Resilient San Francisco 2080

Cressica Brazier
Fei Hong
Juney Lee
Chris Mackey
Karen Noiva
Our Site

Our Goals:
1) Eliminate the use of gas by using passive solar and heat island.
2) Eliminate air conditioning with cool bay water and night flushing
We focus on phase 2 in green
EXISTING DOWNTOWN SAN FRANCISCO
Existing Low Density, Predominantly Residential Neighborhood

**EXISTING Downtown San Francisco**
Global Warming Will Reduce Building Energy Use And Outdoor Comfort

**Density (FAR)**
- 2.1-3.9

**Energy (kWh/m²)**
- 124-167

**Accessibility (%)**
- 85

**2013**
- Average Annual EUI
  - 167 kWh/m²

**2080**
- Average Annual EUI
  - 134 kWh/m²
  - 160 kWh/m²

**2030**
- Average Annual EUI
  - 124 kWh/m²
EXISTING Downtown San Francisco
Global Warming Will Reduce Building Energy Use And Outdoor Comfort

Walkable San Francisco
Urban Heat Island
Global Warming Will Reduce Building Energy Use And Outdoor Comfort

Warmer Weather Reduces Annual Energy Consumption
DEVELOPER Proposal for Hunter’s Point
The Currently Proposed Masterplan By The Developer Lennar Urban

- **Density (FAR):** 0.8
- **Finance (CFI/COST):** $8.2
- **Energy (kWh/m² a):** 90
- **Daylit Area (%):** 32
- **Accessibility (%):** 61
- **Comfort (%):** 82*

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N

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- **Commercial**
- **Residential**
- **Public Amenities**

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**Bus Route**
DEVELOPER Proposal for Hunter’s Point
The Currently Proposed Masterplan By The Developer Lennar Urban

Density [FAR]: 0.8
Finance [CFO/COST]: $8.2
Energy [kWh/m² a]: 90
Daylit Area [%]: 32
Accessibility [%]: 61
Comfort [%]: 82*

[Images of the proposed masterplan with aerial and ground views]
Developer Scheme - FAR / Area Summary

Table 2.1a Development Program – Non-Stadium Housing Option

<table>
<thead>
<tr>
<th>Residential</th>
<th>Commercial (sq ft)</th>
<th>Community Live/Sq Ft</th>
<th>TOTAL Open Space (Acre)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Units</td>
<td>Leasehold</td>
<td>Regional</td>
<td>Office and R&amp;D</td>
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<tr>
<td>Shipyard</td>
<td>4,275</td>
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<td>Commerical</td>
<td>6,255</td>
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<tr>
<td>TOTAL</td>
<td>10,530</td>
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</table>

Total Site Area
500 acres = 21,780,000 ft²

Total Project Floor Area
17,331,760 ft²

Total Site FAR
0.80

Typical Block FAR
2
**DEVELOPER Proposal for Hunter’s Point**

The Currently Proposed Masterplan By The Developer Lennar Urban

**Density [FAR]**

0.8

**Finance [CFI/COST]**

8.2

**Energy [kWh/m2 a]**

90

**Daylit Area [%]**

32

**Accessibility [%]**

61

**Comfort [%]**

82*

---

**Tower – Form**

Towers should be slender, maximizing views and limiting visual impact by way of smaller, articulated floorplates and use of light materials and transparency.

- Towers have slim proportioning and a small floorplate area of 8,000-10,000 square feet.
- Massing is articulated to avoid large monolithic blocks.
- Employ large degrees of transparency through the use of glass.
- Use of distinctive architectural roof treatments.
- Sufficient spacing provided between towers to provide light, air and views.
- Towers oriented parallel to view corridors.

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**Climate – Wind Mitigation**

Streets, blocks and buildings should be oriented to minimize the adverse effects of prevailing winds.

**Streets and Blocks**

- Street and block pattern oriented at 45° to prevailing winds at Candlestick Point.
- Street and block pattern oriented at 45° to prevailing winds at Hunters Point.

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**Buildings**

- Minimize wind tunneling with sufficient space between towers.
- On windward sites, set tower back on podium to deflect downdrafts.

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**Towers above the podium, and in all cases above 50 feet, are to be slender in order to protect views to the bay and to accentuate their vertical proportions.**

Beyond a maximum of 50 feet above the street, the floor plate must not exceed 80 feet on the dimension facing the bay and 130 feet in the other. The maximum floor plate size must not exceed 10,000 square feet.
DEVELOPER Proposal for Hunter’s Point
The Currently Proposed Masterplan By The Developer Lennar Urban

<table>
<thead>
<tr>
<th>0.8</th>
<th>$8.2</th>
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<th>32</th>
<th>61</th>
<th>82*</th>
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<tr>
<td>Density (FAR)</td>
<td>Finance (CFO/COST)</td>
<td>Energy (kWh/m² a)</td>
<td>Daylit Area (%)</td>
<td>Accessibility (%)</td>
<td>Comfort (%)</td>
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The Currently Proposed Masterplan By The Developer Lennar Urban

DEVELOPER Proposal for Hunter’s Point
PROPOSED HEAT-RESILIENT HUNTER’S POINT
THREE TYPES OF OUTDOOR SPACES FOR HEAT RESILIENCY
PROPOSED Heat-Resilient Hunter’s Point
Balancing Sustainability, Energy Use and Density with Heat Wave Resiliency for 2080


RECOMMENDED H/W FOR LOW HEAT ISLAND

SPACE TYPE 1 - BOULEVARDS

Height To Width Ratio

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<thead>
<tr>
<th>Number of Floors</th>
<th>0.2</th>
<th>0.4</th>
<th>0.6</th>
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HIGHER DENSITY

TRANSPORTATION REQUIREMENTS

ACROSS-STREET ACCESS
**SPACE TYPE 2 - PARKS AND PLAZAS**

### Definite Cooling Effects on Surrounding Urbanity

- Park Cool Island (°C)
- Park Area (hectares)

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</table>

- Number of Floors

- HIGHER DENSITY ACROSS-PARK ACCESS

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# SPACE TYPE 3 - ALLEYS ARCADES AND COURTYARDS

## Height To Width Ratio

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LOW ENOUGH SUMMER HEAT GAINS FOR COOLING W/ WATER OR WIND

HIGHER DENSITY

TRANSPORTATION REQUIREMENTS
1.9 Density [FAR]
8.0 Finance [CFO/COST]
51 Energy [kWh/m² a]
85 Daylit Area [%]
94 Accessibility [%]
71* Comfort [%]

PROPOSED Heat-Resilient Hunter’s Point
Balancing Sustainability, Energy Use and Density with Heat Wave Resiliency for 2080

Heat-Resilient Public Space Matrix

Height To Width Ratio

Number of Floors

Heat Island

Min Street Daylight

Density (FAR)

Solar Radiation

Plaza
Boulevard
Alley

1.9
8.0
51
85
94
71*
### Plazas and Squares

<table>
<thead>
<tr>
<th>Density</th>
<th>FAR 0.87</th>
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<tbody>
<tr>
<td>Street Width</td>
<td>90.0 m</td>
</tr>
<tr>
<td>Heat Island</td>
<td>+1.5°C</td>
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<tr>
<td>Lowest Daytime Light</td>
<td>4,600 lux</td>
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</table>

<table>
<thead>
<tr>
<th>Winter Day</th>
<th>-212 kWh/m/day</th>
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<tr>
<td>Winter Night</td>
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<tr>
<td>Summer Day</td>
<td>702 kWh/m/day</td>
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<tr>
<td>Summer Night</td>
<td>-698 kWh/m/day</td>
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### Boulevards

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<td>Street Width</td>
<td>30.0 m</td>
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<td>+6.0°C</td>
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<tr>
<td>Lowest Daytime Light</td>
<td>3,600 lux</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Summer Day</th>
<th>261 kWh/m/day</th>
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</thead>
<tbody>
<tr>
<td>Summer Night</td>
<td>261 kWh/m/day</td>
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</tbody>
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### Alleys, Arcades + Courtyards

<table>
<thead>
<tr>
<th>Density</th>
<th>FAR 2.62</th>
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<tbody>
<tr>
<td>Street Width</td>
<td>10.7 m</td>
</tr>
<tr>
<td>Heat Island</td>
<td>+9.0°C</td>
</tr>
<tr>
<td>Lowest Daytime Light</td>
<td>2,400 lux</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Summer Day</th>
<th>101 kWh/m/day</th>
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<tbody>
<tr>
<td>Summer Night</td>
<td>-90 kWh/m/day</td>
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</tbody>
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**KNOWLEDGE**

**Supporting Literature**

- UrbanPlan. 80, 386–395.
- Foster + Partners and Masdar

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**PLAZA BOULEVARD ALLEY**

**Table:**

<table>
<thead>
<tr>
<th>FAR</th>
<th>Density</th>
<th>Street Width</th>
<th>Heat Island</th>
<th>Lowest Daytime Light</th>
<th>Energy kWh/m² a</th>
<th>Daylit Area %</th>
<th>Comfort %</th>
<th>Accessibility %</th>
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<tr>
<td>0.87</td>
<td>1.9</td>
<td>90.0 m</td>
<td>+1.5°C</td>
<td>4,600 lux</td>
<td>-212</td>
<td>99</td>
<td>71*</td>
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<td>1.92</td>
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<td>81</td>
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<td>2,400 lux</td>
<td>101</td>
<td>85</td>
<td>71*</td>
<td>94</td>
</tr>
</tbody>
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**Diagram:**

- Plaza
- Boulevard
- Alley
PROPOSED Heat-Resilient Hunter’s Point
Balancing Sustainability, Energy Use and Density with Heat Wave Resilience for 2080

WIND AND PARK STRATEGY
PARKS ORIENTED TO THE PREVAILING WINDS
PROPOSED Heat-Resilient Hunter’s Point
Balancing Sustainability, Energy Use and Density with Heat Wave Resiliency for 2080

WATER STRATEGY
RUNOFF LOWPOINTS BECOME WATER PLAZAS

- collection area
- water street
- water square
- street with wetland water clean system

RAINWATER RUNOFF
(POINT ANALYSIS USING GRASSHOPPER)
PROPOSED Heat-Resilient Hunter’s Point
Balancing Sustainability, Energy Use and Density with Heat Wave Resiliency for 2080

COMMUNITY PUBLIC SPACE STRATEGY
PLAZAS ACT AS COMMUNITY HUBS CONNECTED BY A BUS ROUTE

- public amenity
- water sports
- community center
- transit center
- museum
- market

- bus route
- bus station
- water street
- pedestrian road
PROPOSED Heat-Resilient Hunter’s Point
Balancing Sustainability, Energy Use and Density with Heat Wave Resiliency for 2080

1.9
Density (FAR)

8.0
Finance (CFO/COST)

51
Energy (kWh/m² a)

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Daylit Area [%]

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Accessibility [%]

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Comfort [%]

Balancing Sustainability, Energy Use and Density with Heat Wave Resiliency for 2080

PROPOSED Heat-Resilient Hunter’s Point

Balancing Sustainability, Energy Use and Density with Heat Wave Resiliency for 2080

PROPOSED Heat-Resilient Hunter’s Point
Balancing Sustainability, Energy Use and Density with Heat Wave Resiliency for 2080

WALKABILITY STRATEGY
DISTRIBUTED COMMERCIAL CENTER
DEVELOPER PROPOSAL

WALKABILITY STRATEGY
DISTRIBUTED COMMERCIAL CENTER
DEVELOPER PROPOSAL

HEAT-RESILIENT PROPOSAL
Walkability LOCATION OF MAIN STREET

The new proposed bus route of resilient Hunter’s Point places amenities throughout the site instead of at one point. This increases the walkscore.

DEVELOPER-TYPE BUS ROUTE
61 WALKSCORE

HEAT-RESILIENT BUS ROUTE
94 WALKSCORE
PROPOSED Heat-Resilient Hunter’s Point
Balancing Sustainability, Energy Use and Density with Heat Wave Resiliency for 2080

WIND DIRECTION

PROTOBLOCK

1.9
Density (FAR)

8.0
Finance (CFO/COST)

51
Energy (kWh/m² a)

85
Daylit Area [%]

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Accessibility [%]

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PROPOSED Heat-Resilient Hunter's Point
Balancing Sustainability, Energy Use and Density with Heat Wave Resiliency for 2080

- 1.9 Density (FAR)
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- 71* Comfort [%]
PROPOSED Heat-Resilient Hunter’s Point
Balancing Sustainability, Energy Use and Density with Heat Wave Resiliency for 2080

Adjusting Floor Height For Optimal Daylight

Residential
Floor Height = 3 m
Total Area = 17,643 m²
Daylit Area = 81%

Commercial
Floor Height = 5 m
Total Area = 4,795 m²
Daylit Area = 99%
### TEMPLATE CONSTRUCTION ASSEMBLES

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<th>Wall</th>
<th>Internal Floor</th>
<th>Floor</th>
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<tr>
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<td>PassivHaus standard</td>
<td>Asphalt and EPS</td>
<td>Wood, Steel Studs</td>
<td>Wood, Uninsulate, Insulated</td>
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<td>0.1m</td>
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<td><strong>R</strong></td>
<td><strong>C</strong></td>
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<td><strong>Comfort</strong></td>
<td><strong>71%</strong></td>
<td><strong>Energy</strong></td>
<td><strong>Daylit Area</strong></td>
<td><strong>Accessibility</strong></td>
<td><strong>71%</strong></td>
</tr>
</tbody>
</table>

**PROPOSED Heat-Resilient Hunter’s Point**

Balancing Sustainability, Energy Use and Density with Heat Wave Resiliency for 2080
PROPOSED Heat-Resilient Hunter’s Point
Balancing Sustainability, Energy Use and Density with Heat Wave Resiliency for 2080

Density [FAR] 1.9
Finance [CFO/COST] $8.0
Energy [kWh/m² a] 51
Daylit Area [%] 85
Accessibility [%] 94
Comfort [%] 71*

TEMPLATE U-VALUES

- **Roof**: 20” EPS
- **Window**: 23” EPS
- **Wall**: 13” EPS
- **Internal Floor**: 4” EPS
- **Floor**: 2.5”

PassivHaus ASHRAE 90.1 Existing Buildings Title 24 ASHRAE 189.1 Target
PROPOSED Heat-Resilient Hunter’s Point
Balancing Sustainability, Energy Use and Density with Heat Wave Resiliency for 2080

Reducing Energy & Gaining Density

Developer Proposal:
High energy with low density

Heat-Resilient New Proposal:
Low energy with high density

Energy Use Intensity (EUI) [kWh/m²/year]

50 60 70 80 90 100+

Under both schemes, strategically improved insulation and natural ventilation in 201□ and 2080□.

With strategically improved insolation,

Daylit Area [%] 94

Comfort [%] 71*

Developer Density [FAR] 1.9

Finance [CFO/COST] $8.0

Energy [kWh/m² a] 51

Accessibility [%] 94

Accessibility [%] 71*
Reducing Energy & Gaining Density

Energy Use Intensity (EUI) [kWh/m²/year]

50 60 70 80 90 100+

Developer Proposal: High energy with low density

Heat Resilient Proposal: Low energy with high density

Balancing Sustainability, Energy Use and Density with Heat Wave Resiliency for 2080

PROPOSED Heat-Resilient Hunter’s Point
Balancing Sustainability, Energy Use and Density with Heat Wave Resiliency for 2080

1.9
8.0
51
85
94
71*
Density (FAR)
Finance (CFO / COST)
Energy (kWh/m² a)
Daylight Area [%]
Accessibility [%]
Comfort [%]

Reducing Energy & Gaining Density

Energy Use Intensity (EUI) [kWh/m²/year]

50 60 70 80 90 100+

Developer Proposal: High energy with low density

Heat Resilient Proposal: Low energy with high density

Balancing Sustainability, Energy Use and Density with Heat Wave Resiliency for 2080

PROPOSED Heat-Resilient Hunter’s Point
Balancing Sustainability, Energy Use and Density with Heat Wave Resiliency for 2080

1.9
8.0
51
85
94
71*
Density (FAR)
Finance (CFO / COST)
Energy (kWh/m² a)
Daylight Area [%]
Accessibility [%]
Comfort [%]
Reducing Energy & Gaining Density

Developer Proposal:
High energy with low density

Heat Resilient Proposal:
Low energy with high density

Energy Use Intensity (EUI) [kWh/m²/year]

- 50
- 60
- 70
- 80
- 90
- 100+

Roof
- 10”
Window
- 1”
Wall
- 2” PINK FOAM
Int. Floor
- 2”
Floor
- 3”

+ Natural ventilation
+ Thermal mass
+ Night cooling

Developer
Title 24
New
ASHRAE 189.1++
Reducing Energy & Gaining Density

Energy Use Intensity (EUI) [kWh/m²/year]

- **Developer Proposal:** High energy with low density
- **Heat Resilient Proposal:** Low energy with high density

**Office/Com.**
- 51

**Residential**
- 82%

**Comfort [% Occupied Hours]**
- 71%

**Title 24**
- New ASHRAE 189.1++
- Heating & Cooling
- + Natural ventilation
- + Thermal mass
- + Night cooling

**Density [FAR]**
- 1.9

**Finance [CFO/COST]**
- 8.0

**Energy [kWh/m² a]**
- 51

**Daylit Area [%]**
- 85

**Accessibility [%]**
- 94

**71**

**Comfort [% Occupied Hours]**
Energy Costs vs. Resilient Value

Developer Proposal:
High energy costs & lower revenue

Heat Resilient Proposal:
Lower energy costs & more leasable GFA

Energy costs
+$215
-$9
-$45 other expenses

+$340 revenue per sq.m.
-$6
-$70 other expenses

$8.2 Finanace[CASH/COST]
$8.0 Finanace[CASH/COST]
PROPOSED Heat-Resilient Hunter’s Point
Balancing Sustainability, Energy Use and Density with Heat Wave Resiliency for 2080

WIND DIRECTION

THANKS!