```
clear all; close all; clc;
```

Part 1

```
opts = detectImportOptions('housing.csv', 'NumHeaderLines', 1);
preview('housing.csv', opts)

A = readtable('housing.csv', 'NumHeaderLines', 1);
B = A(:,1:end-1);
labels = {'<1H OCEAN', 'INLAND', 'NEAR OCEAN', 'NEAR BAY', 'ISLAND'};

for label_ind = 1:numel(labels)
    for inst = 1:height(A)
        if string(A.Var10(inst)) == labels(label_ind)
            B.Var10(inst) = label_ind;
        end
    end
end

figure();
pltmtx = plotmatrix(table2array(B));

figure();
hold on;
separated_data.label = struct('title',{},'label_data', {});

for label_ind = 1:numel(labels)
    label = string(labels(label_ind));
    separated_data.label(label_ind).title = label;

    all_data_for_label = B(B.Var10 == label_ind,:);
    separated_data.label(label_ind).label_data = all_data_for_label;

    scatter(table2array(all_data_for_label(:,1)),...
        table2array(all_data_for_label(:,2)), '.',...
        'DisplayName', label);
end
title('Locations of 5 Housing Classes across California');
xlabel('Longitude x_1');
ylabel('Latitude x_2');
legend();
```

Part 2

```
N = readtable('newhouses.csv', 'NumHeaderLines', 1);

x_new = [N.Var2, N.Var3];
x_old = [B.Var1, B.Var2, B.Var10];

% Overlay New Houses:
```

```
scatter(x_new(:,1), x_new(:,2), 1000, 'k.', 'DisplayName', 'New
 Data');

nn_data.house = struct('title',{},'nns',{}, 'pred', {});

% Find k=20 NNs
for N_idx = 1:height(N)
    nn_idx = knnsearch(x_old(:,1:2), x_new(N_idx,:), 'K', 20); %,
 'SortIndices', false);
    nns = x_old(nn_idx,:);

    house_name = strcat('House',string(N_idx));
    nn_data.house(N_idx).title = house_name;
    nns_table = array2table(nns, 'VariableNames',
{'Longitude','Latitude','Label'});
    nn_data.house(N_idx).nns = nns_table;
    nn_labels = unique(nns(:,end));
    label_freq = [nn_labels, histc(nns(:,end),nn_labels)];
    label_pred = label_freq(label_freq(:,2)==max(label_freq(:,2)),1);
    nn_data.house(N_idx).pred = label_pred;

    disp(strjoin(['20 NNS of', house_name, 'and their data:'], ' '))
    disp(nns_table)

    scatter(nns(:,1),nns(:,2), 500, 'b^', 'DisplayName', 'NNs')
    legend('AutoUpdate','off')
end
axis square;
hold off;

for N_idx = 1:height(N)
    house_name = nn_data.house(N_idx).title;
    label_pred = nn_data.house(N_idx).pred;
    disp(strjoin(['Predicted label for', house_name, 'is',
 cellstr(labels(label_pred))], ' '))
end

for house_num = 1:height(N)
    wm = webmap('Open Street Map');
    hold on;
    nns_webmap_data = geopoint(nn_data.house(house_num).nns.Latitude,
 nn_data.house(house_num).nns.Longitude);
    nns_webmarker = wmmarker(nns_webmap_data, 'Color', 'blue');
    new_houses_data = geopoint(x_new(house_num, 2), x_new(house_num,
 1));
    new_houses_webmarker = wmmarker(new_houses_data, 'Color', 'red');
end
hold off;


ans =

  8×10 table
```

Var1	Var2	Var3	Var4	Var5	Var6	Var7	Var8	Var9	Var10
-122.23	37.88	41	880	129	322	126	8.3252	4.526e+05	{'NEAR BAY'}
-122.22	37.86	21	7099	1106	2401	1138	8.3014	3.585e+05	{'NEAR BAY'}
-122.24	37.85	52	1467	190	496	177	7.2574	3.521e+05	{'NEAR BAY'}
-122.25	37.85	52	1274	235	558	219	5.6431	3.413e+05	{'NEAR BAY'}
-122.25	37.85	52	1627	280	565	259	3.8462	3.422e+05	{'NEAR BAY'}
-122.25	37.85	52	919	213	413	193	4.0368	2.697e+05	{'NEAR BAY'}
-122.25	37.84	52	2535	489	1094	514	3.6591	2.992e+05	{'NEAR BAY'}
-122.25	37.84	52	3104	687	1157	647	3.12	2.414e+05	{'NEAR BAY'}

20 NNS of House1 and their data:

Longitude	Latitude	Label
-117.59	34.1	2
-117.6	34.11	2
-117.58	34.11	2
-117.58	34.1	2
-117.59	34.09	2
-117.61	34.1	2
-117.58	34.09	2
-117.61	34.12	2
-117.61	34.09	2
-117.61	34.09	2
-117.59	34.13	2
-117.6	34.08	2
-117.62	34.11	2
-117.62	34.11	2
-117.61	34.13	2
-117.61	34.08	2
-117.61	34.08	2
-117.62	34.09	2
-117.57	34.13	2
-117.56	34.12	2

20 NNS of House2 and their data:

Longitude	Latitude	Label
-122.93	38.02	3
-122.84	38.07	3
-122.86	38.1	3

-122.81	38.08	3
-122.71	37.9	3
-122.71	37.88	3
-122.69	37.91	3
-122.7	38.03	3
-122.68	38.01	3
-122.66	37.93	3
-122.8	38.18	3
-122.68	38.07	3
-122.64	37.96	3
-122.96	38.26	3
-122.65	38.01	3
-122.64	38.01	3
-122.64	38.01	3
-122.62	37.85	3
-122.62	37.97	3
-122.9	38.28	3

20 NNS of House3 and their data:

Longitude	Latitude	Label
-122.47	37.74	4
-122.47	37.74	4
-122.47	37.74	4
-122.47	37.74	4
-122.48	37.74	3
-122.48	37.74	3
-122.48	37.74	3
-122.48	37.74	3
-122.47	37.75	4
-122.47	37.75	4
-122.47	37.75	4
-122.47	37.75	4
-122.47	37.75	4
-122.47	37.75	4
-122.48	37.75	4
-122.48	37.75	4
-122.48	37.75	4
-122.48	37.75	4
-122.48	37.75	4
-122.47	37.73	3

20 NNS of House4 and their data:

Longitude	Latitude	Label
-118.1	34.14	1
-118.1	34.14	1
-118.11	34.14	1
-118.11	34.14	1
-118.1	34.13	1
-118.1	34.13	1
-118.1	34.13	1

-118.1	34.15	2
-118.1	34.15	2
-118.09	34.14	2
-118.11	34.15	1
-118.11	34.15	1
-118.09	34.15	2
-118.09	34.15	2
-118.09	34.15	2
-118.09	34.15	2
-118.12	34.14	1
-118.12	34.14	1
-118.1	34.12	1
-118.1	34.12	1

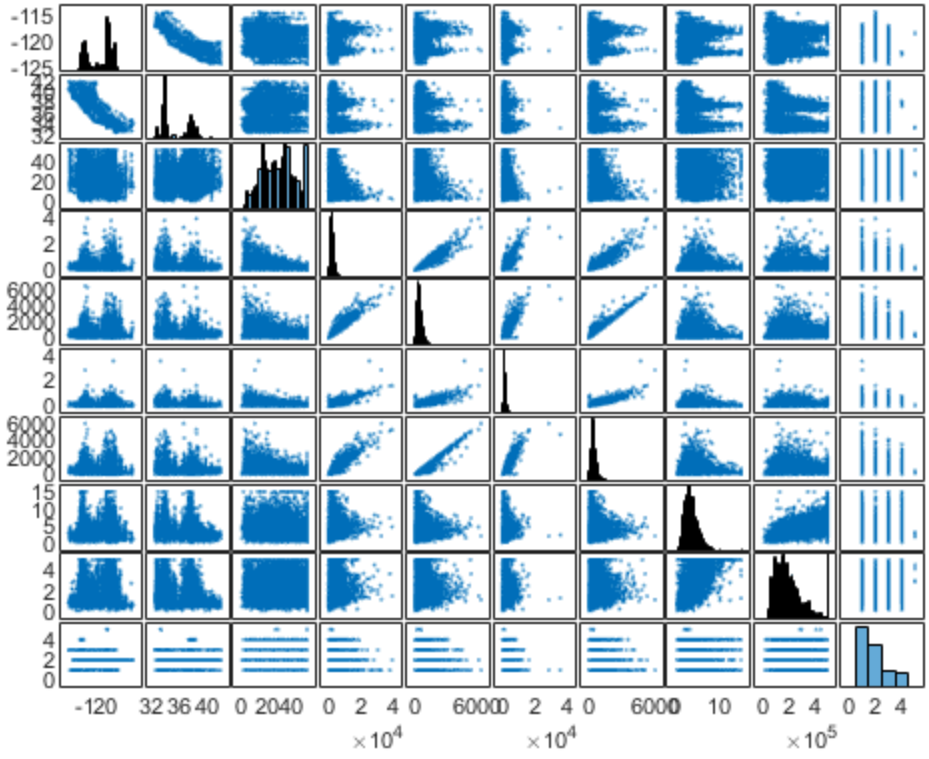
20 NNS of House5 and their data:

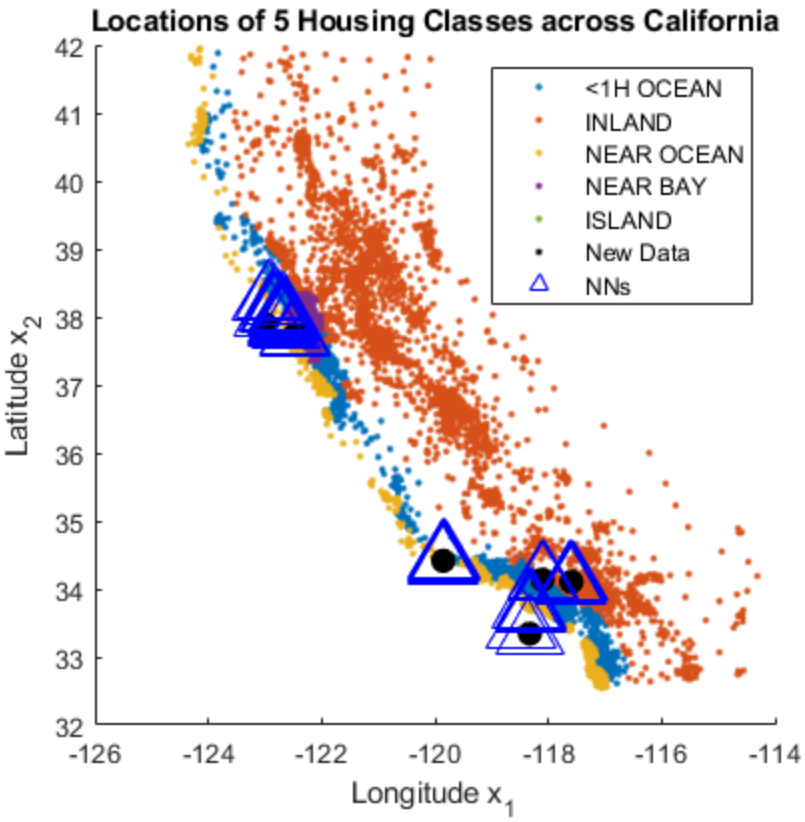
Longitude	Latitude	Label
-119.86	34.42	3
-119.86	34.41	3
-119.85	34.4	3
-119.85	34.44	3
-119.88	34.42	3
-119.83	34.43	3
-119.84	34.44	3
-119.88	34.43	3
-119.88	34.43	3
-119.88	34.43	3
-119.88	34.4	3
-119.83	34.44	3
-119.83	34.44	3
-119.88	34.44	3
-119.86	34.38	3
-119.86	34.38	3
-119.82	34.43	3
-119.84	34.45	3
-119.82	34.44	3
-119.82	34.44	3

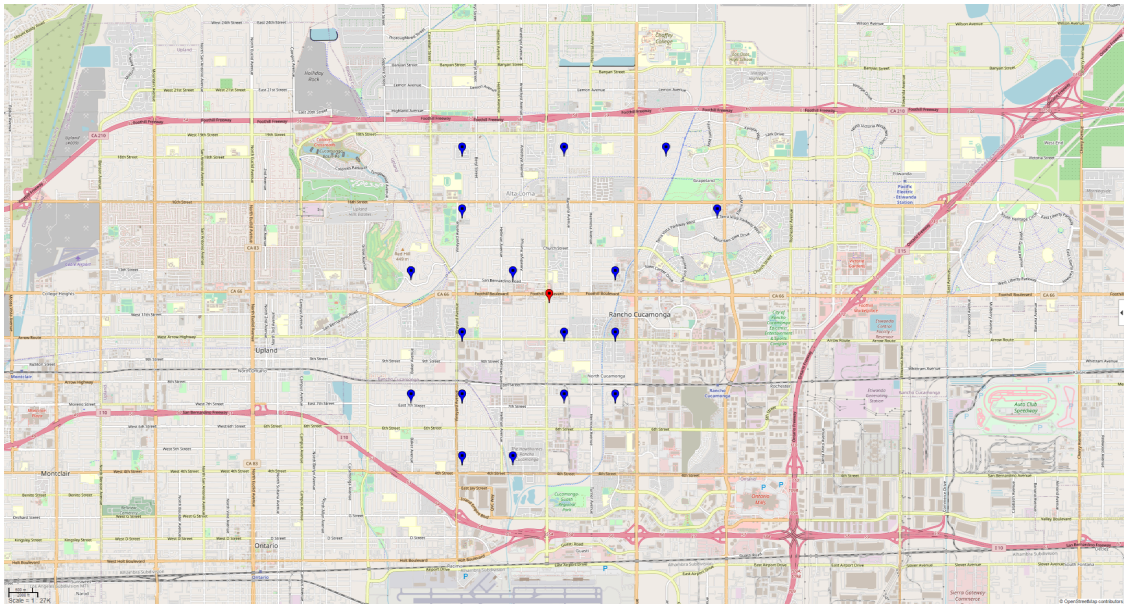
20 NNS of House6 and their data:

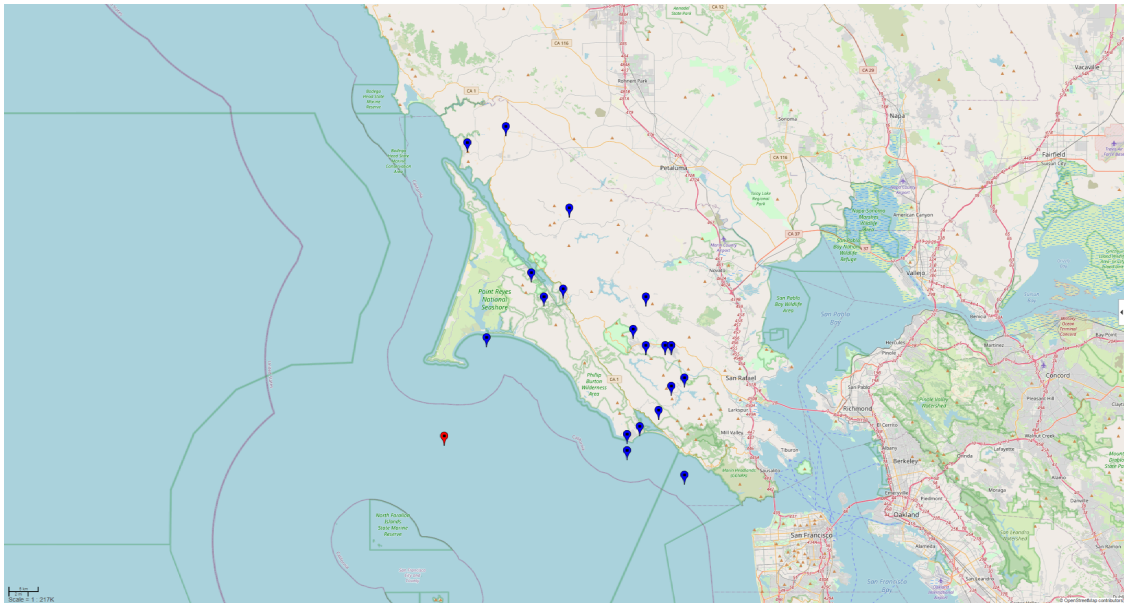
Longitude	Latitude	Label
-118.33	33.34	5
-118.32	33.34	5
-118.32	33.35	5
-118.32	33.33	5
-118.48	33.43	5
-118.31	33.67	3
-118.28	33.68	3
-118.33	33.69	3
-118.29	33.71	3
-118.29	33.71	3
-118.29	33.71	3

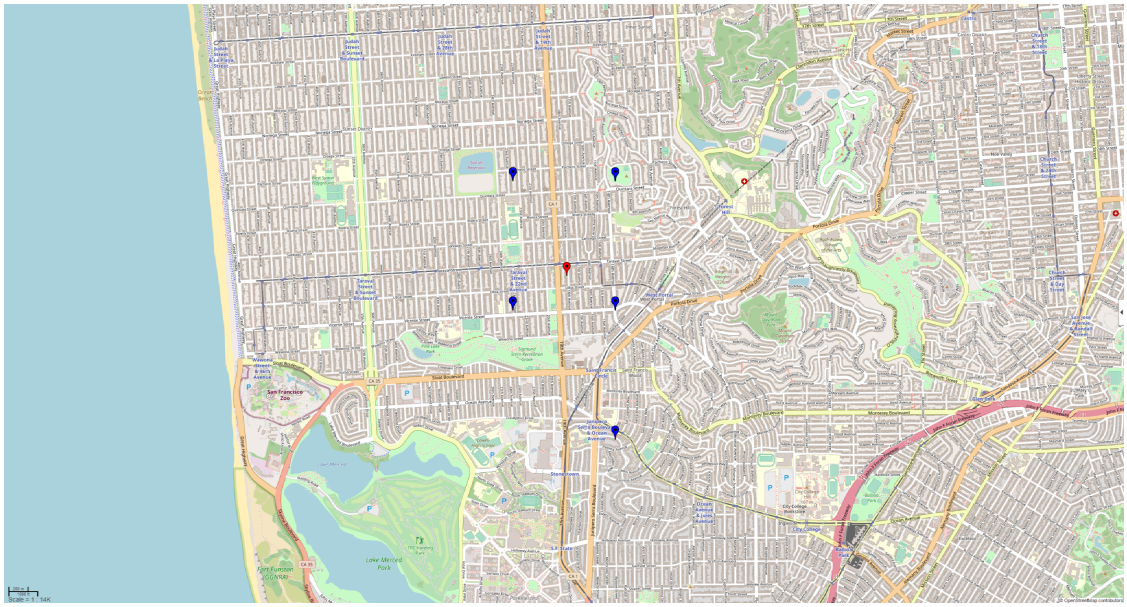
```
    -118.29      33.71        3
    -118.39      33.71        3
    -118.33      33.72        3
    -118.31      33.72        3
     -118.3      33.72        3
     -118.3      33.72        3
     -118.3      33.72        3
    -118.29      33.72        3
    -118.29      33.72        3

Predicted label for House1 is INLAND
Predicted label for House2 is NEAR OCEAN
Predicted label for House3 is NEAR BAY
Predicted label for House4 is <1H OCEAN
Predicted label for House5 is NEAR OCEAN
Predicted label for House6 is NEAR OCEAN
```

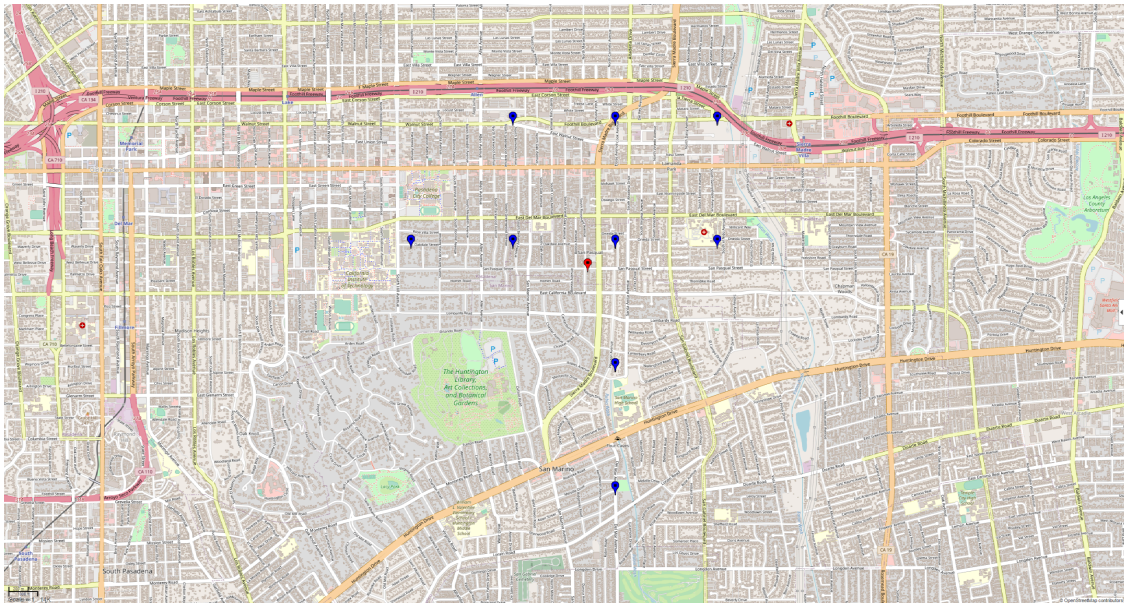


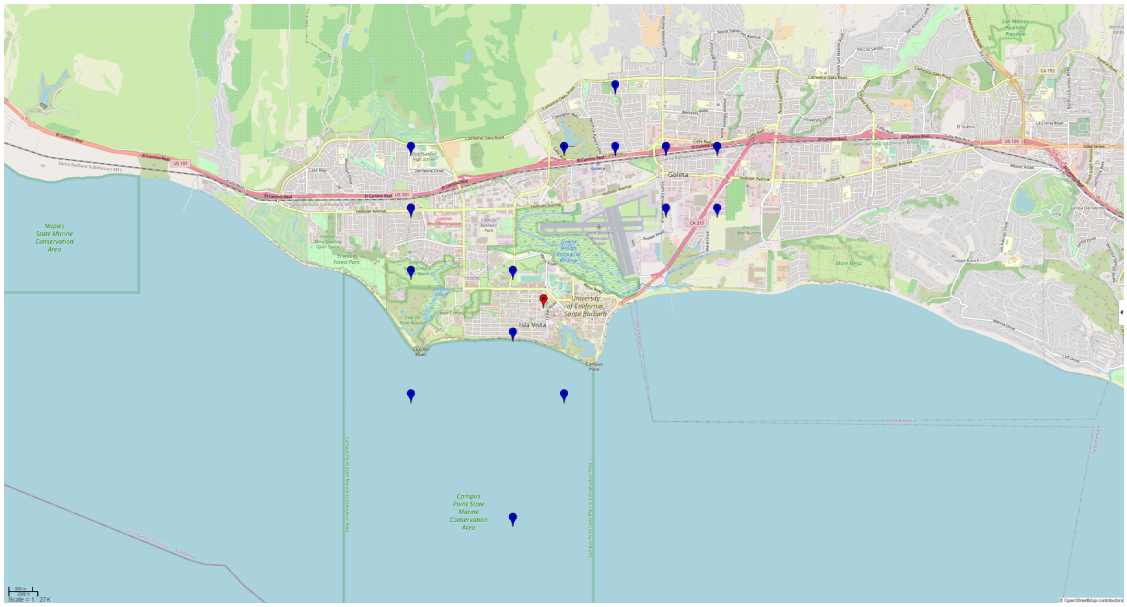

Locations of 5 Housing Classes across California
<1H OCEAN
INLAND
NEAR OCEAN
NEAR BAY
ISLAND
New Data
NNs
Latitude x2
Longitude x1
42
41
40
39
38
37
36
35
34
33
32
-126
-124
-122
-120
-118
-116
-114

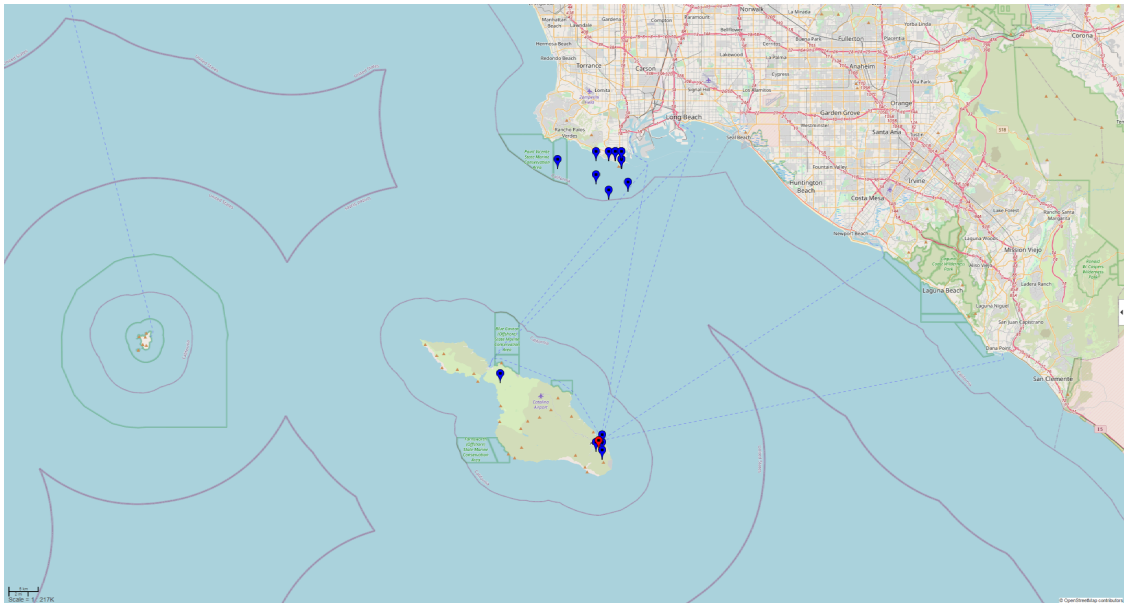

Rancho Cucamonga
Upland
Ontario
Montclair


Point Reyes National Seashore
Petaluma
Napa
Fairfield
Vallejo
San Rafael
Richmond
Concord
Berkeley
Oakland
San Francisco


San Francisco Zoo
Lake Merced Park
Fort Funston (closed)


The Huntington Library, Art Collections, and Botanical Gardens
San Marino
South Pasadena


Goleta
Isla Vista
Point State Marine Conservation Area



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