



8/03/2017

Verizon Piedmont High School

Existing RF Coverage and CW Results (700 MHz and 2100 MHz bands)

The Foundation for a Wireless World.

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Answers to the Wireless Communications Facility Application Form Questions

Item	Description
13	<p>This item has not been completed. The exhibits entitled, "Existing RF Coverage and CW Results (700 MHz and 2100 MHz bands," provided on FEB 10th 2017, do not satisfy the application submittal requirements.</p> <ul style="list-style-type: none"> - Customers normally approach to us in areas that has capacity and coverage issues which a macro cannot address it. This is either due to tough zoning laws in the area or in high density locations. Small cells is a low power solution which is typically deployed on a pole with lower size antenna with lower gain compared to macro antennas. Small cells equipment have a smaller footprint when compared to typical macros.
13 (a)	<p>The assumptions and parameters of the study shown in the map exhibits for the existing conditions, composite coverage, and preliminary results are not provided in the report. Please amend the report to provide the methodology, assumptions, and parameters used to develop the exhibits.</p> <ul style="list-style-type: none"> - Slide 4 shows the System Drive setup, methodology and configuration settings. This setup provides Verizon's existing coverage of 700MHz and 2100MHz. - Slide 5 shows the Continuous Wave (CW) setup, methodology and configuration settings. This setup provides the composite coverage and preliminary results for each node location.
13 (b)	<p>There is not explanation why the 700 MHz and 2100 MHz bands were chosen for the study. Please clarify.</p> <ul style="list-style-type: none"> - The client provides mobile phone services [voice and data] using the channels/frequencies at 700 MHz and 2100 MHz bands. The CW drive test were done using the above two frequencies to get accurate results.
13 (c)	<p>Please provide a comparison of the proposed sites with two to three alternative locations for each installation proposed in an area outside zone B. - Deemed Infeasible, identify issues.</p> <ul style="list-style-type: none"> - Slides 6 and 7 provide comments and a street map showing additional survey locations.

Answers to the Wireless Communications Facility Application Form Questions (Continues)

Item	Description
13 (d)	<p>Color Coding is more clear in study received on FEB 17th 2017. However, please revise report to provide to provide range of signal strengths considered "good", "weak" and "poor".</p> <ul style="list-style-type: none"> - <i>Legend changed to show three colors; Green for Good Signal Level between -30 dBi and greater than -85 dBi, Yellow for Weak Signal Level between less than -85 dBi and greater than -100 dBi and Red for Poor Signal Level between less than -100 dBi and -120 dBi.</i>
13 (e)	<p>Please provide boundaries around the areas of different signal strengths to show areas inside and outside each area of change in signal strength.</p> <ul style="list-style-type: none"> - <i>By using three colors and leaving only the node location for each node, we can see the boundaries more clear.</i>
13 (f)	<p>Some areas in the exhibits do not have colored points. For example, page 26 shows many streets without colored points to represent signal strength. Please amend report to clarify.</p> <ul style="list-style-type: none"> - <i>The streets that have no data is either because it was not driven and/or the signal was really low.</i>
13 (g)	<p>Please amend the report to provide the improvement in service/coverage/capacity intended by the project and how the report demonstrates the intended improvement in service/coverage/capacity. Narrative is needed here.</p> <ul style="list-style-type: none"> - <i>Slide 8 and 9 shows the before and after comparison of the signal strength for 700 MHz.</i> - <i>Slides 10 and 11 shows the before and after comparison of the signal strength for 2100 MHz.</i> - <i>The targeted area is Piedmont High School and surrounding neighborhoods.. The design requirement is for the proposed node locations to have signal strength better than 10 dBm of the existing signal for 2100 MHz. The reason for the number of nodes to be more around Piedmont high school is to take into account the capacity issues that will be there due to higher concentration of users in the school. More nodes around the school will improve the network quality.</i>

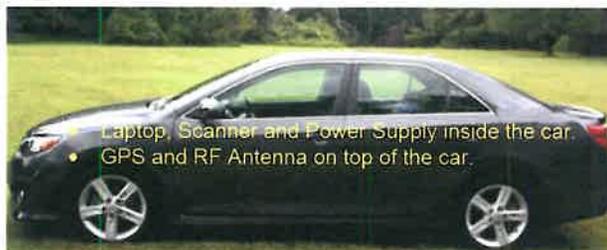
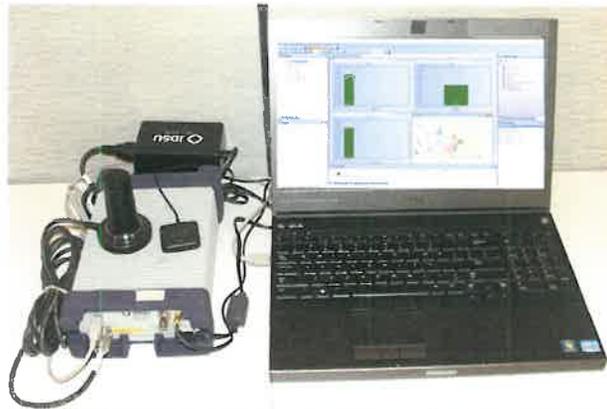
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System Drive Setup and Configuration Settings

The System drive test is way to determine how the existing network is. One can determine if there are any coverage issues, capacity issues and any other key performance issues for that network. The test is done by using a car containing a laptop, scanner, phones if needed, GPS antenna and RF Antenna that can detect and record the existing coverage.

Based on the data, if there are coverage issues then that is addressed by adding new sites. If there are capacity issues, then that is addressed by making software adjustments in the existing sites and add more sites as a last resort.

The below setup and configuration was used for acquiring the System Drive data. The EUTRA Absolute Radio Frequency Channel Number (Earfcn) is essentially a Long Term Evolution (LTE) carrier channel number. This test was done on June, 2016.



Verizon Wireless	Name	Band	Bandwidth (MHz)	Earfcn DL	Downlink Frequency (MHz)	Earfcn UL	Uplink Frequency (MHz)
700 LTE	700 c	13	10	5230	751	23230	782
2100 LTE	AWS-1	4	15	2050	2120	20050	1720

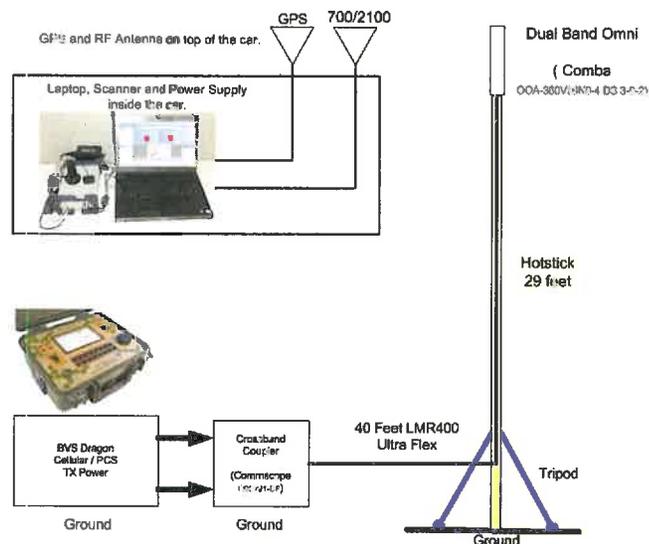
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CW Setup and Configuration Settings

Continuous Wave (CW) drive test primarily is done as a method of evaluating the propagation characteristics of a node location. During the Drive Test, Reference Signal Received Power (RSRP) values between a cell node and the receiver are measured along with their position. This involves driving the area around a transmitter until the RSRP values fall below -120 dBm.

The CW setup shown below was configured to collect data at 700 MHz and 2100 MHz bands. The coverage for 700 MHz and 2100 MHz is subject to the terrain, buildings and line of sight. The more dense an area is, the less the signal will travel. Also higher the frequency, the less distance it can travel through the air.

A team of three people is needed each time we collect data. The first person drives the car around the neighborhood. The second person is inside the car and makes sure that the receiver is working properly and that its collecting data. The third person stays next to the transmitter and tripod and makes sure that everything is working. The test usually takes between 2 to 3 hours. These drives were done on different months and some were moved to different locations. CW data was collected on October 2014, August 2015, March 2016 and June 2016.



Piedmont High School		Omni (Comba)	
Frequency (MHz)		764	2100
Power out of Dragon (dBm)		28.6	28.2
40ft Cable loss (dB) + Duplexer		2.0	3.5
Tx Antenna Gain (dBi)		4.0	6.0
Rx Mag-mount Antenna Gain (dBi)		3.0	3.0
Total Power		33.6	33.7
Usable EIRP (LB) (1 Panel) - 40W		33.6	33.7
Offset		0.00	0.00

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Additional Survey Locations and Comments

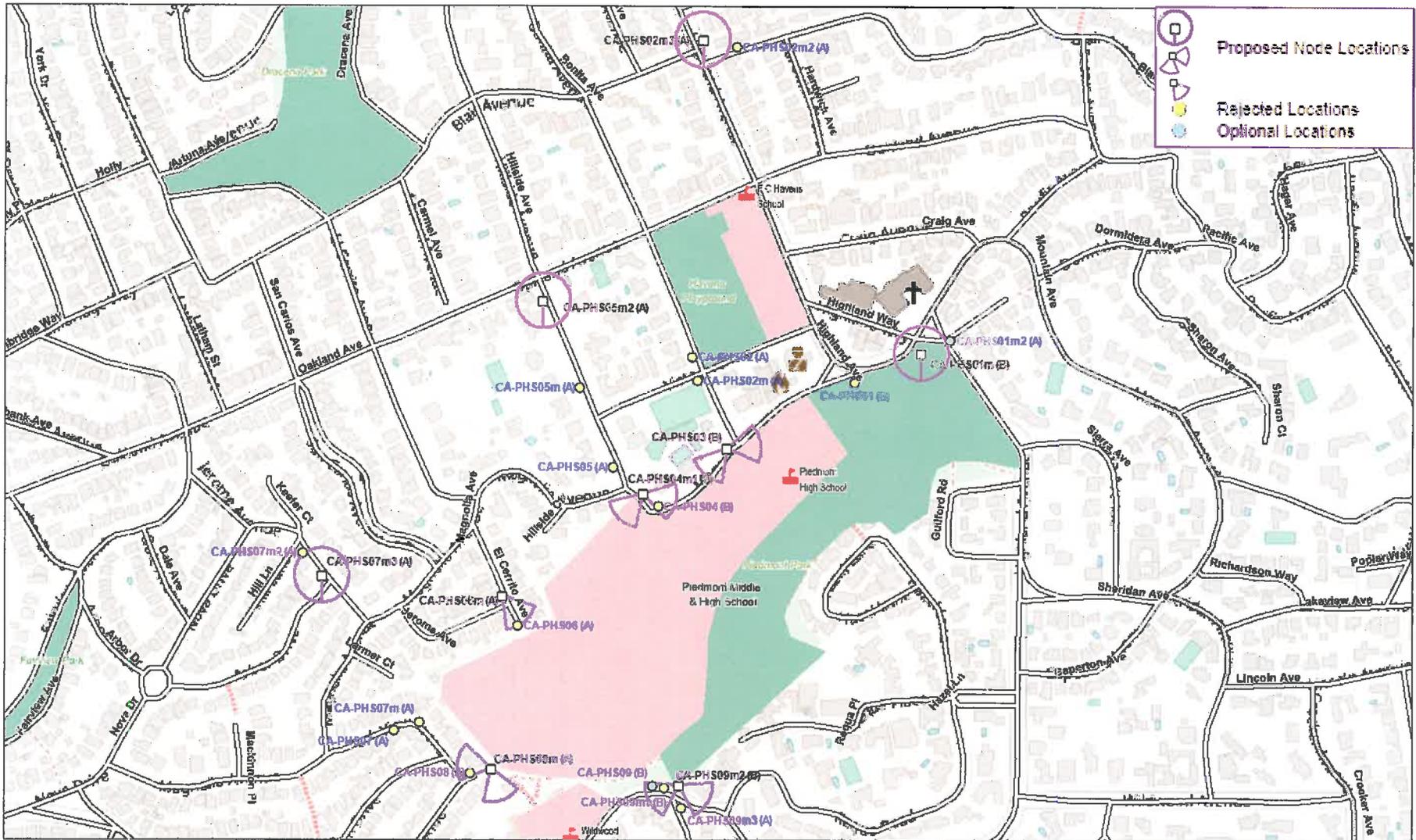
Crown Node ID	Zone	Pole ID	Latitude	Longitude	Street Address	Comments
CA-PHS01	B	497	37.824238	-122.23162	Magnolia Ave and Highland Ave	Original Pole closer to 995 Magnolia, East of proposed pole was located within trees, would not provide coverage desired by RF/Client, Additionally located at a more prominent park entrance.
CA-PHS01m2	A	110151068	37.824673	-122.230395	614 Highland Ave, Piedmont, CA	Could be an option if CA-PHS01m gets denied, but proposed location before City is open area, and provides ample coverage, and meets our objectives with less visual impact. This candidate would provide less coverage.
CA-PHS02	A	110118131	37.824499	-122.233689	331 Bonita Ave	Client declined this location. This location is too close to CA-PHS03. Would require potential new location.
CA-PHS02m	A	NA	37.82426	-122.233623	Across 29 Vista Ave	Client declined this location. This location is too close to CA-PHS03. Would require potential new location.
CA-PHS02m2	A	110151054	37.827829	-122.233138	505 Blair Ave	Moved. Placing an antenna on the communication zone would have a visual impact.
CA-PHS04	B	16	37.822997	-122.234129	Magnolia Ave	Moved. Not enough space on the sidewalk for a vault or mailbox.
CA-PHS05	A	110118161	37.823386	-122.234701	365 Hillside Ave	This location is too close to CA-PHS04, thus impacting our overall network.
CA-PHS05m	A	110118164	37.824183	-122.235129	337 Hillside Ave	Location engulfed with large tree, along with too close to Vista Ave, meaning we do not hit our coverage objectives, which could require an additional location. Note - we are trying to minimize the amount of sites to benefit both the City and our client.
CA-PHS06	A	110113810	37.821785	-122.235918	476 El Cerrito Ave	This location was reviewed, however it has a transformer on the pole, the current pole barely leaves enough room for ADA compliance, and there is no room for a vault.
CA-PHS07	A	110112936	37.820724	-122.237498	226 Park View Ave	Client declined this location. This location is too close to CA-PHS08m. Would require potential new location.
CA-PHS07m	A	110113806	37.820803	-122.237178	237 Park View Ave	Client declined this location. This location is too close to CA-PHS08m. Would require potential new location.
CA-PHS07m2	A	110110146	37.822518	-122.238674	355 Jerome Ave	Moved. Not enough climbing space.
CA-PHS08	A	110113804	37.820286	-122.238522	1159 Winsor Ave	CA-PHS08m is a better option. Hidden from public.
CA-PHS09	B	110113886	37.820164	-122.23419	314 Wildwood Ave	This location can be an option for CA-PHS09m2. Antenna would be on the communication zone.
CA-PHS09m1	B	NA	37.820145	-122.234044	Across from 314 Wildwood Ave	Moved. Placing a new streetlight would have a visual impact.
CA-PHS09m3	A	110113887	37.819938	-122.23382	1 Prospect Rd, Piedmont, CA	Potential pole is within median just East of Wildwood Park however this existing JPA wood pole already has been replaced, and there is no room to place a vault without damaging the existing root systems of the trees.



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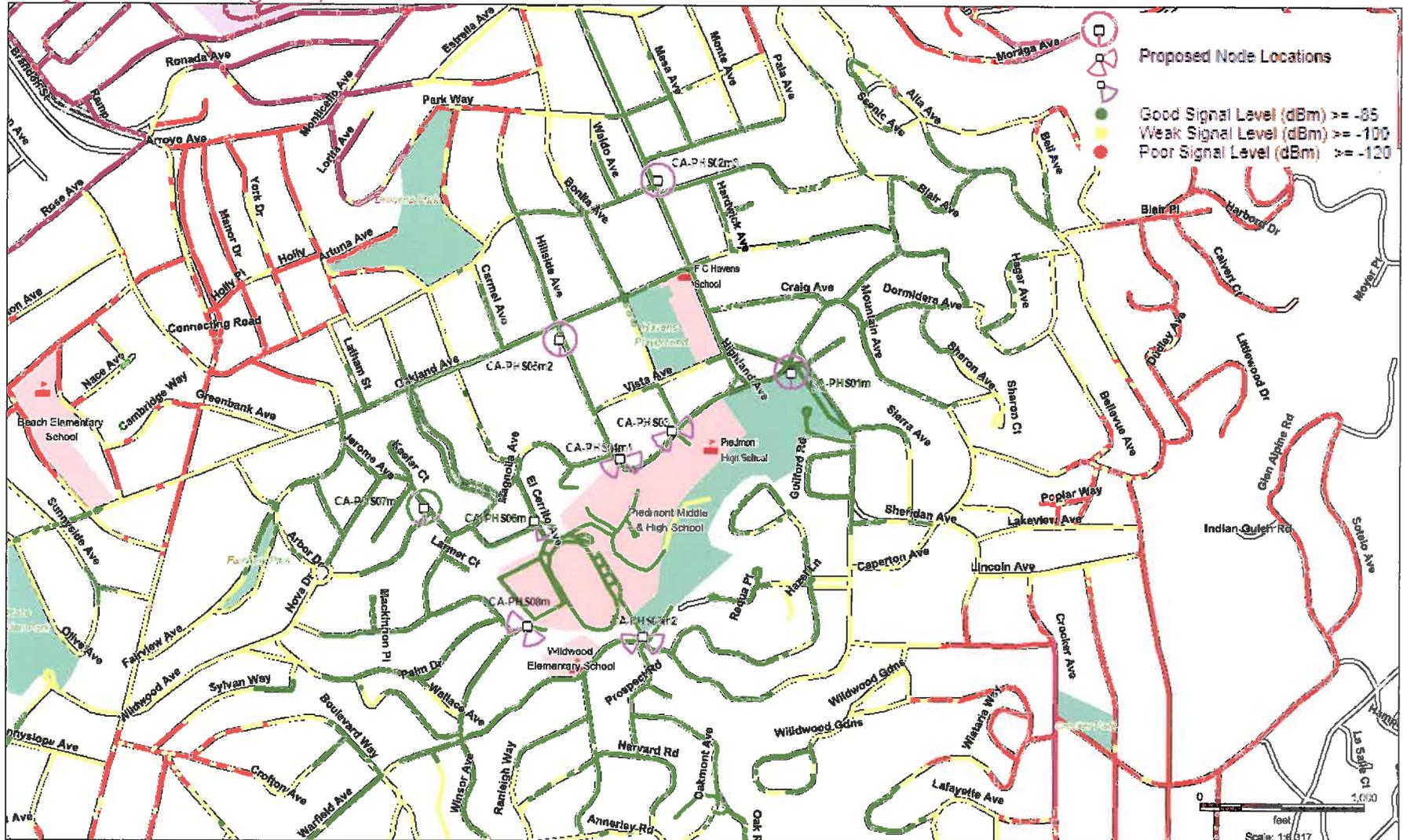
Survey Locations in Zone A and B



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CW Results – 9 Nodes Composite

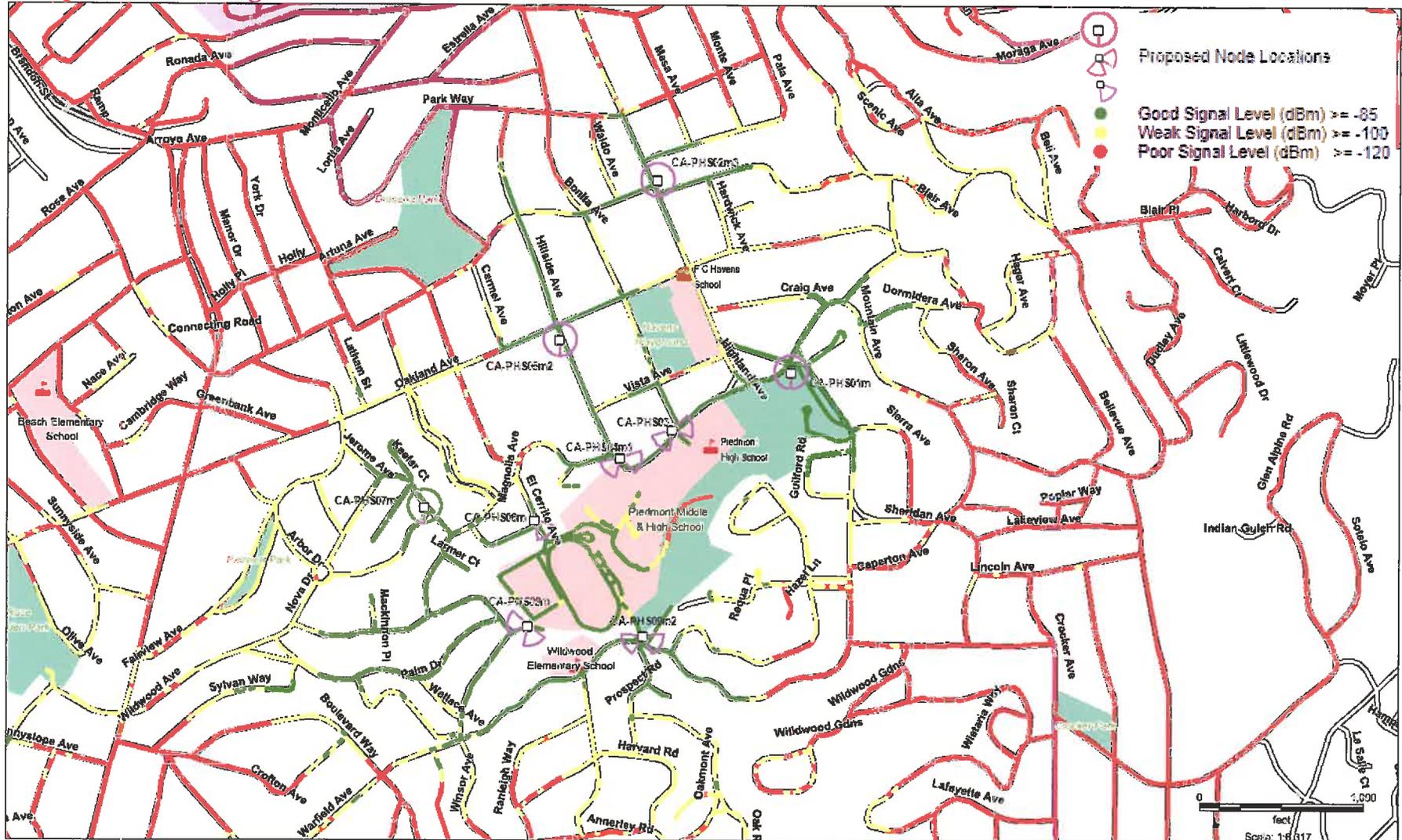
Proposed RF Coverage for 700 MHz Band



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CW Results – 9 Nodes Composite

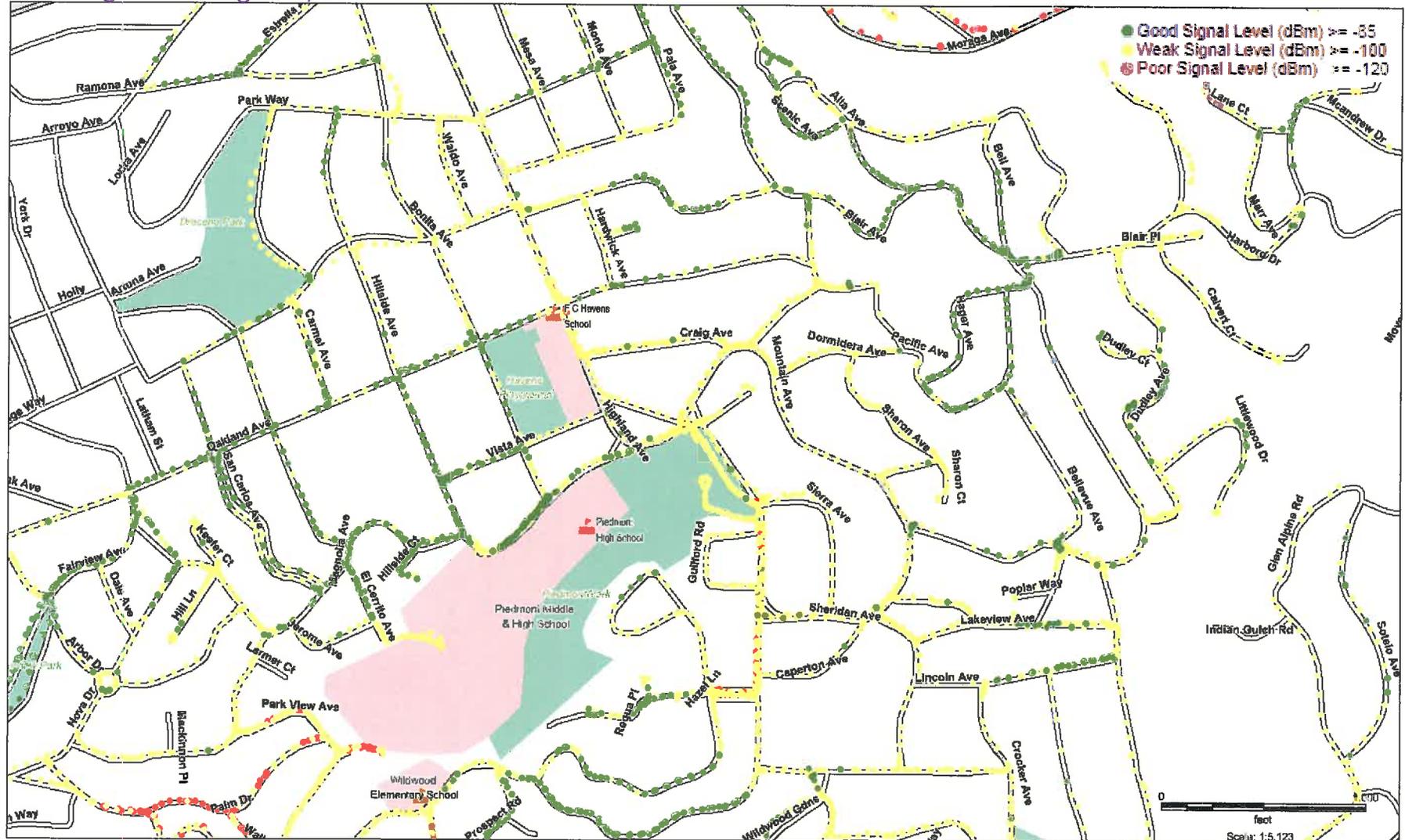
Proposed RF Coverage for 2100 MHz Band



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System Drive Data- CA-PHS01m

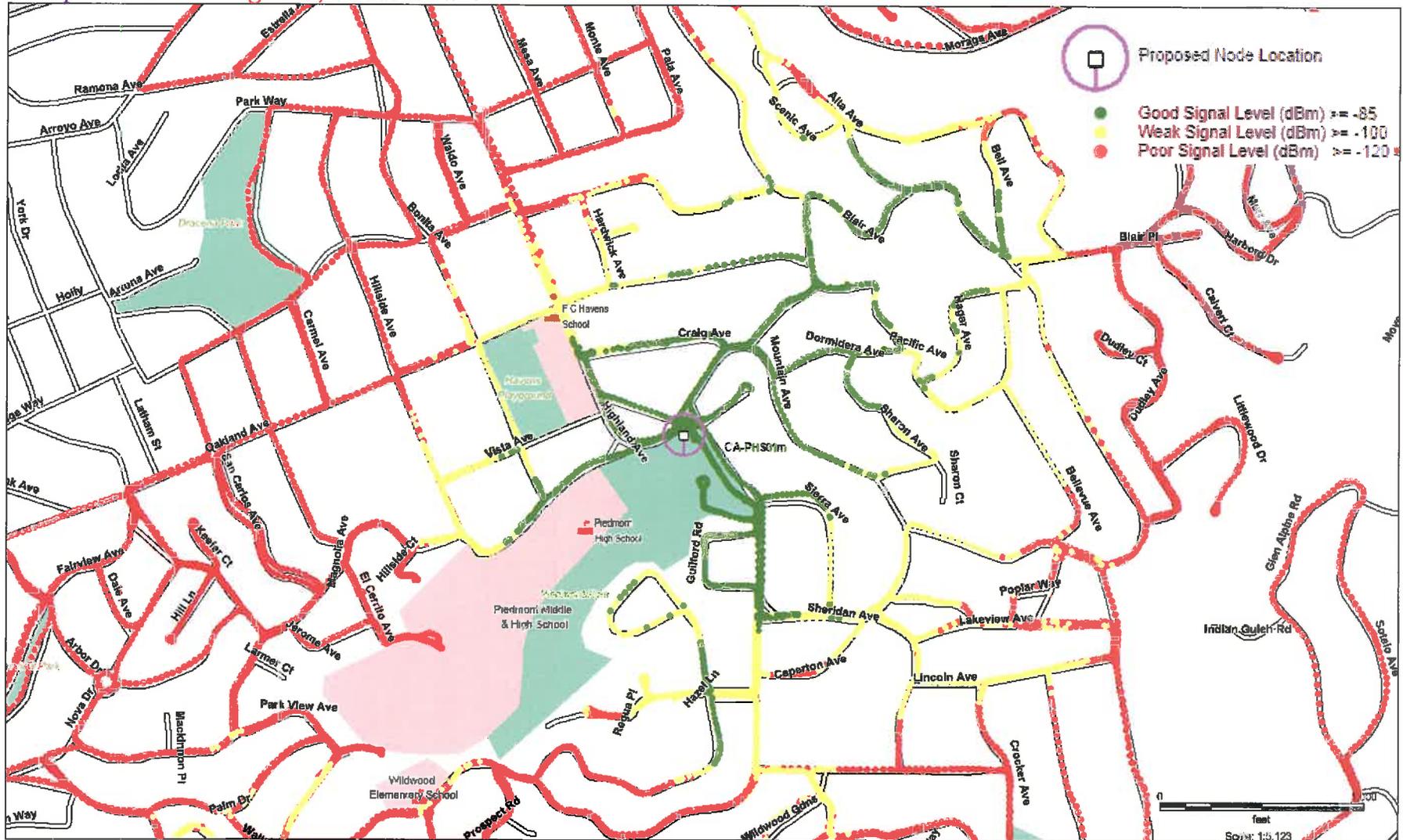
Existing RF Coverage for 700 MHz Band



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CW Results – CA-PHS01m

Proposed RF Coverage for 700 MHz Band

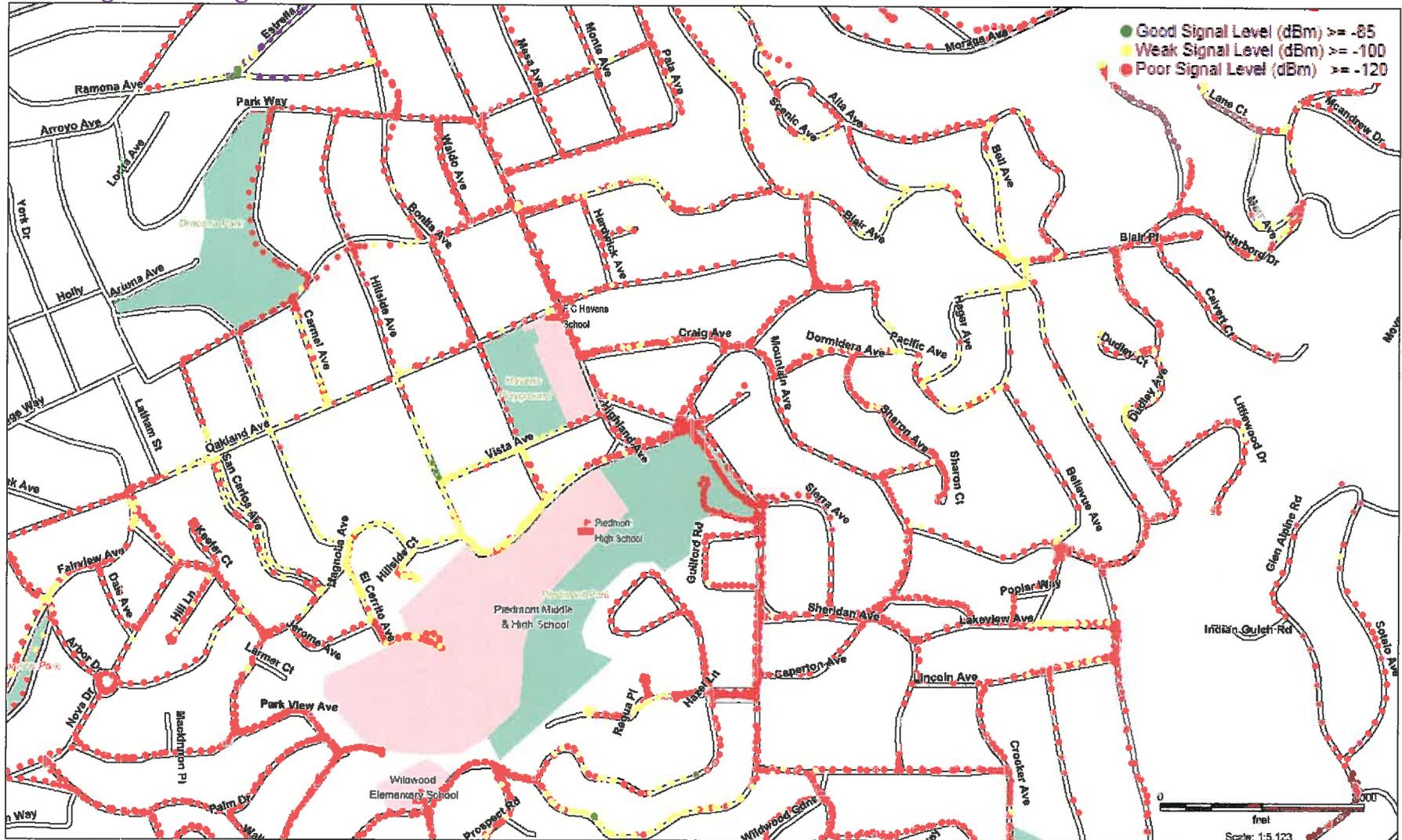


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System Drive Data- CA-PHS01m

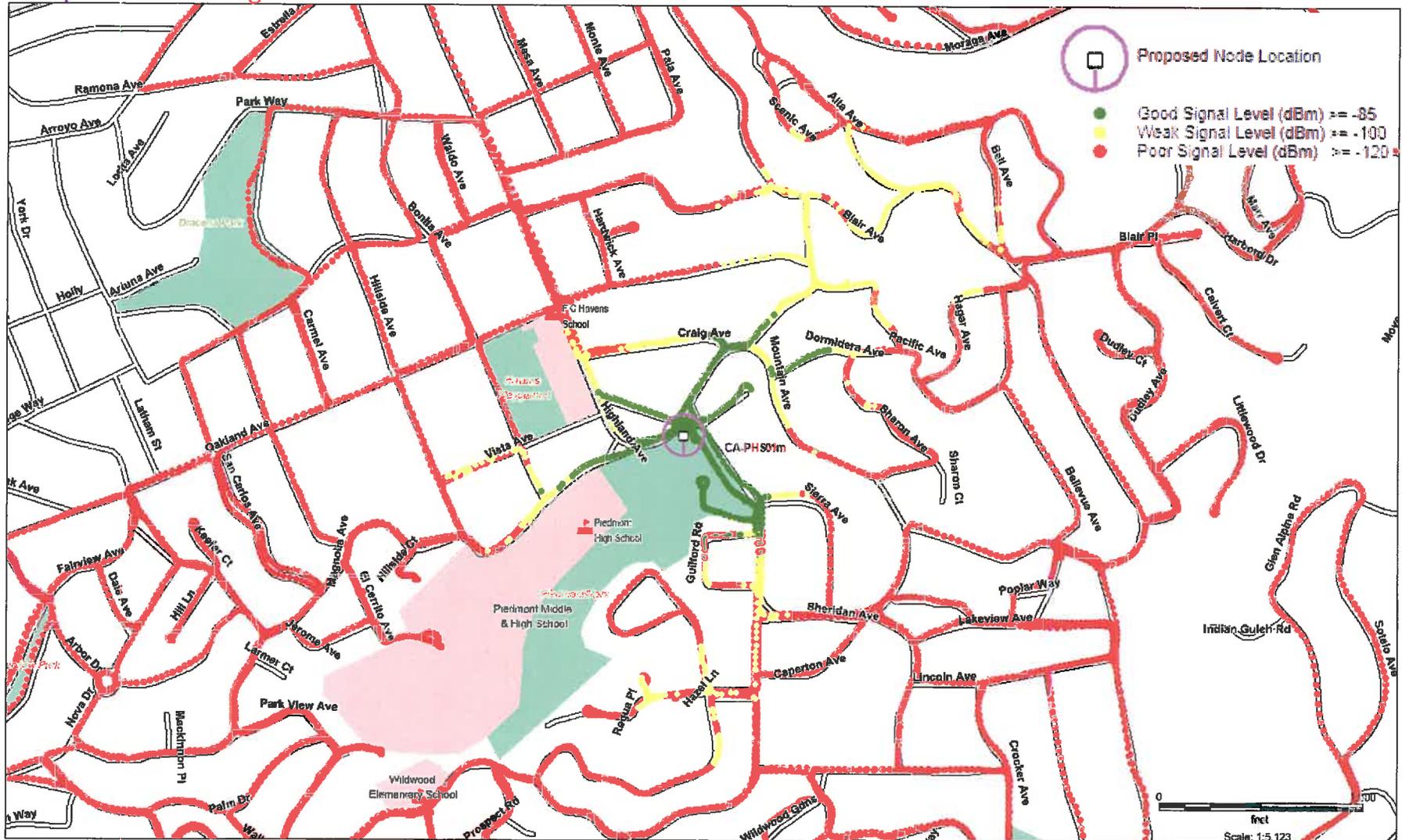
Existing RF Coverage for 2100 MHz Band



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CW Results – CA-PHS01m

Proposed RF Coverage for 2100 MHz Band

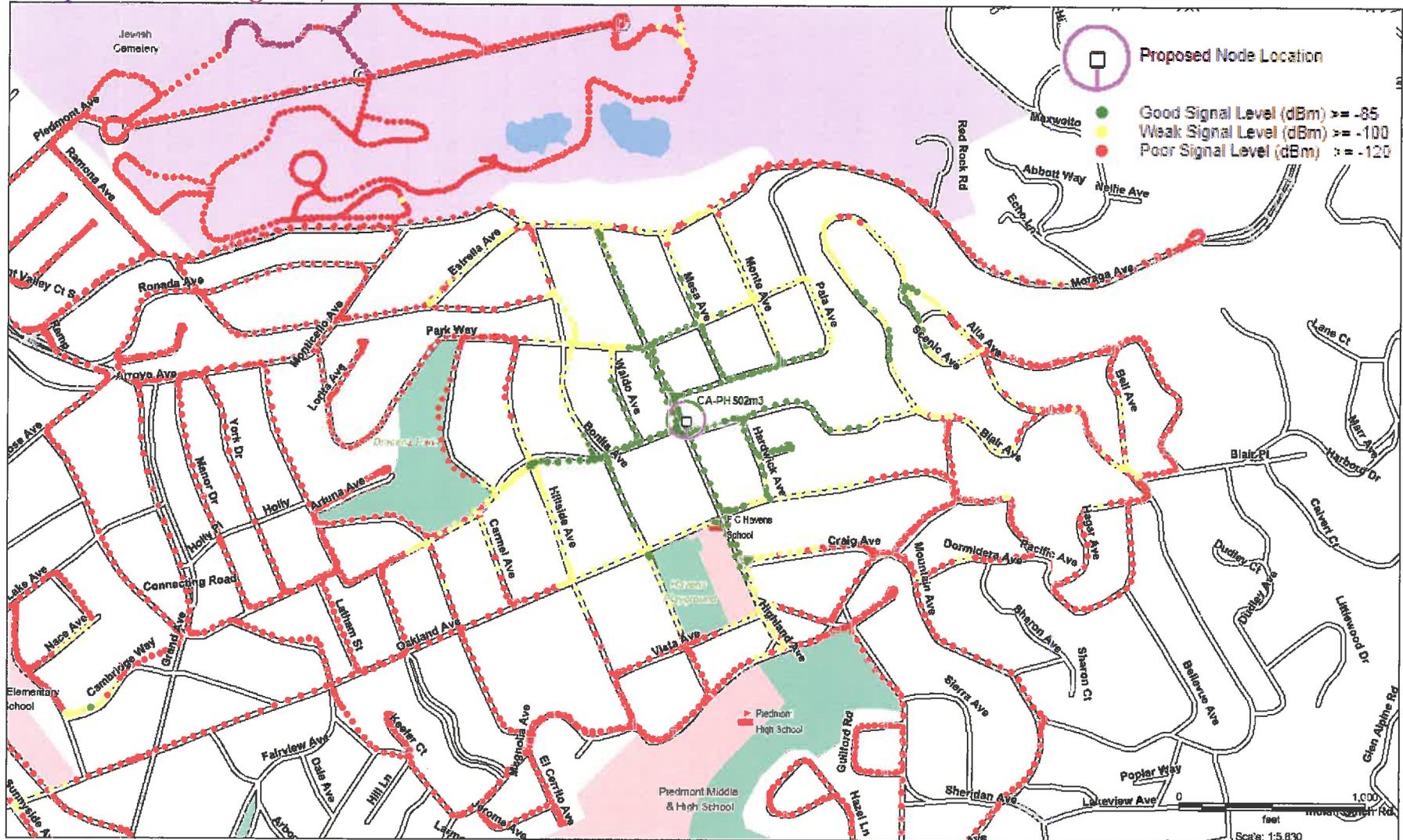


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CW Results – CA-PHS02m3

Proposed RF Coverage for 700 MHz Band

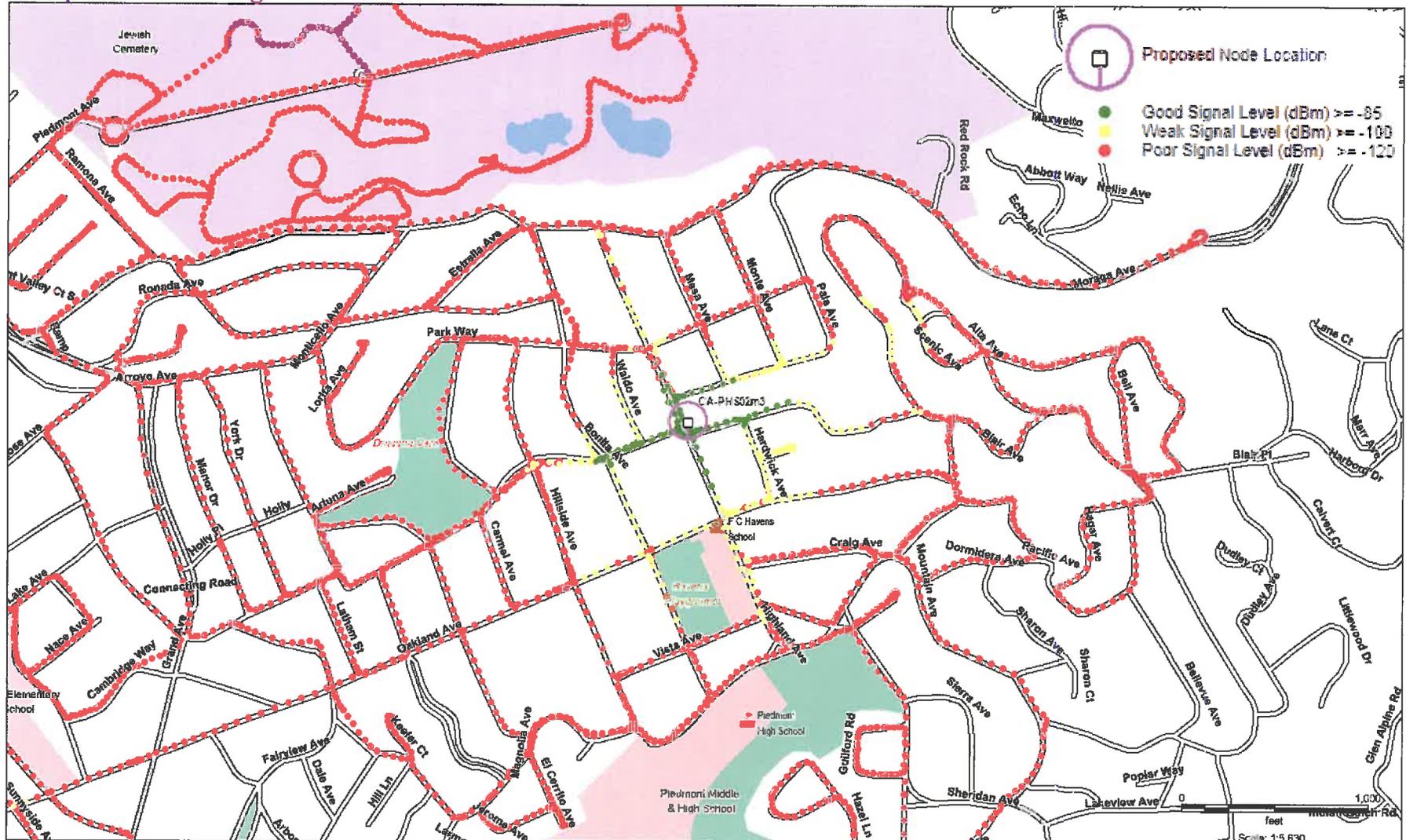


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CW Results – CA-PHS02m3

Proposed RF Coverage for 2100 MHz Band

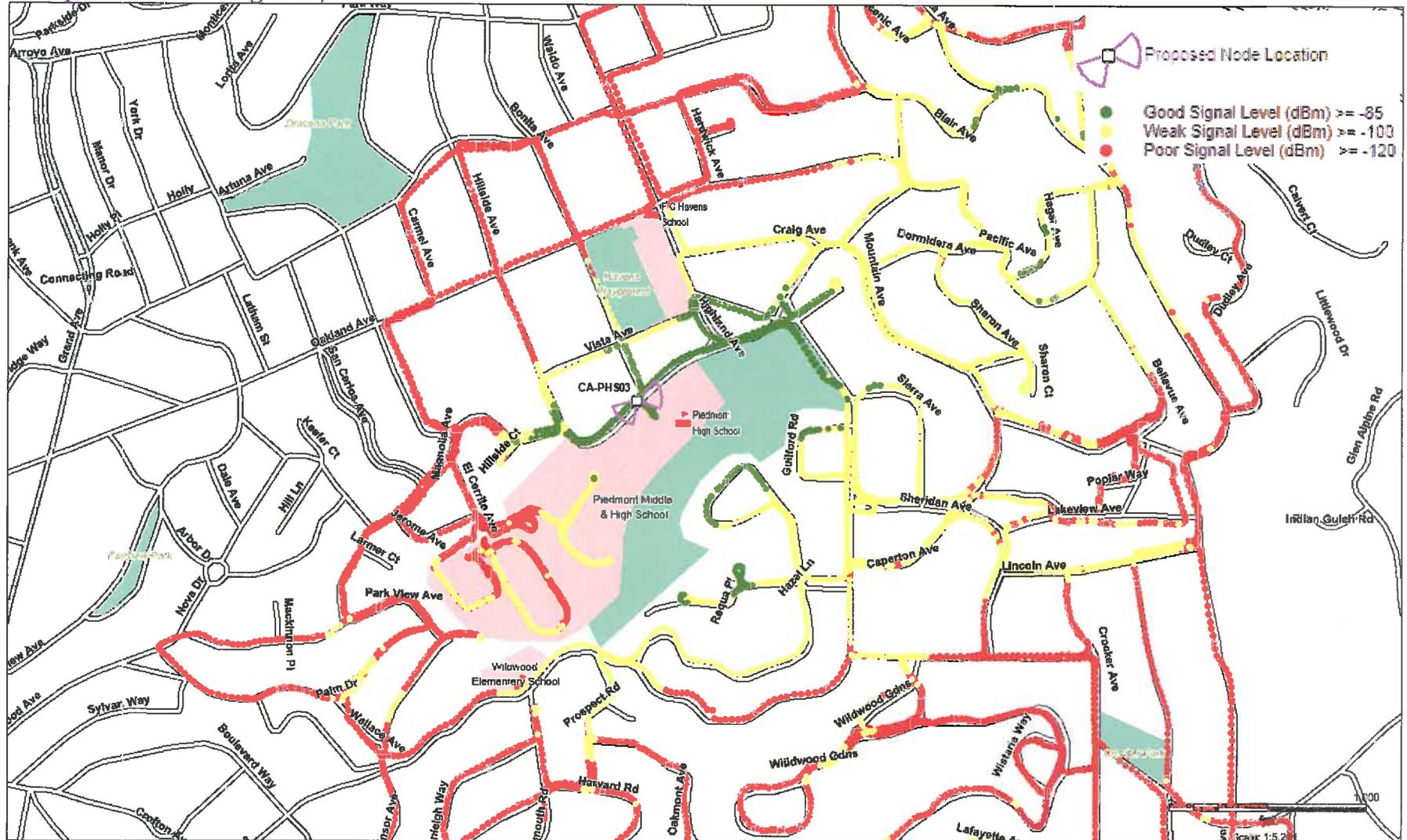


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CW Results – CA-PHS03

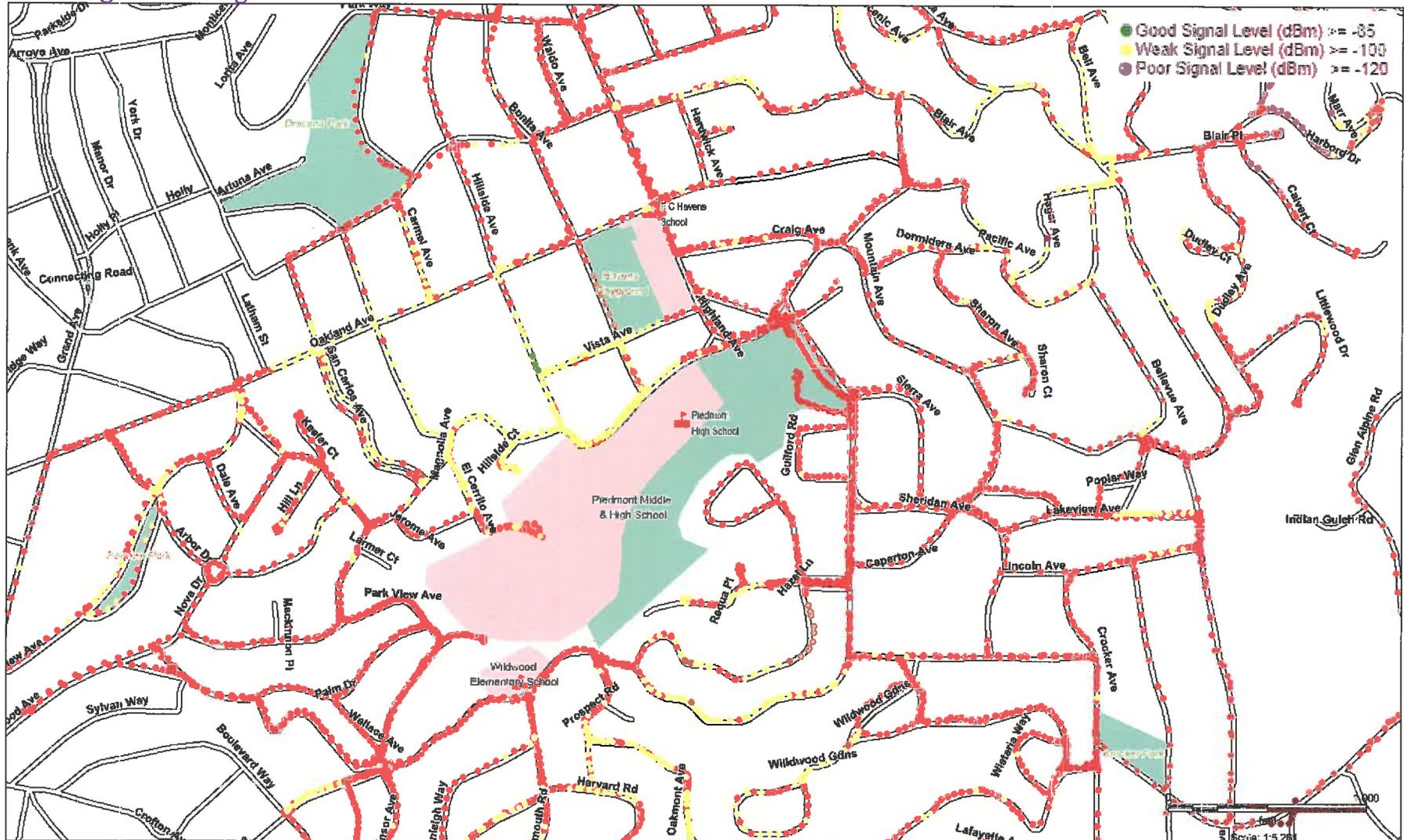
Proposed RF Coverage for 700 MHz Band



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System Drive Data- CA-PHS03

Existing RF Coverage for 2100 MHz Band

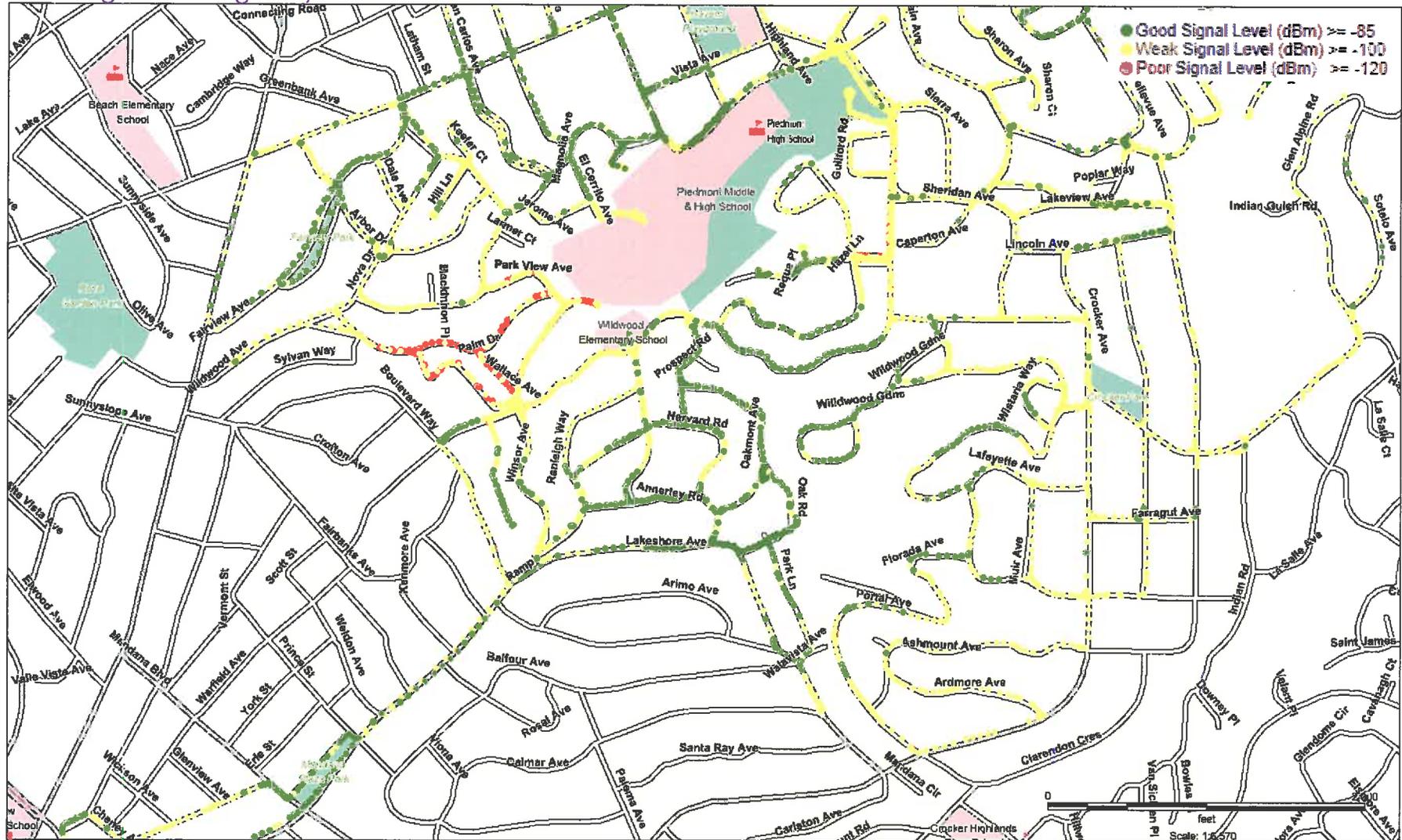


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System Drive Data- CA-PHS04m1

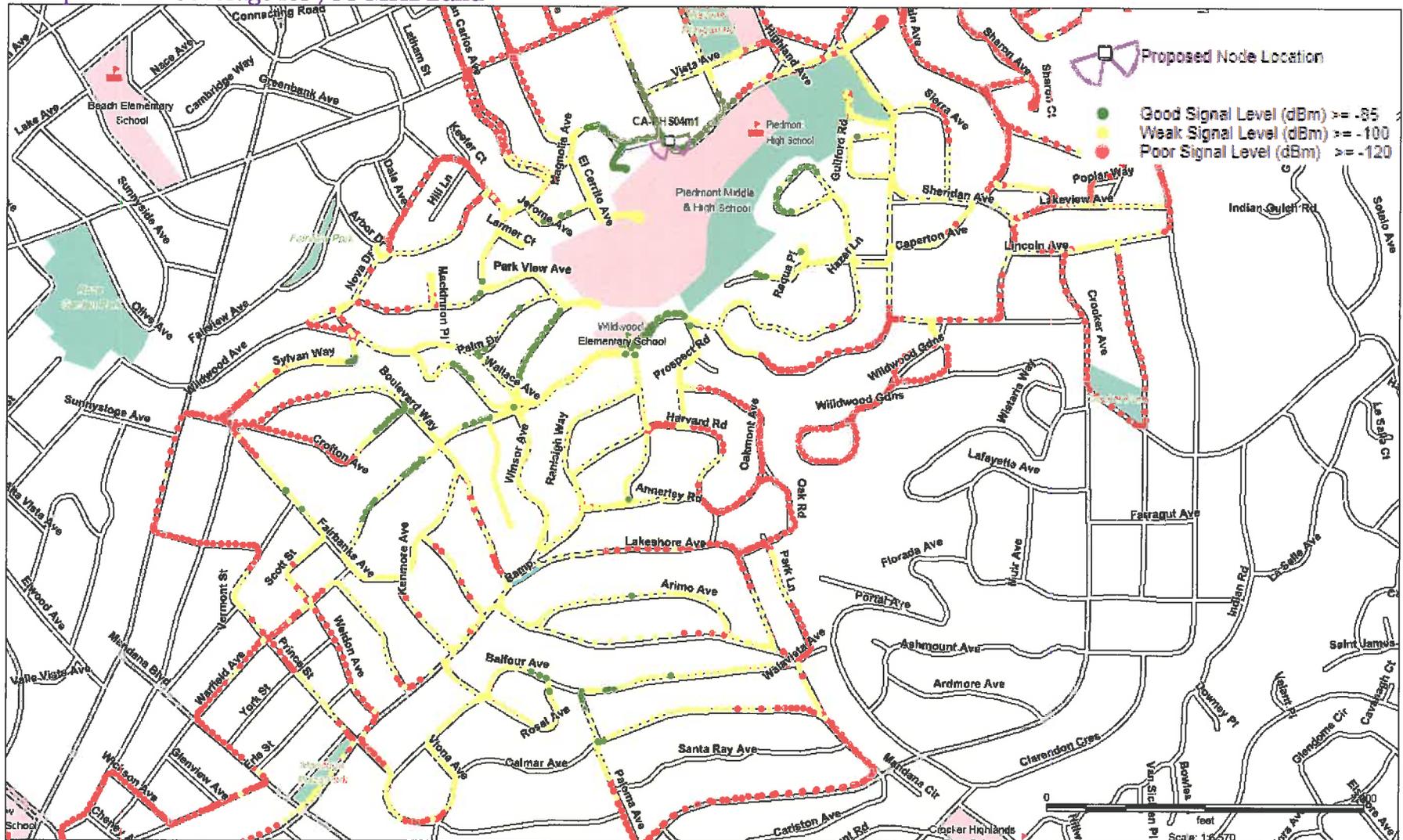
Existing RF Coverage for 700 MHz Band



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CW Results – CA-PHS04m1

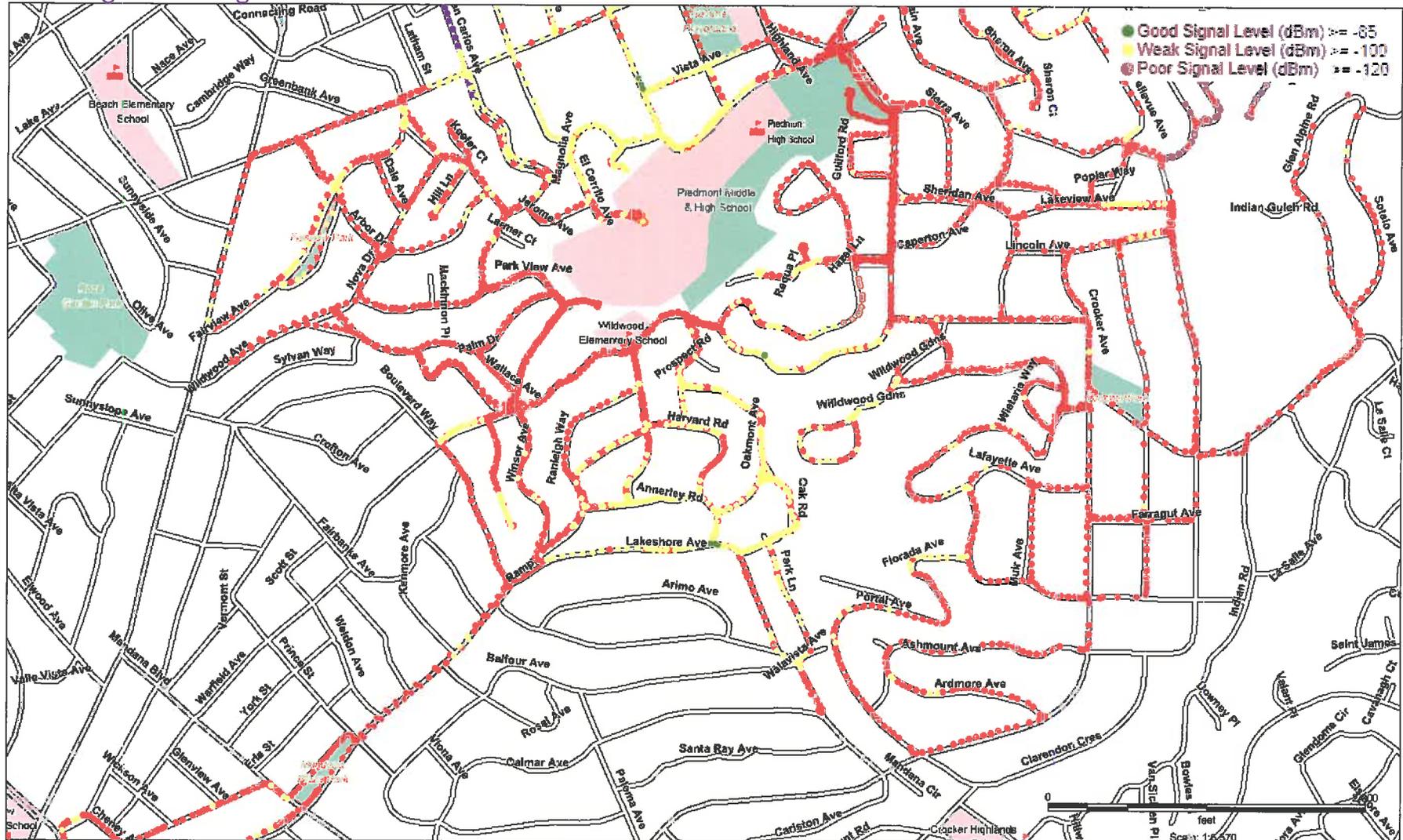
Proposed RF Coverage for 700 MHz Band



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System Drive Data- CA-PHS04m1

Existing RF Coverage for 2100 MHz Band

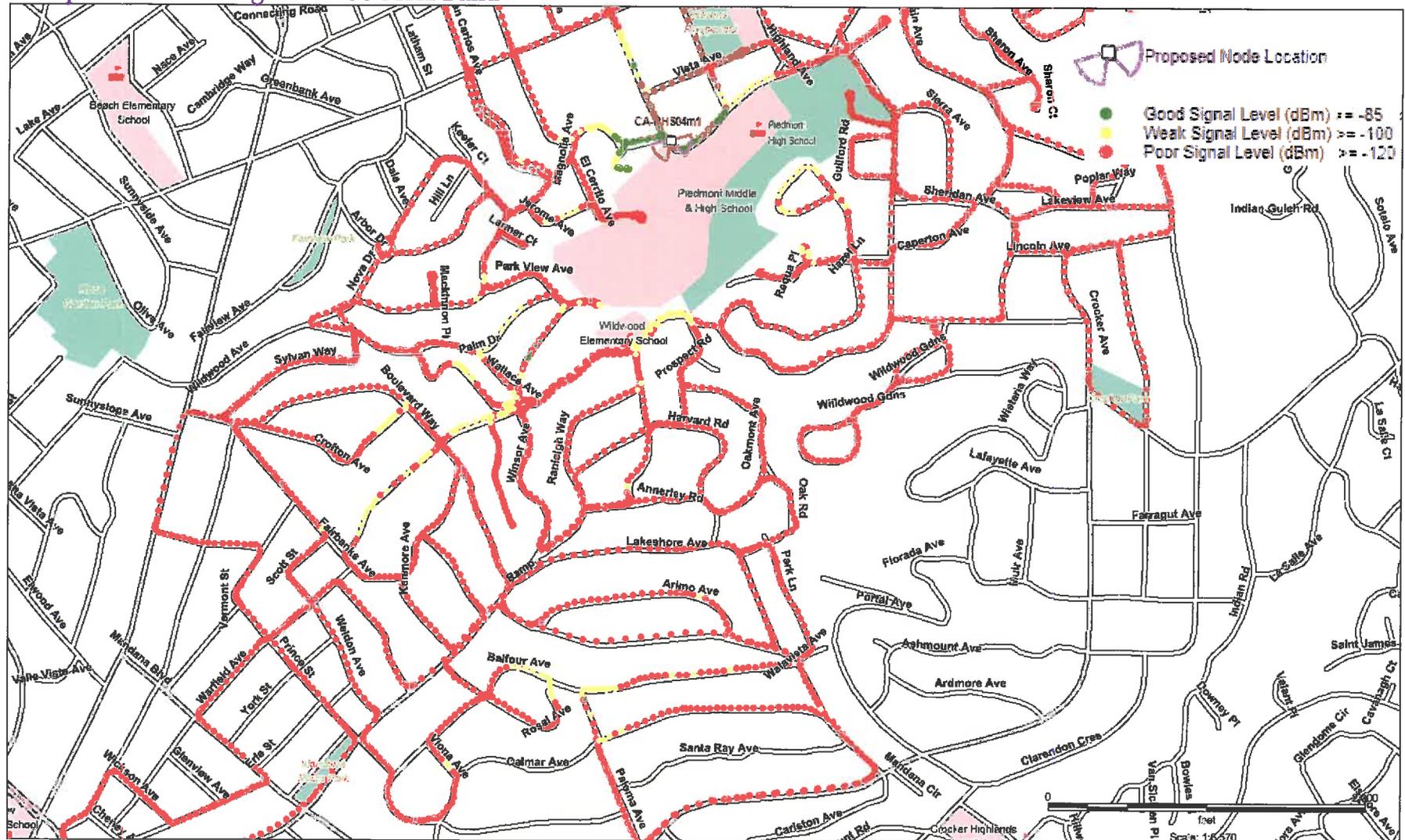


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CW Results – CA-PHS04m1

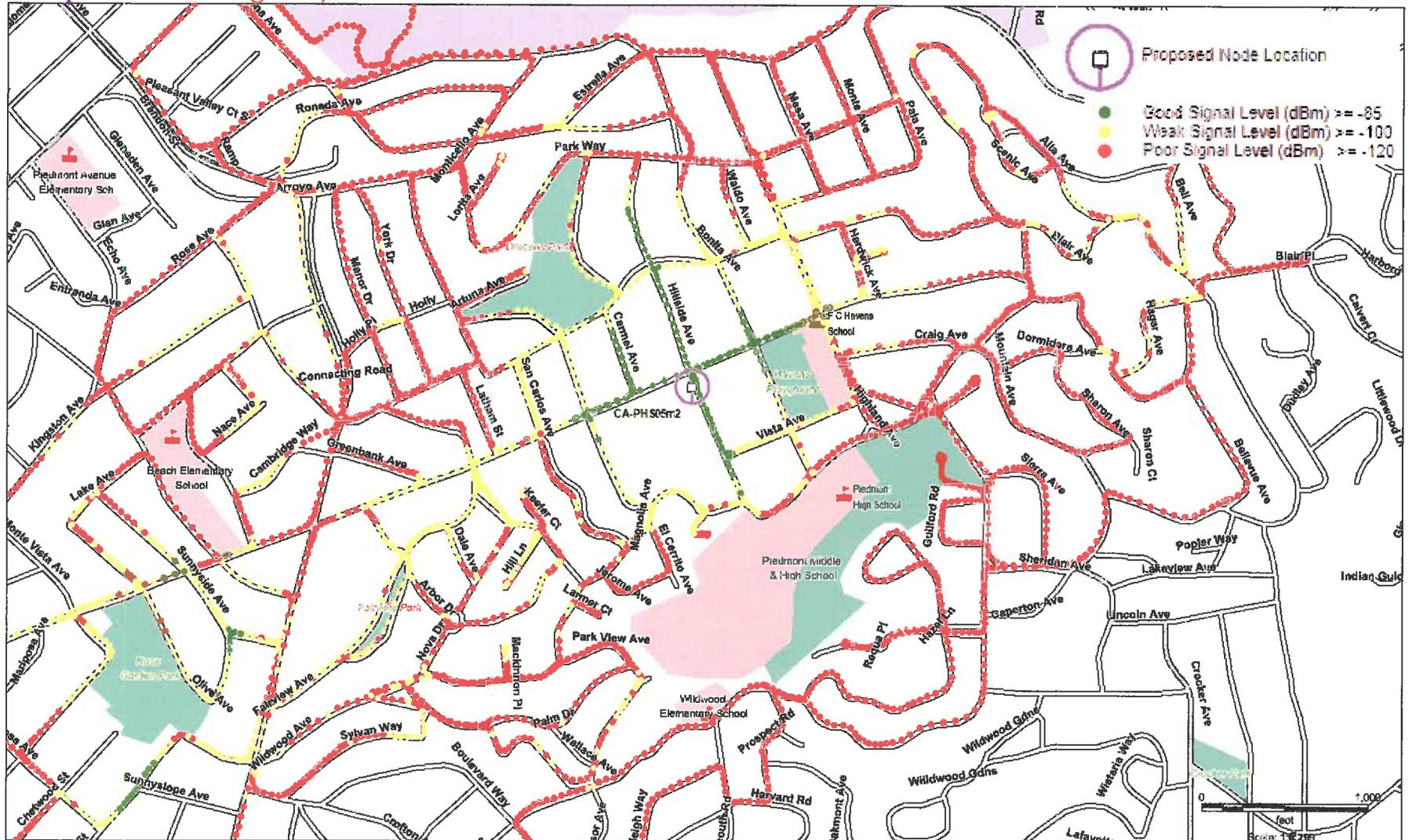
Proposed RF Coverage for 2100 MHz Band



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CW Results – CA-PHS05m2

Proposed RF Coverage for 700 MHz Band

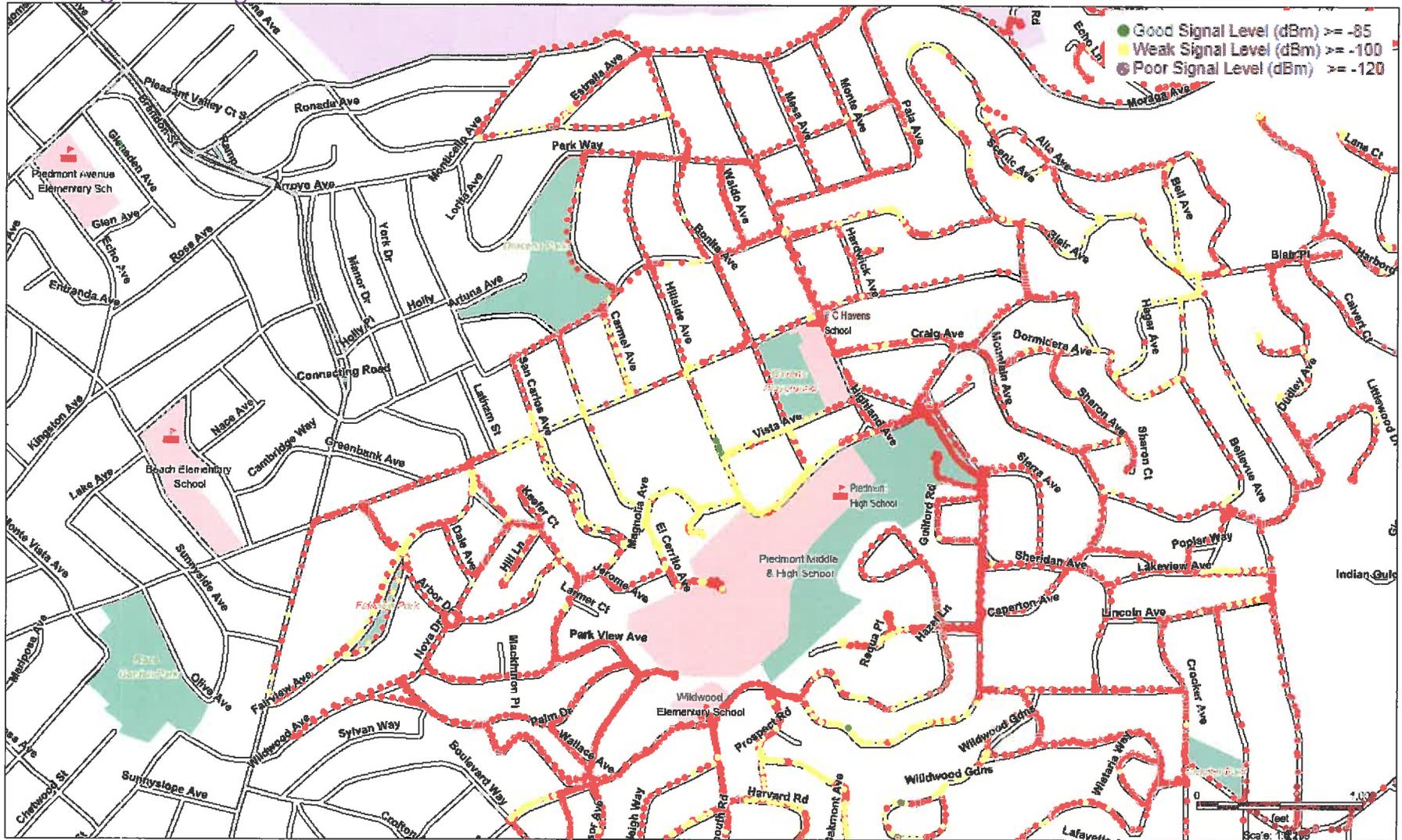


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System Drive Data- CA-PHS05m2

Existing RF Coverage for 2100 MHz Band

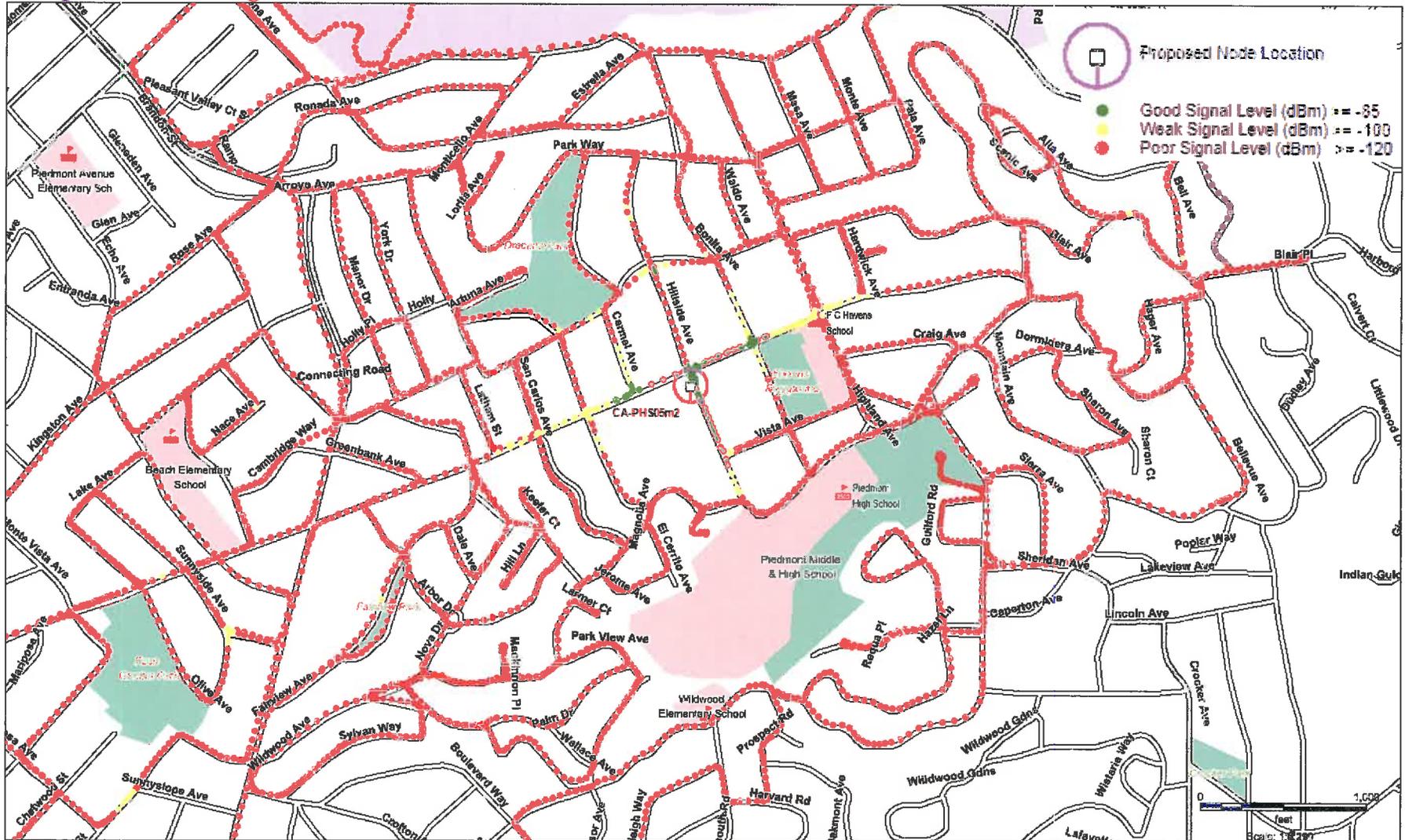


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CW Results – CA-PHS05m2

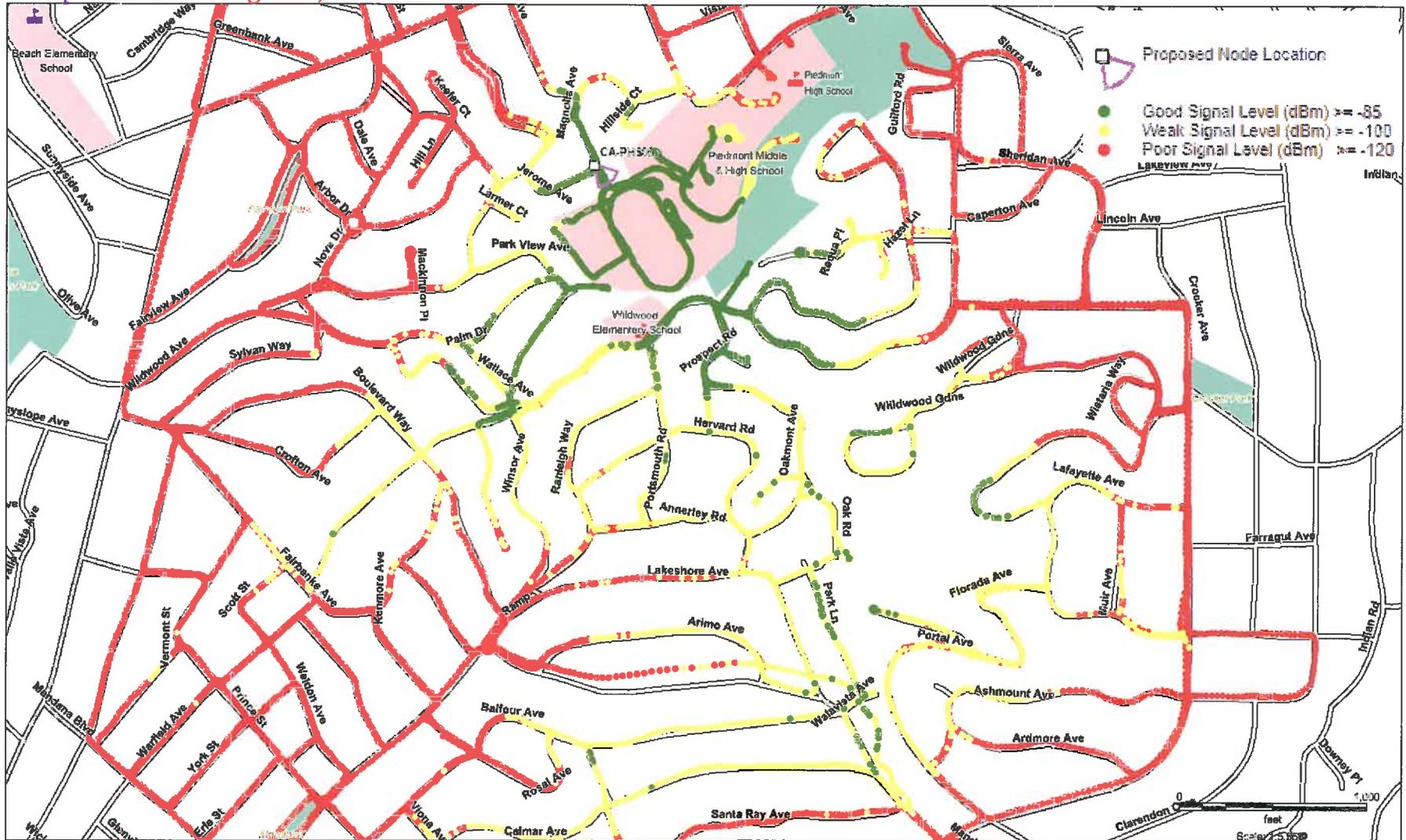
Proposed RF Coverage for 2100 MHz Band



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CW Results – CA-PHS06m

Proposed RF Coverage for 700 MHz Band

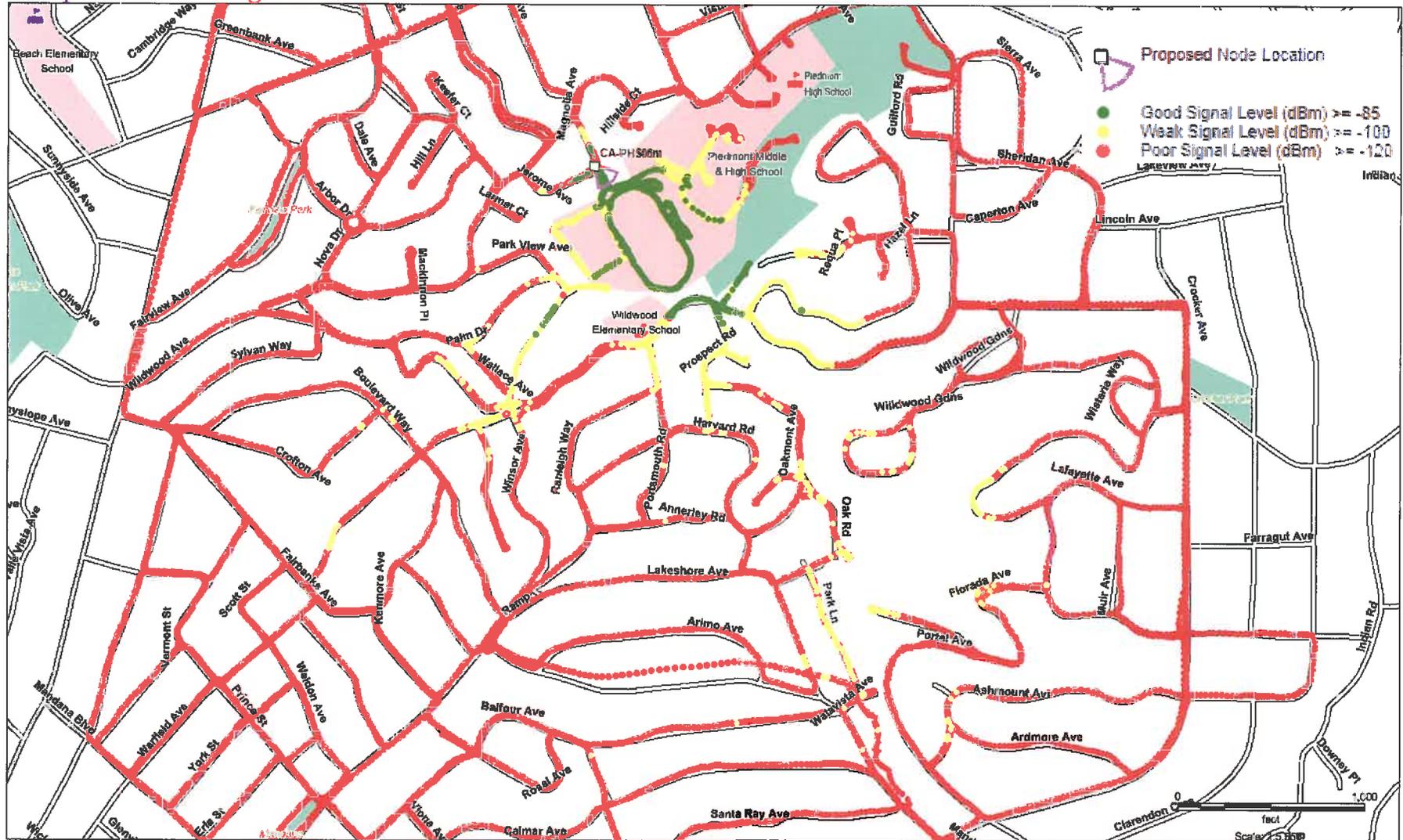


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CW Results – CA-PHS06m

Proposed RF Coverage for 2100 MHz Band

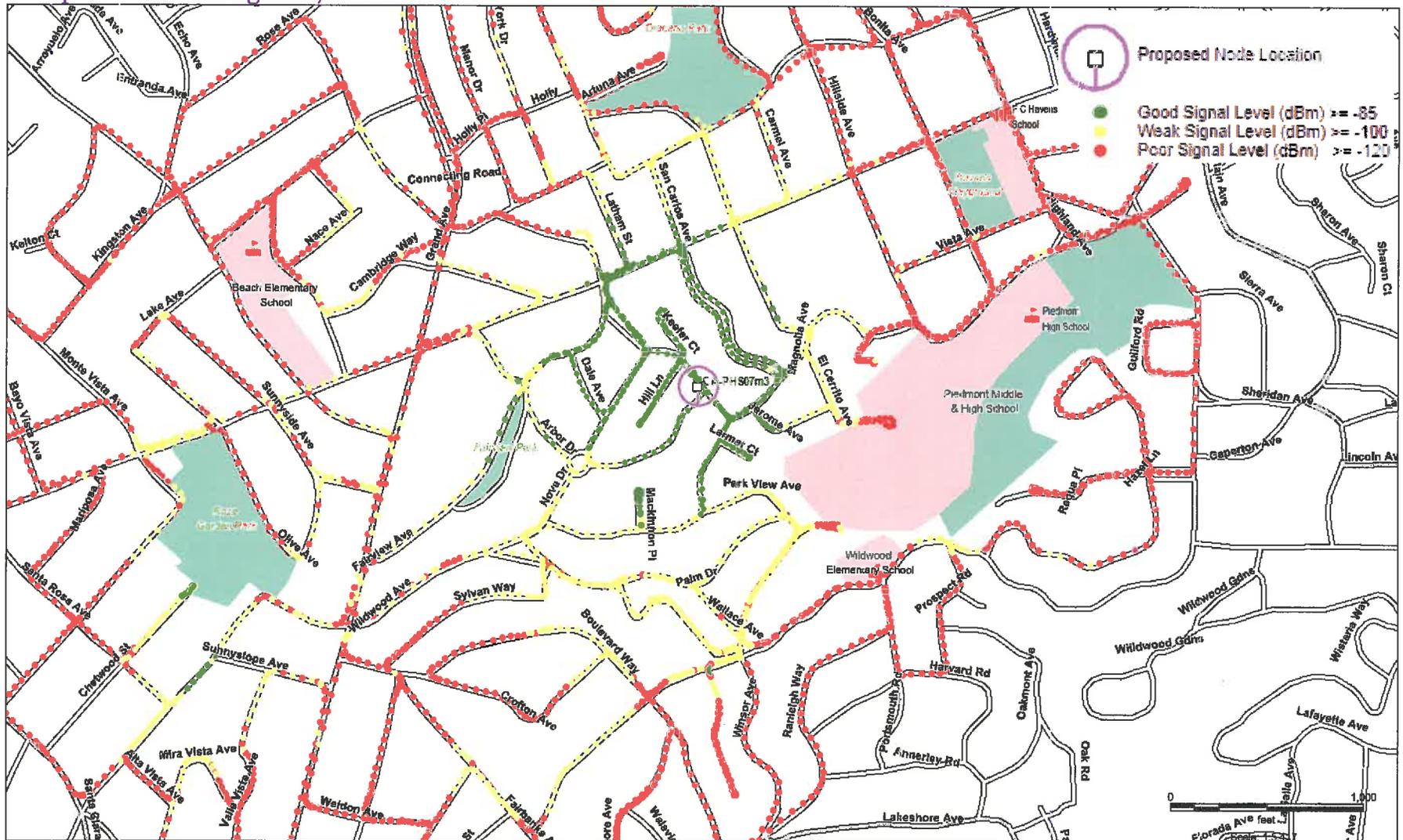


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CW Results – CA-PHS07m3

Proposed RF Coverage for 700 MHz Band



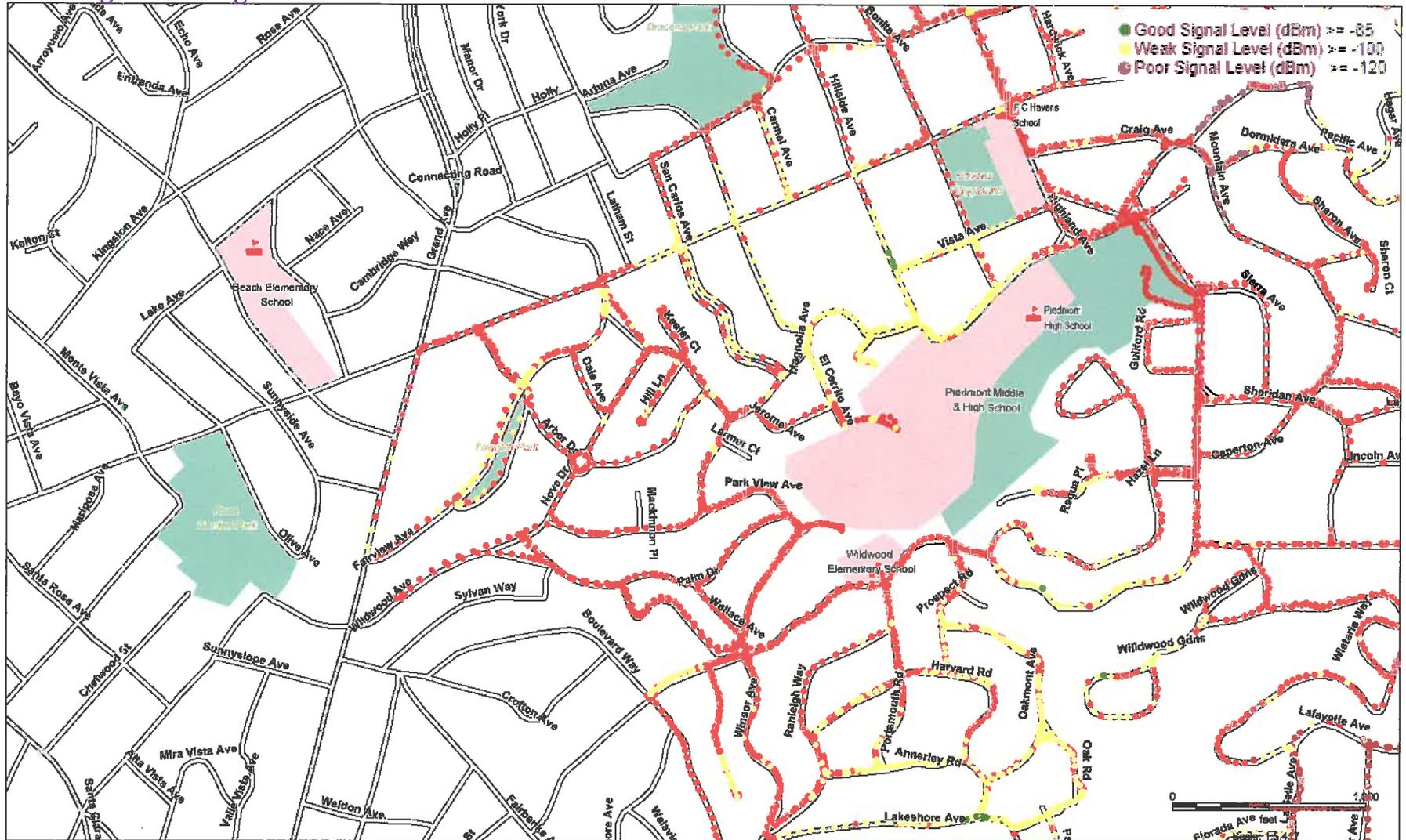
**CROWN
CASTLE**

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System Drive Data- CA-PHS07m3

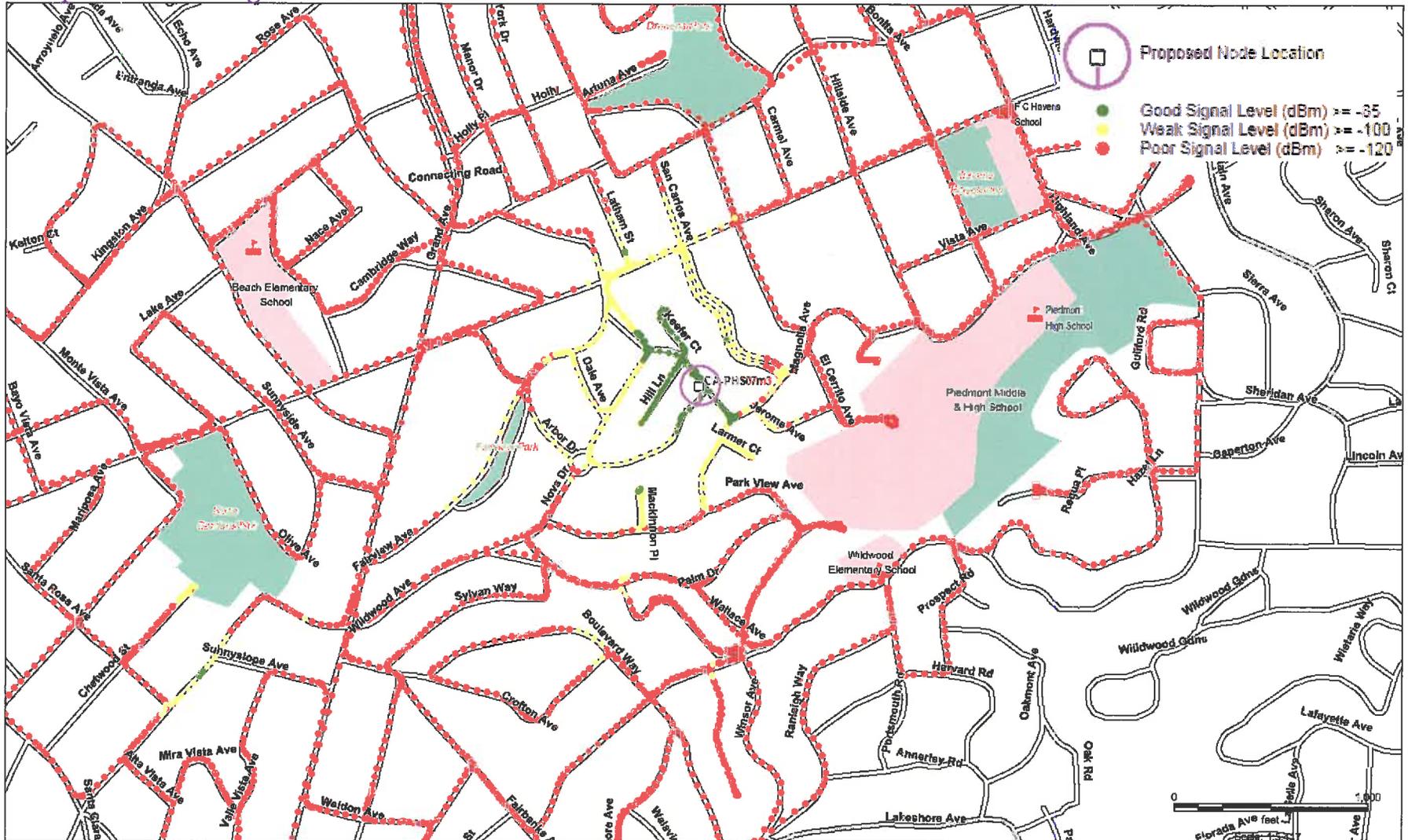
Existing RF Coverage for 2100 MHz Band



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CW Results – CA-PHS07m3

Proposed RF Coverage for 2100 MHz Band

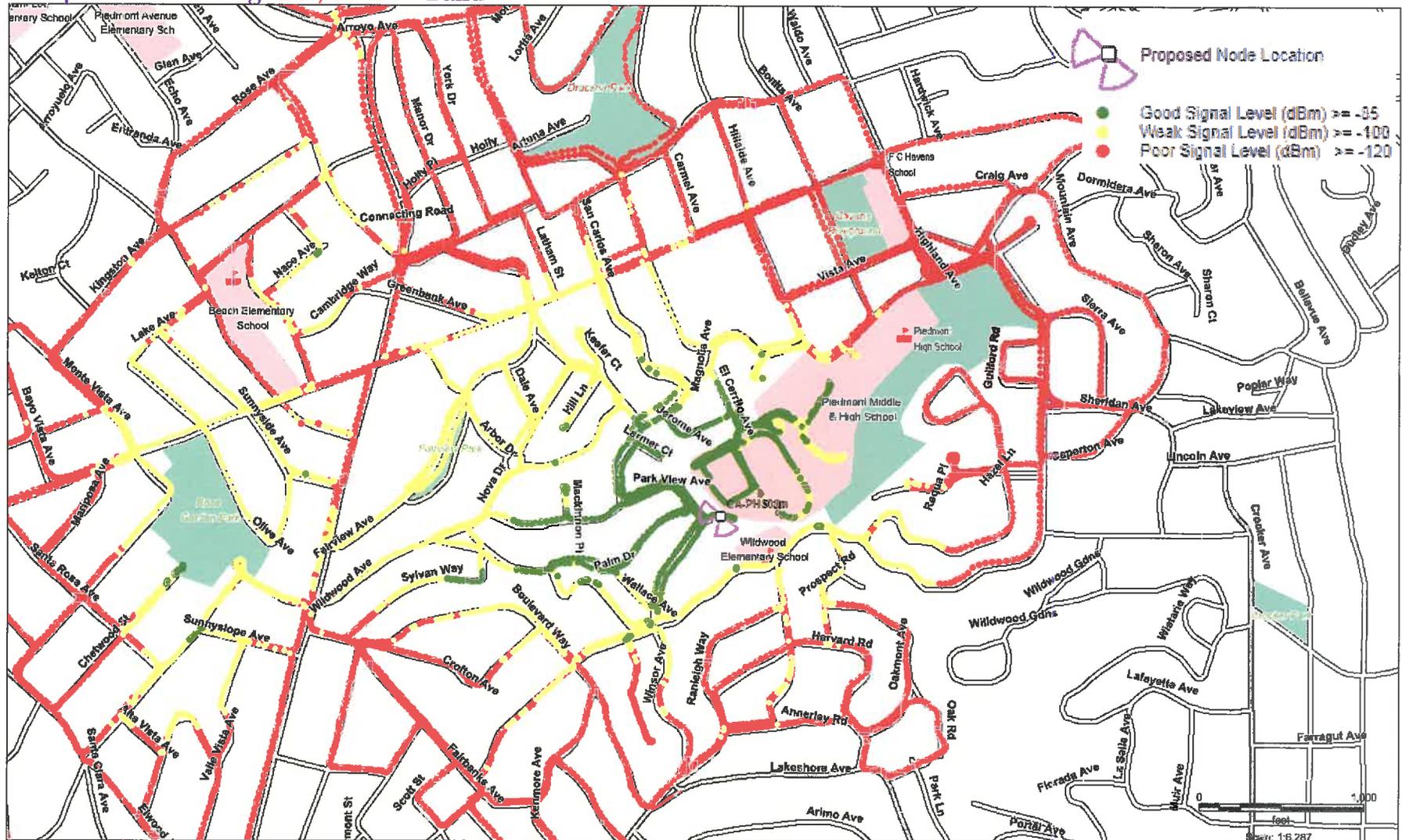


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CW Results – CA-PHS08m

Proposed RF Coverage for 700 MHz Band

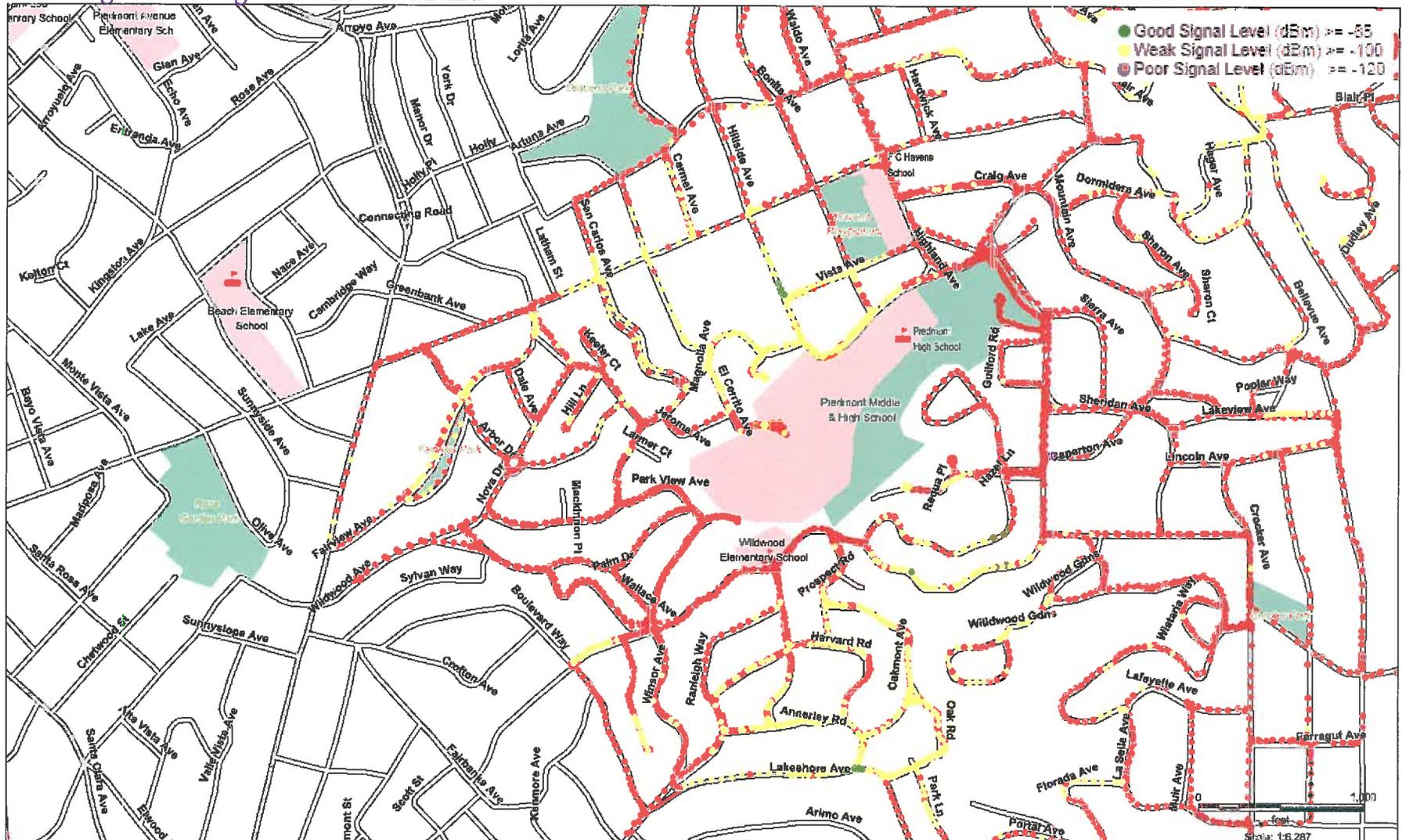


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System Drive Data- CA-PHS08m

Existing RF Coverage for 2100 MHz Band

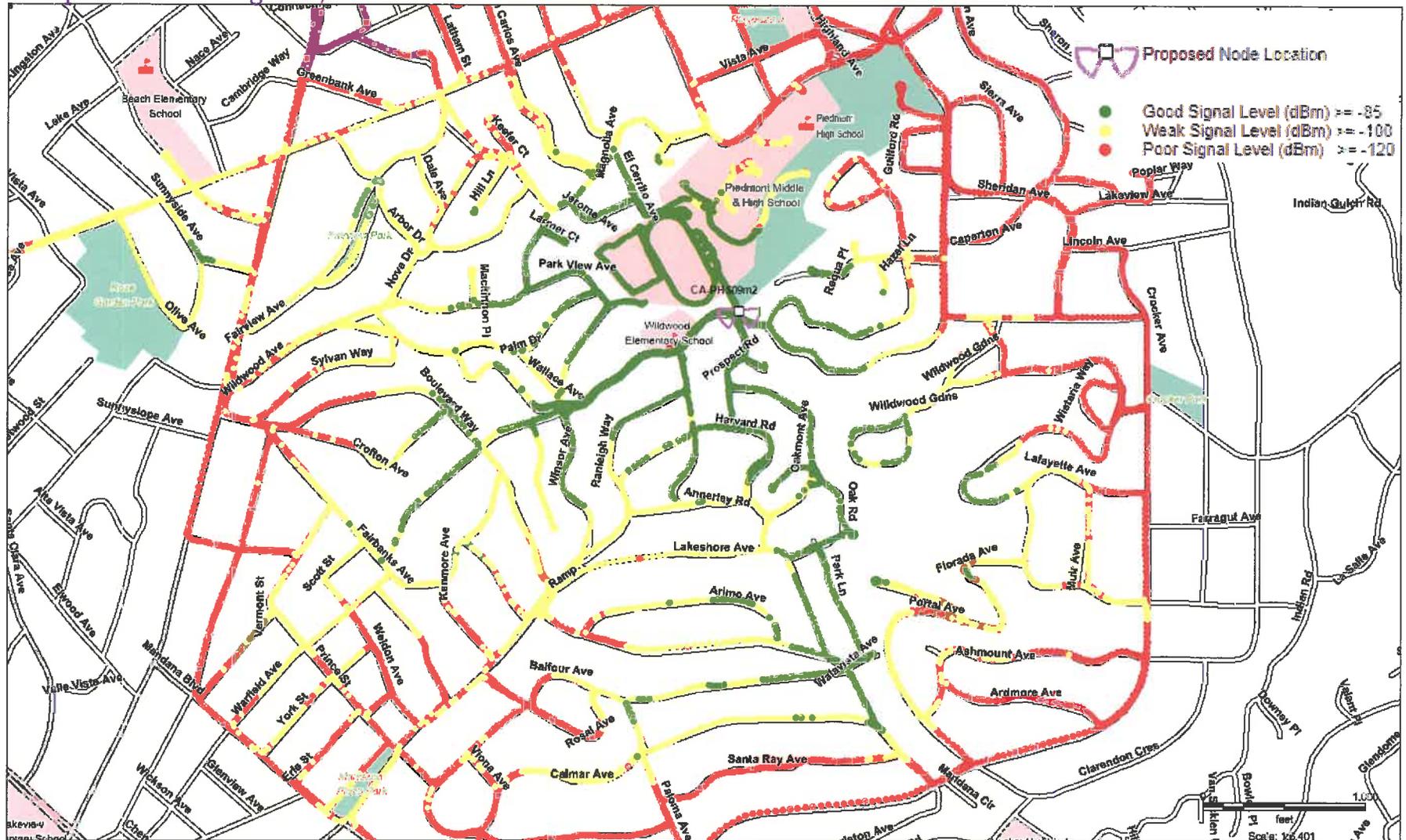


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CW Results – CA-PHS09m2

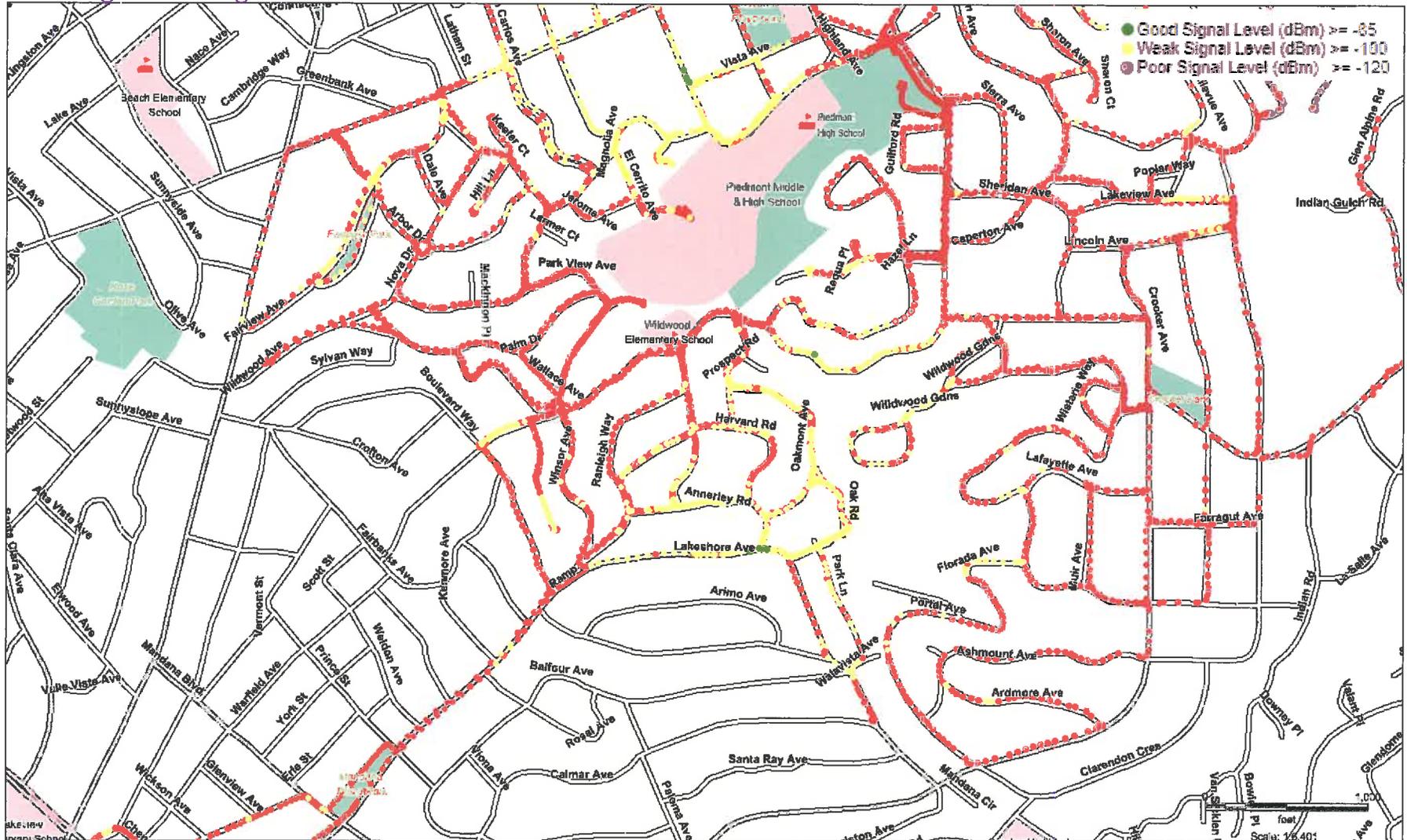
Proposed RF Coverage for 700 MHz Band



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System Drive Data- CA-PHS09m2

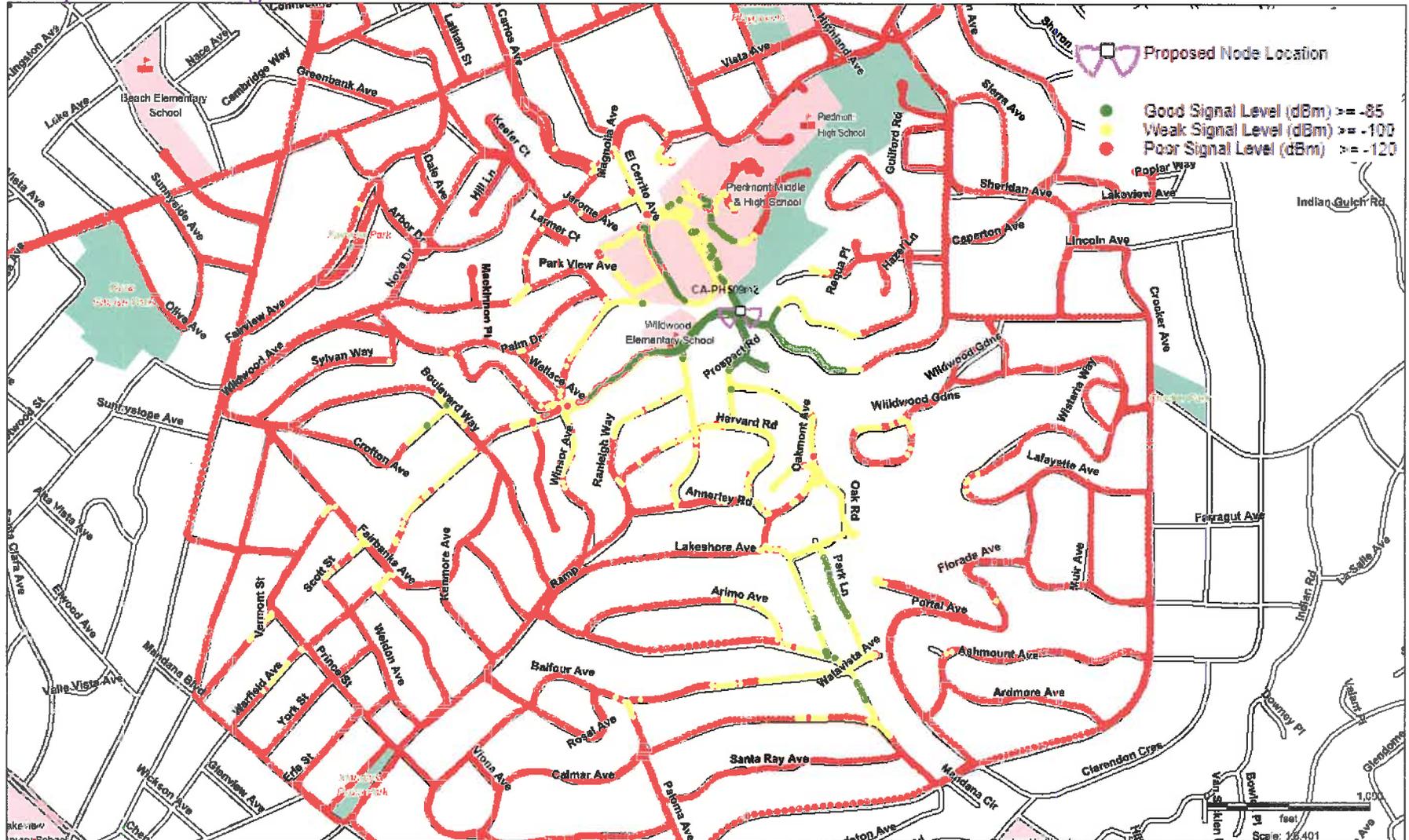
Existing RF Coverage for 2100 MHz Band



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CW Results – CA-PHS09m2

Proposed RF Coverage for 2100 MHz Band



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