condition, and especially since the signal cycle there is two and a half minutes! Vehicles are unable to enter the intersection going northbound because of blockage ahead, and must wait with significant delays before they can pass through, one row of vehicles at a time. The level of service at this intersection cannot be calculated in a vacuum, or LOS C conditions would be the result, which is incorrect. In conclusion, it is not possible to bring more traffic through this intersection without creating an even worse impact on an already LOS F condition at the Woodside and Bay intersection. There must be mitigating improvements to this situation before more traffic is allowed to impact the intersection. Because LOS C conditions was reported in the Hexagon traffic study, which is incorrect, there was no discussion of mitigation. Caltrans would require a traffic operations study to be completed with microsimulation tools at a minimum, because these intersections along Woodside are so closely spaced, the HCM 2010 methods are entirely inappropriate and inaccurate.

Traffic Study Review

TRIP GENERATION. PRISM Engineering reviewed the key traffic study assumptions that affect impact, namely, trip generation of the project and trip distribution. Even though the traffic study acknowledges that five other Bay Area Rocketship Charter School locations are averaging am peak hour trip generation of 0.96 trips per student[1] and that this is the observed actual average trip generation, it may be that this average trip rate could be too low. This is considering the location of this proposed school site in an industrial location where possible pedestrian and bike safety and even transient concerns could motivate more parents to directly drive their children to school to help ensure their safety.

TDM REDUCTIONS NOT REASONABLE. The report also mentions possible trip reductions in a Transportation Demand Management (TDM) program (see Table 7) up to nearly 50% lower volumes due to carpooling. We do not think this is a reasonable assumption to consider seriously as a potential mitigation because this kind of additional reduction is not being realized in the other Rocketship schools nearby (still averaging 0.96 trips / student). The Hexagon report stated:

> *"The proposed TDM Program is expected to reduce the vehicle trips and parking demand generated by the Rocketship Redwood Academy thereby reducing the length of queue storage needed for drop-off and pickup operations."*

There are TDM Program assumptions discussed in the report indicating that 60 families would car pool based on financial incentives, resulting in 120 trip ends being subtracted from the total, and another 60 families would bike or walk to school also based on a $20/mo. financial incentive. What's wrong with this assumption is that the trip rate of 0.96 trips per student is ***already*** including carpooling with or without these incentives. We believe this trip rate for the school will

[1] See page 30 of Rocketship Redwood Academy – Traffic Study Report, Table 6.

be even higher based on what is happening in San Francisco where charter schools are getting parent driver rates up to 90%, not the 50% represented in the Hexagon traffic study.

National surveys by US DOT, etc. have shown that less than 13% of K-8 students today walk or bike to school,[2]

ITE Trip Generation Rates for all kinds of schools, including elementary schools, shows that the vehicle trip generation rates ***already*** reflect car-pooling because the observed number of vehicles entering is always less than 50% of the number of students at the school (am trip rates of 0.45 trips/student, ITE Elementary School 520). This is not the case in San Francisco, however, where this number is 90%. There are 480 students proposed, and only 225 inbound student trips shown in Table 8 of the report. This means that even with the higher 0.96 trip/student rate used, there is already a built-in assumption that there are more than two students per inbound car, average, already. To go beyond this and further reduce the number for "car-pooling" in TDM programs is to ignore that car-pooling is already taking place, by default, in the trip generation number itself. Any additional reductions for the project based on TDM is a highly unlikely scenario and should not be seriously considered. In fact, a common-sense case could be made that since the project site is in an environment/zoning relatively unfriendly to pedestrians and cyclists (industrial uses with double parking, large trucks, narrow driveways with blind spots), that there are few parents who would have their elementary aged children try to navigate arriving to school alone without the protection of being in a vehicle. The area is an industrial zoned area leaning more in the heavy industrial uses with larger trucks.

Safety

It is my professional opinion that although there are sidewalks in the area surrounding the school site, there are also industrial uses with large trucks, saturated parking on both sides of the street, and numerous blind spots are created by large vehicles parked right next to driveways. In addition, there are tall buildings immediately adjacent to both sides of these narrow driveways, and the buildings are also immediately adjacent to the sidewalk, which is narrow. This condition makes it very difficult for large and small vehicles to enter or leave a driveway without creating some tension with any pedestrian or bicycle traffic. The nose of a vehicle must enter the sidewalk before the driver of the vehicle can even look left or right to see if a pedestrian or bike conflict is imminent. This create an unsafe condition, an accident waiting to happen. For inbound driveway vehicles and trucks, this same condition is created by parked vehicles and

[2] US DOT / FHA, Center for Urban Transportation Research, Carpooling Without the Car CUTR

trucks immediately adjacent to these narrow driveways, creating a blind spot where a driver must nose past the sidewalk without a full vision of the sidewalk. In other words, these sidewalks and the current parking condition is not a situation conducive to safe routes to school.

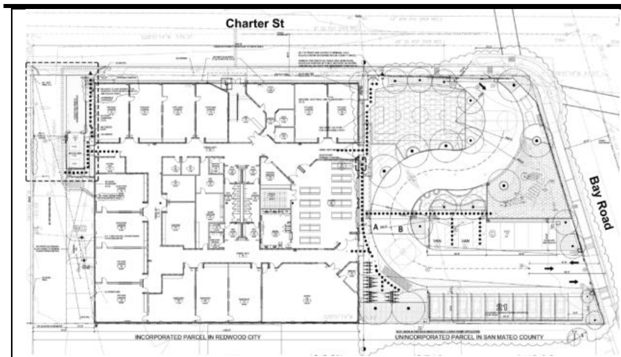
The nationally recognized Safe Routes to School programs are being implemented throughout the USA to help improve unsafe situations for existing schools. It seems apparent that this proposed site is one that is in a location fraught with safe route to school problems. The Hexagon study did not address this very important concern, on safety.

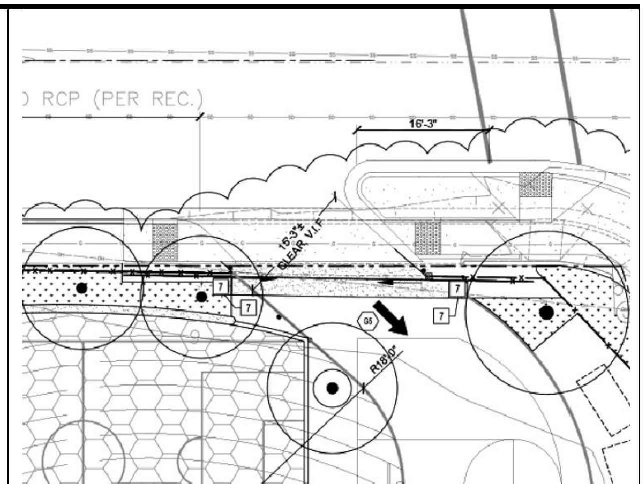
Parking and Circulation, Traffic Queues

PARKING ALREADY IN SHORT SUPPLY. PRISM Engineering's observations of parking along Charter Street in the am peak hour on the section of Charter Street between Bay Road and Spring Street (the proposed charter school site frontage) indicate that during the am peak hour the parking on both sides of the street is completely saturated/occupied by vehicles and trucks. I also observed double parking, indicating that parking is already in short supply. The photos below show this condition, and show how there are blind spots for the numerous industrial business driveways. A child could be walking along the sidewalk, and because of a large truck or car parked immediately adjacent to the driveway, they cannot be seen (too short) by drivers on Charter Street. It is not inconceivable that a child could be easily hit by an incoming turning car or truck who did not see a child just about ready to enter the driveway but obscured behind the parked vehicle. Children also might even be running on the sidewalk (typical) just before a truck or vehicle enters one of these several driveways from Charter Street. An accidental vehicle/ped collision could easily take place. See example photos of some of these existing blind spots below.

	
Driveway with Blind Spots on Charter St	Driveway with Blind Spots on Charter St

I also reviewed the proposed project site plan and have specific concerns with the parking situation on Charter Street and other surrounding streets, and the proposed entrance to the project.





Project Site Plan	Blow-up of proposed Project Driveway

LONG VEHICLE QUEUE LINES. First of all, there is existing parking saturation on Charter Street here, and specifically along the eastern curb of Charter Street along the project site frontage and beyond. The site plan shows an entry driveway that is angled at 45 degrees forcing an inbound movement coming from northbound Charter Street only. In other words, all project traffic must pass through the Spring Street / Charter Street intersection. All students in vehicles must travel northbound on Charter Street then enter the site just before Bay Road.

All elementary schools have long arrival queue lines. There are no observable exceptions throughout the USA. This is because the majority of parents will drive their young children to school, and in particular in the Bay Area where this has been observed to be as high as 90% in San Francisco. This equates to significant vehicle queues on the road serving the school driveway. An average elementary school is getting queue lines up to a quarter mile long (1320 feet, see photo to left). The distance between the project driveway and Spring Street is less than 600 feet. This means that when parents are arriving with their children, the vehicles will block all driveways long Charter Street for in and outbound traffic for all businesses, and far beyond Spring Street. This queue congestion typically takes place for about a half an hour. The only way to mitigate impacts to a local street is to provide adequate queue storage on the school site. It is interesting to note that if all Rocketship charter school parents arrived at exactly the same time, and with an average of 8 feet between cars 15 feet long, this distance of 23 feet multiplied by the 250 inbound cars calculates to a distance of 5,750 feet, or more than a mile. This is the amount of roadway occupancy that takes place with 250 vehicles in a queue. However, this queue has arrivals taking place over about a half hour period of time, lessening this length.

The site plan (shown to the left) has an internal road that is only 150 feet maximum of storage on site. The average vehicle is 15 feet long, and spacing between vehicles in a queue varies but is about half the distance, or 8 feet. This will hold only about 7 of the 250 incoming vehicles while three other vehicles unload students. This slow process takes time, and students are only allowed to exit their vehicle at the designated drop off zone, handling about 3 or 4 cars max at a time. Assuming a reasonable drop off time of at least 30 seconds to pull up and get the kid(s) out of the car, this means that 4 cars can be processed ideally per 30 seconds, or 8 vehicles per minute. Since there are 250 vehicles and assuming nobody creates any delays, this means it will take about 30 minutes to clear this queue and allow Charter Street to function again. The red cars in the illustration above represent cars stopped on and blocking Charter Street during the arrival time of the school traffic. Driveways will be blocked, and there will literally be a gridlock of Charter Street during this time. Spring Street will also experience these same problems, as the queue will extend to this street as well.

Ideally, a school should be providing on-site storage of this arrival queue. It is understood that there is not enough room on the site to do this, but there is also not enough room offsite either to reasonably do this, without creating a grid lock of business driveway traffic and negatively impacting all surrounding businesses in the vicinity at an LOS F condition, which is unacceptable. If the charter school is having classes all start at the same time, it is conceivable that this traffic queue problem could be far worse than is typical. Since the Rocketship schools are flexible on arrival times[3] (say they can drop off kids as early as 7 am even though school does not start until 8 am). This means that it is actually possible for the worst condition to take place, since it can be random. The Hexagon traffic study did not address this queue problem that will certainly exist, but only talked about loss of parking. It also suggested that parents desiring to park during drop off times would need to park on Charter Street, but this is not even possible with the already saturated parking, further exacerbated by their own recommendation that some parking even be removed. That study apparently did not inspect the real-world parking and driveway conditions extant today on Charter Street, which are significant.

[3] See DROP OFF on page 8 of Rocketship School's Student Family Handbook found at:

http://www.rsed.org/documents/RNNEStudentFamilyHandbook.pdf

APPENDIX

HCM Signalized Intersection Capacity Analysis
3: Woodside (SR 84) & Bay Road

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	8	100	10	212	110	119	32	1357	78	174	1233	43
Future Volume (vph)	8	100	10	212	110	119	32	1357	78	174	1233	43
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Lane Util. Factor		0.95			0.95		1.00	0.91		1.00	0.95	
Frt		0.99			0.96		1.00	0.99		1.00	0.99	
Flt Protected		1.00			0.98		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		3207			3055		1630	4646		1630	3243	
Flt Permitted		0.92			0.76		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		2946			2370		1630	4646		1630	3243	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	9	109	11	230	120	129	35	1475	85	189	1340	47
RTOR Reduction (vph)	0	5	0	0	27	0	0	3	0	0	1	0
Lane Group Flow (vph)	0	124	0	0	452	0	35	1557	0	189	1386	0
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)		31.4			31.4		6.0	72.5		21.1	87.6	
Effective Green, g (s)		31.4			31.4		6.0	72.5		21.1	87.6	
Actuated g/C Ratio		0.23			0.23		0.04	0.52		0.15	0.63	
Clearance Time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Vehicle Extension (s)		3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		667			537		70	2432		248	2051	
v/s Ratio Prot							0.02	0.34		c0.12	c0.43	
v/s Ratio Perm		0.04			c0.19							
v/c Ratio		0.19			0.84		0.50	0.64		0.76	0.68	
Uniform Delay, d1		43.2			51.2		64.8	23.6		56.3	16.3	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.1			11.4		5.5	1.3		12.9	1.8	
Delay (s)		43.4			62.6		70.3	25.0		69.2	18.1	
Level of Service		D			E		E	C		E	B	
Approach Delay (s)		43.4			62.6			26.0			24.3	
Approach LOS		D			E			C			C	

Intersection Summary			
HCM 2000 Control Delay	30.5	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.75		
Actuated Cycle Length (s)	138.5	Sum of lost time (s)	13.5
Intersection Capacity Utilization	73.3%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Source: PRISM Engineering and Synchro HCM 2000 methodology