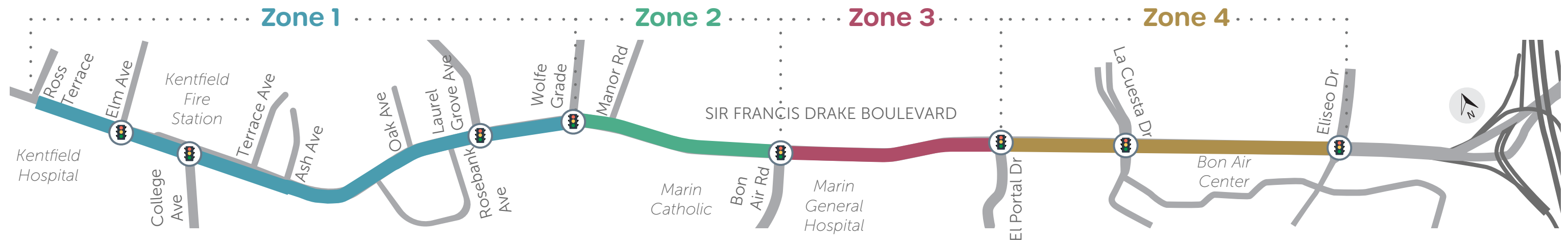


FIXTURE AND POLE CHANGES

Sir Francis Drake Lighting Update

Based on our analysis and discussions with the County and community representatives, we recommend modifications to the recently installed roadway lighting. With our recommended changes, lighting poles and fixtures would be replaced along about one third of the corridor with shorter, decorative poles and fixtures. The shorter poles would require closer spacing to sufficiently and uniformly light the roadway, resulting in a net increase in total street lights. To reduce additional cost, the placement of these decorative poles would reuse light foundations already installed to the extent possible. The remaining light fixtures on the other two thirds of the project corridor, excluding intersection lighting, would be replaced with different fixtures that reduce overall brightness, improve consistency of light, and cast less light outside of the roadway and sidewalks. In addition, backlight shields would be installed on all sidewalk light poles to further minimize light spill into neighboring yards.



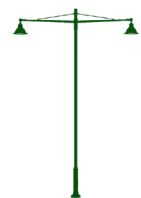
	Zone 1		Zone 2		Zone 3		Zone 4	
Before Upgrade the Drake	42 Existing Fixtures	28 Existing Poles	2 Existing Fixtures	2 Existing Poles	4 Existing Fixtures	4 Existing Poles	2 Existing Fixtures	2 Existing Poles
Today <small>As-installed February 2021 with all lights on</small>	+18 Additional Fixtures	+16 Additional Poles	+14 Additional Fixtures	+9 Additional Poles	+13 Additional Fixtures	+9 Additional Poles	+26 Additional Fixtures	+13 Additional Poles
	60 Total Fixtures	44 Total Poles	16 Total Fixtures	11 Total Poles	17 Total Fixtures	13 Total Poles	28 Total Fixtures	15 Total Poles

Proposed

Details may be refined during design phase



Replace **50** of **60** Cobrahead fixtures
All 44 poles remain



Replace **all 11** poles with Decorative fixtures and poles
+4 additional poles
Reuse **10** of **11** foundations



Replace **10** of **17** Cobrahead fixtures
All 9 poles remain

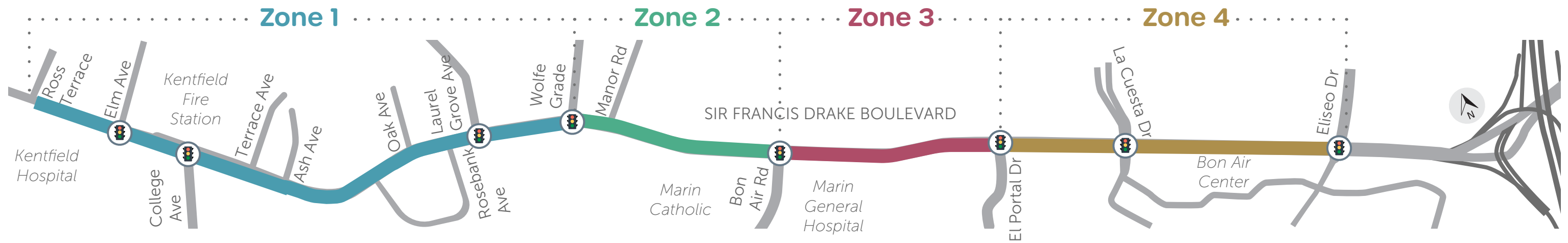


Replace **all 15** poles with Decorative fixtures and poles
+6 additional poles
Reuse **9** of **15** foundations

AVERAGE BRIGHTNESS OF LIGHT SPILLOVER

Sir Francis Drake Lighting Update

Light cast outside of the roadway and sidewalk should be **minimized**. Based on updated model results, the proposed improvements would reduce the average light spillover significantly – 37 to 75 percent, depending on the block analyzed.

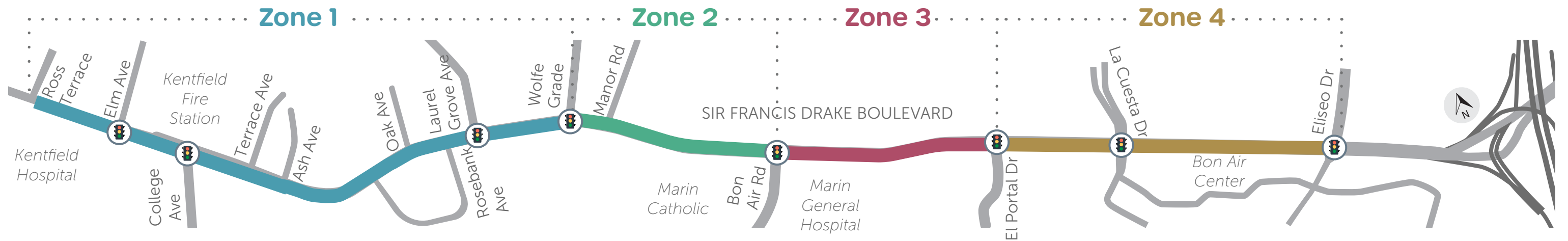


	Zone 1	Zone 2	Zone 3	Zone 4
Before Upgrade the Drake	N/A	N/A	N/A	N/A
Today <small>As-installed February 2021 with all lights on</small>	0.39 fc	0.32 fc	0.30 fc	0.45 fc
Proposed <small>Details may be refined during design phase</small>	0.21 fc 46% Reduction from today	0.20 fc 37% Reduction from today	0.16 fc 47% Reduction from today	0.11 fc 75% Reduction from today

AVERAGE ROADWAY BRIGHTNESS

Sir Francis Drake Lighting Update

Lighting guidance suggests that roadways with characteristics like Sir Francis Drake Boulevard (Major asphalt roadway with low pedestrian activity) are lit with an **average of 0.9 foot candles (fc)** (ANSI/IESNA RP-8-00 Table 2). Before the Upgrade the Drake Project, light levels on the roadway were well below this, averages ranging from 0.2 fc to 0.8 fc. The Upgrade the Drake project installed lights that resulted in brightness levels with averages ranging from 1.2 fc to 1.5 fc. The Proposed modifications would reduce the average roadway brightness compared to the recently installed condition between 5 and 22 percent, resulting in lighting levels of 1.0 fc to 1.2 fc.



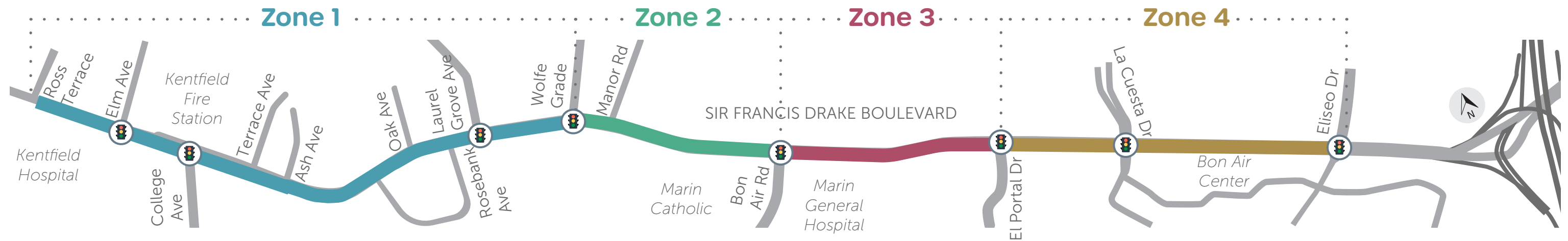
	Zone 1	Zone 2	Zone 3	Zone 4
Before Upgrade the Drake	0.79 fc	0.19 fc	0.32 fc	0.18 fc
Today <small>As-installed February 2021 with all lights on</small>	1.48 fc	1.32 fc	1.24 fc	1.31 fc
Proposed <small>Details may be refined during design phase</small>	1.16 fc 21% Reduction from today	1.19 fc 10% Reduction from today	1.16 fc 6% Reduction from today	1.02 fc 22% Reduction from today



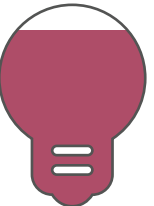

Values reflect roadway segments only
Does not include signalized intersections where roadway lighting is brighter due to safety standards

UNIFORMITY (LIGHT CONSISTENCY)

Sir Francis Drake Lighting Update

Lighting guidance also suggests that uniformity, or light consistency, along a roadway like Sir Francis Drake should be less than 3.0 (uniformity is calculated by dividing the average illuminance by the minimum illuminance on a segment of roadway). Prior to the Upgrade the Drake project, the infrequent lighting resulted in indeterminate uniformity (large segments of the roadway had no illuminance whatsoever). With the lights installed by the Upgrade the Drake project, most of the corridor has an average uniformity ranging from 2.4 to 3.6. The Proposed modifications would have an average uniformity ranging from 1.9 to 3.1, a 5 to 22 percent improvement reduction (similar to the average brightness) compared to the recently installed condition.



	Zone 1	Zone 2	Zone 3	Zone 4
Before Upgrade the Drake	6.24	Only at intersections	Only at intersections	Only at intersections
Today <small>As-installed February 2021 with all lights on</small>	2.43	3.55	3.10	3.51
Proposed <small>Details may be refined during design phase</small>	1.90 22% Improvement from today 	3.10 13% Improvement from today 	3.87 0% Improvement from today 	2.94 16% Improvement from today 

Values reflect roadway segments only
Does not include signalized intersections where roadway lighting is brighter due to safety standards