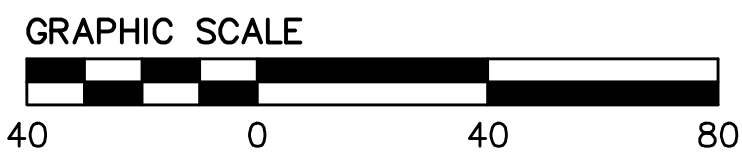


# ***Mayor ED 17-02 Priority permit***

## **APPENDIX J**

### **TYPICAL COMPENSATING LIGHTWEIGHT FILL SECTIONS AND CALCULATIONS**

DRAWING NAME: \\BKF-sf\vol14\2008\080006\Mission Rock\ENG\Exhibits\Street Sections\CI.0 SITE PLAN.dwg  
PLOT DATE: 10-18-18 PLOTTED BY: volk



Revisions	
No.	
Date: MM/DD/YY	
Scale: AS SHOWN	
Design: JD	
Drawn: LB	
Approved: JD	
Job No: 20080006	

Drawing Number:  
**C1.0**

CITY OF SAN FRANCISCO

MISSION ROCK REDEVELOPMENT PROJECT  
BASIS OF DESIGN  
SITE PLAN

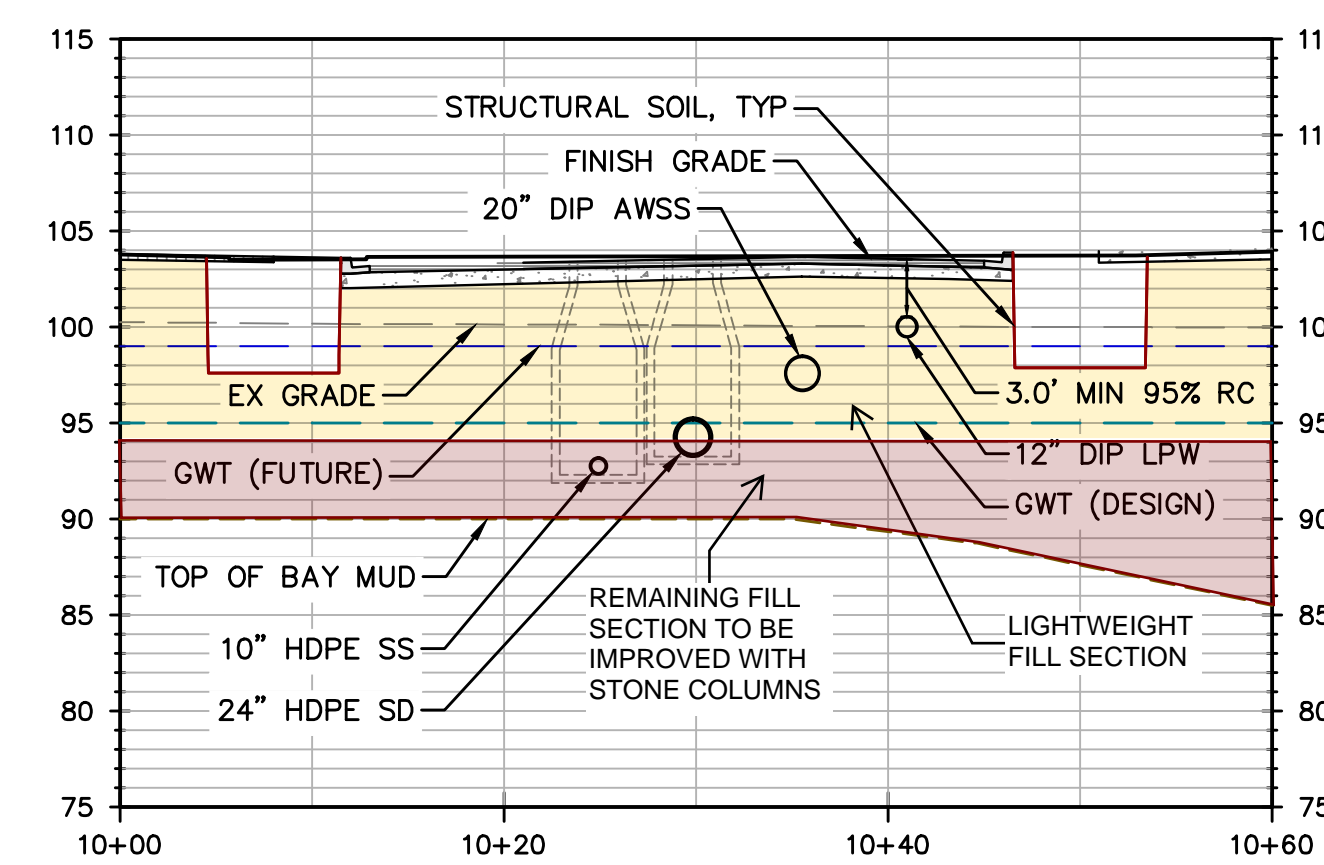
COUNTY OF SAN FRANCISCO

CALIFORNIA

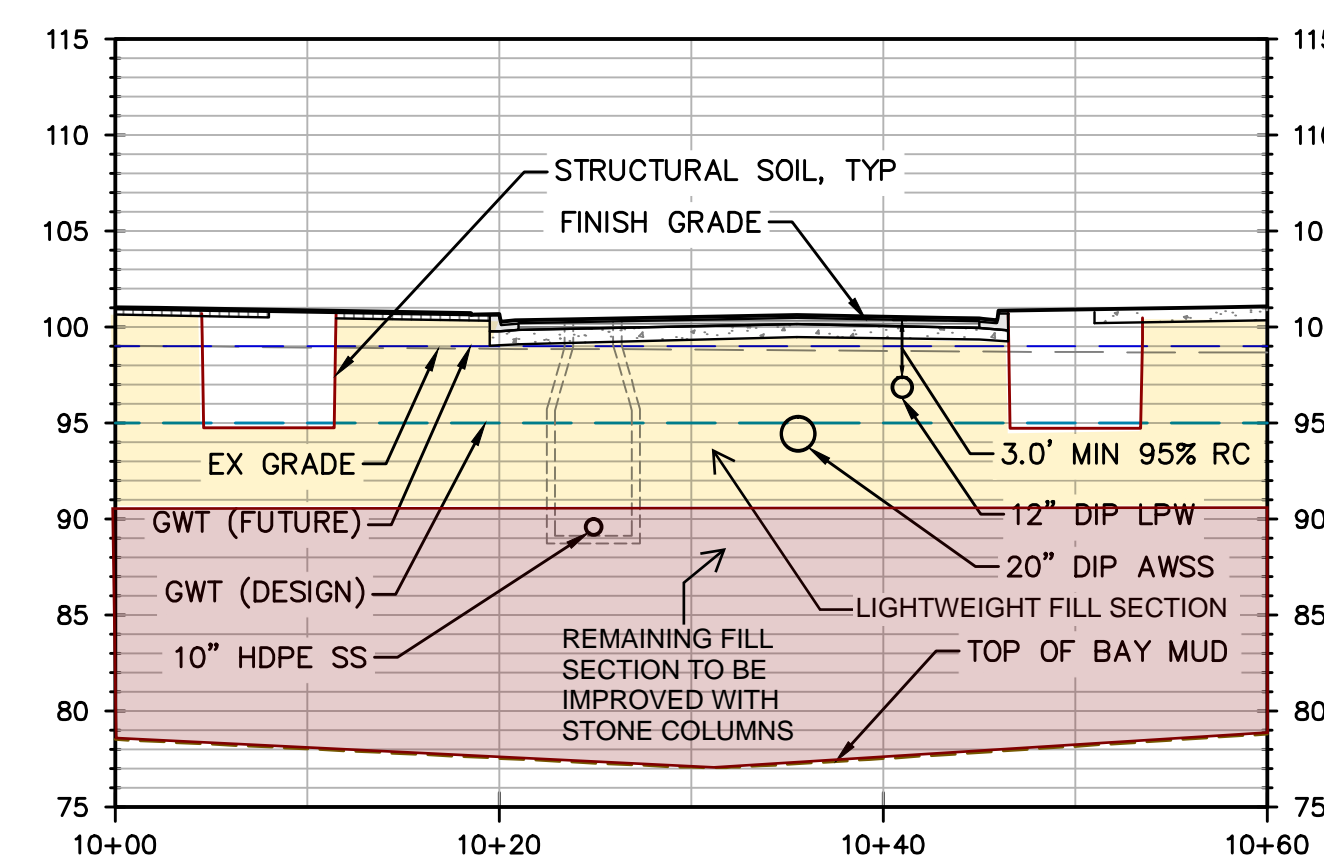


NOT FOR CONSTRUCTION

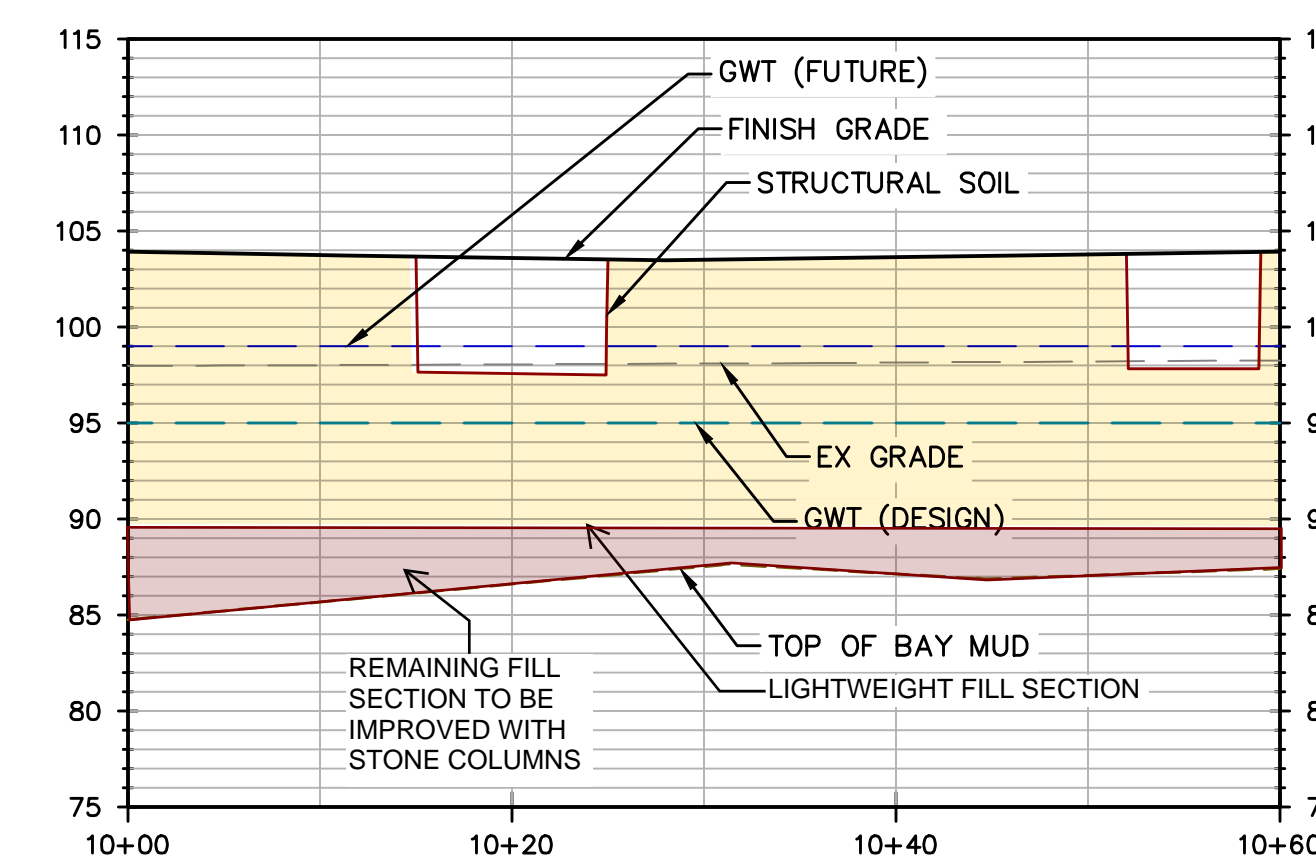




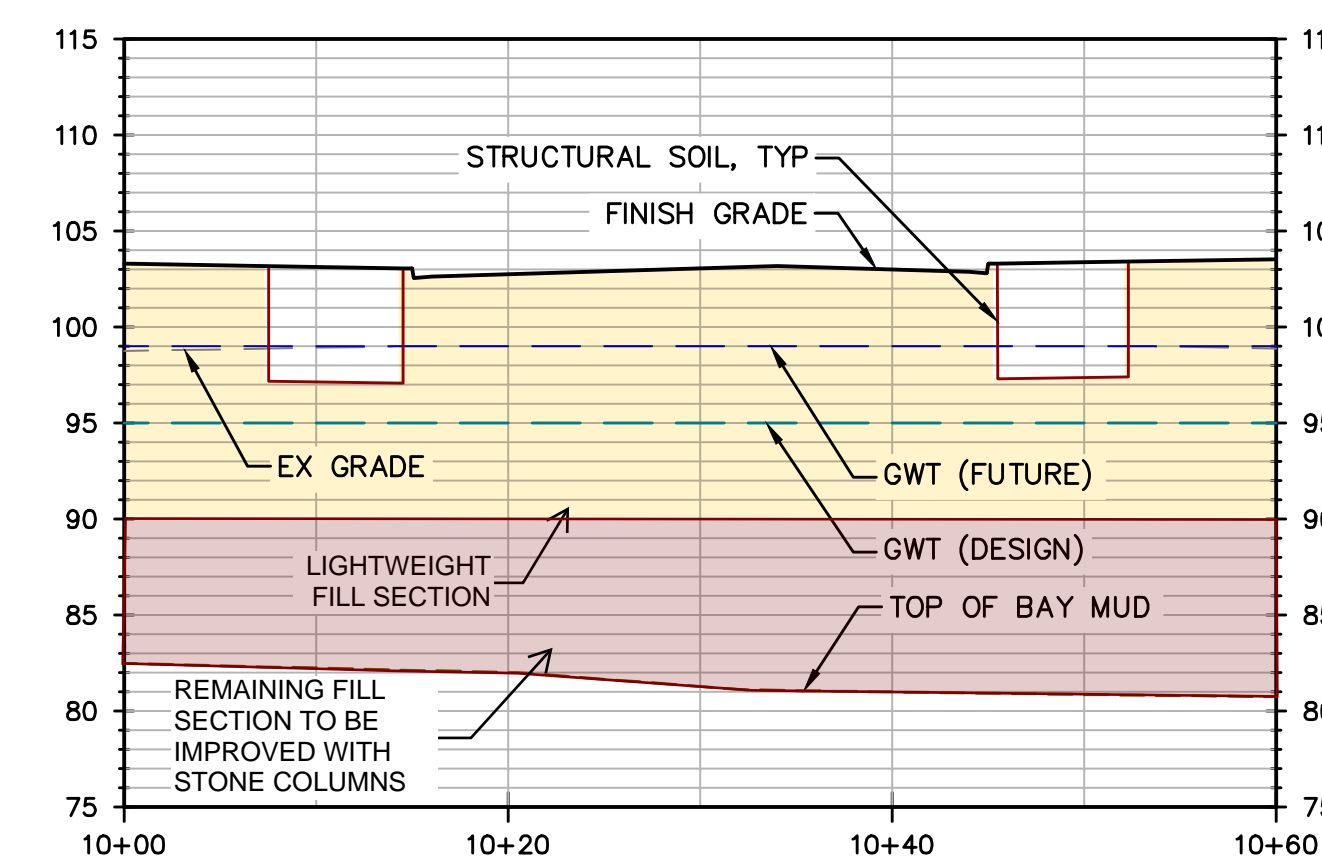
**T1** **EXPOSITION STREET SECTION**  
1" = 10'



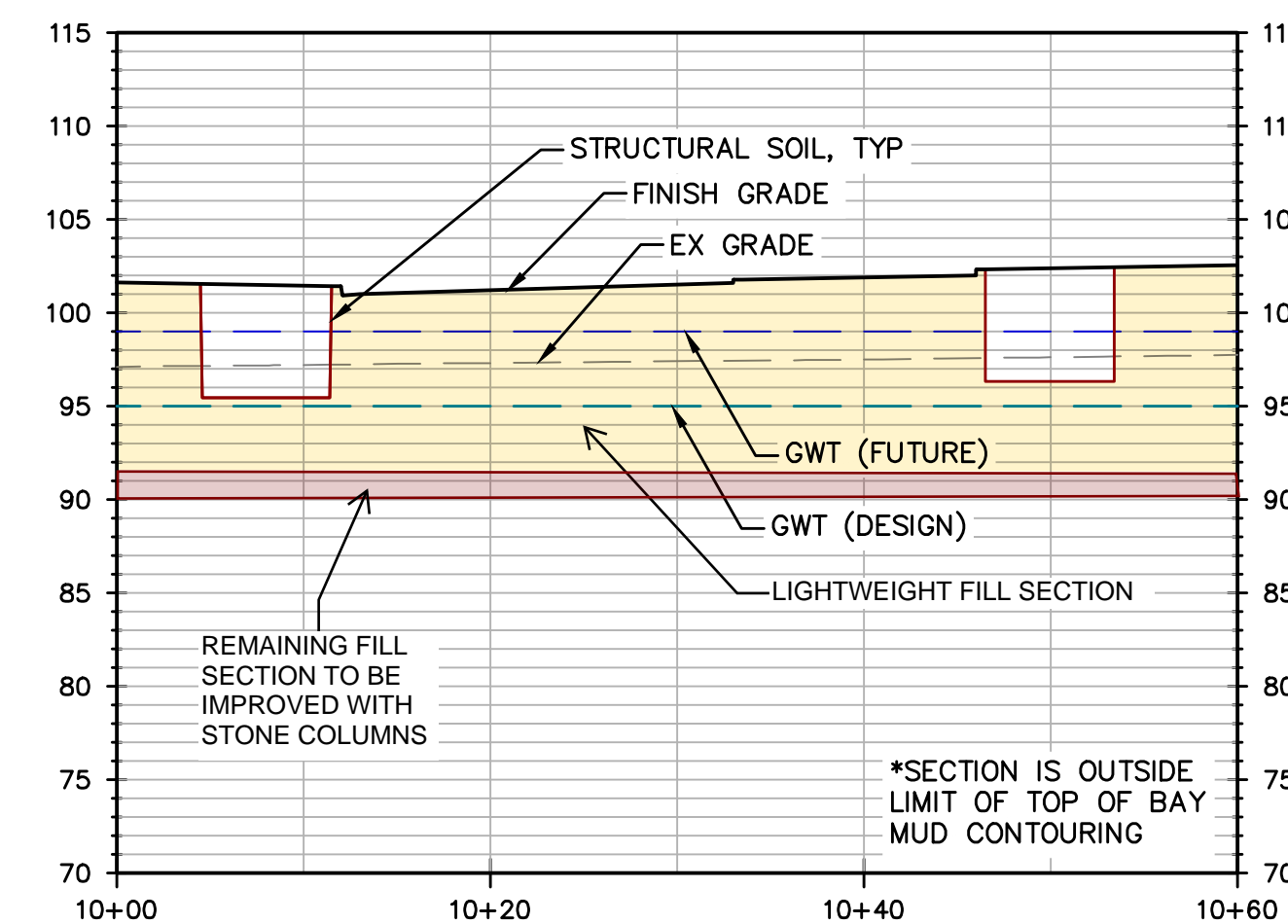
**T2** **EXPOSITION STREET SECTION**  
- 1" = 10'



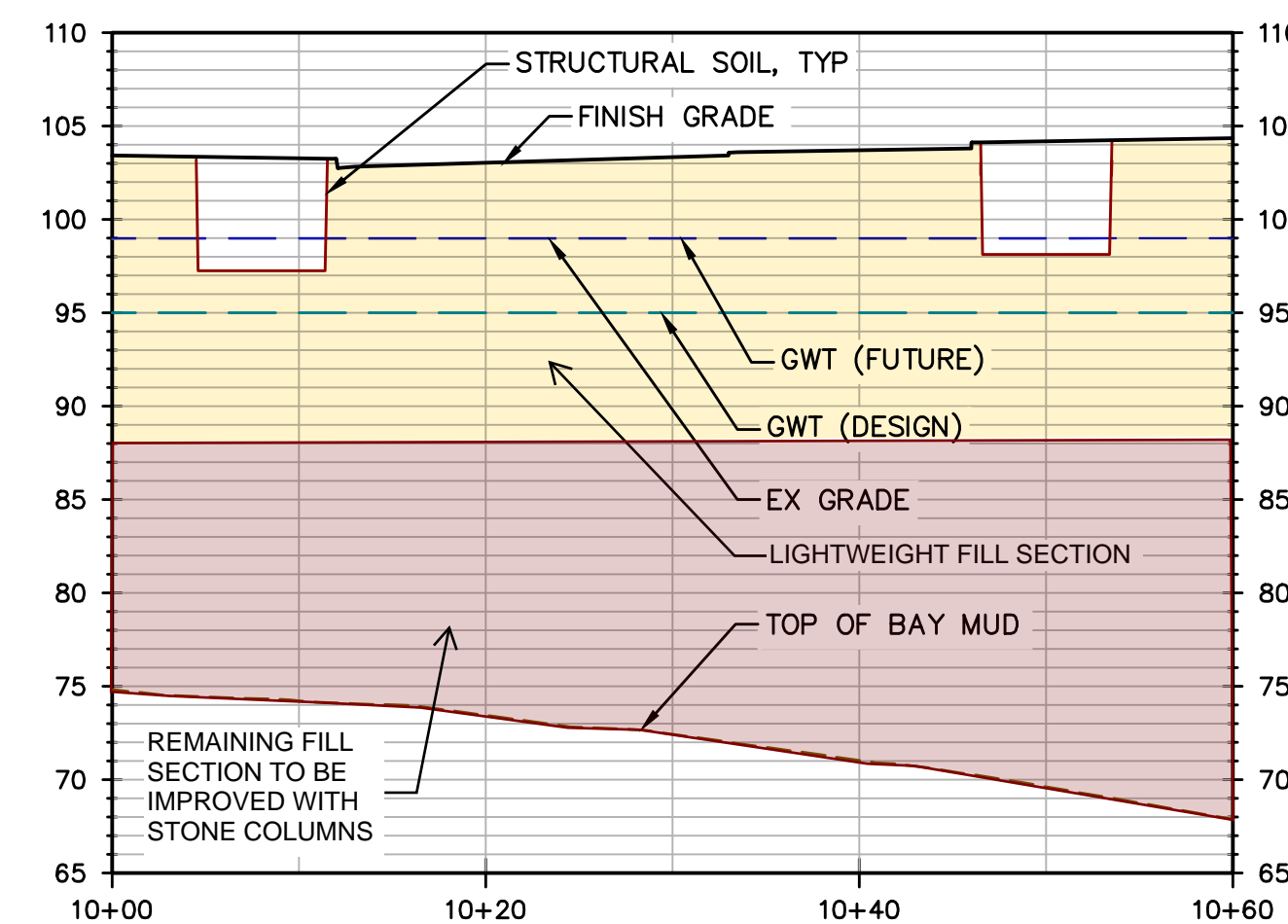
**T3 SHARED PUBLIC WAY SECTION**  
1" = 10'



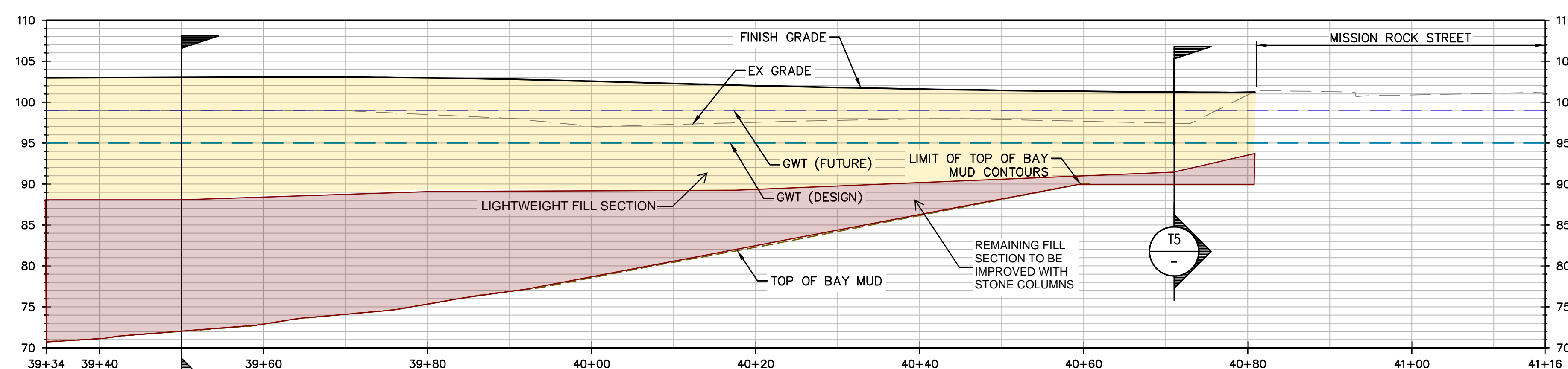
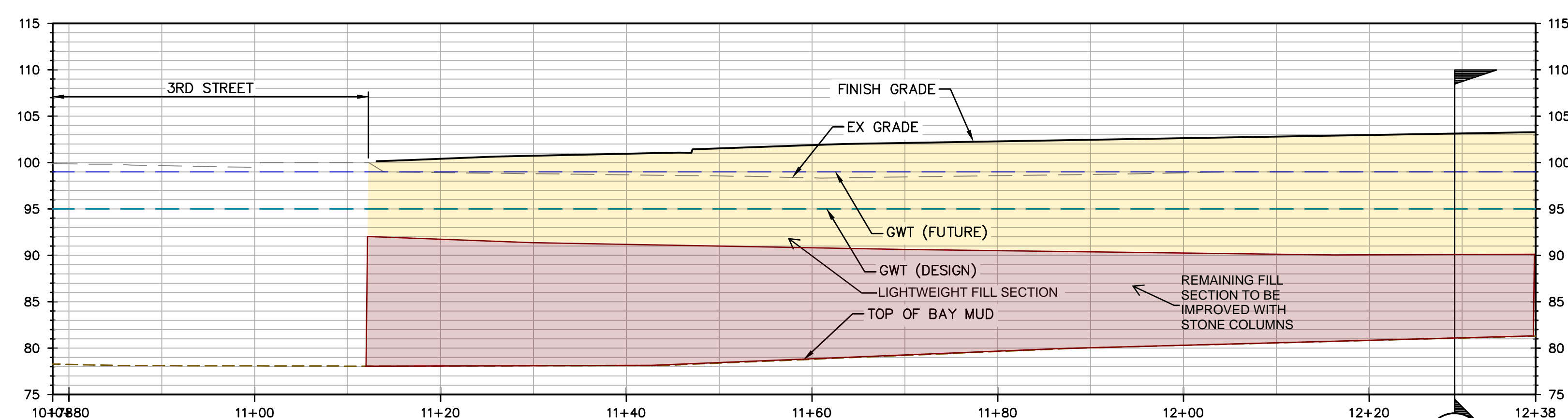
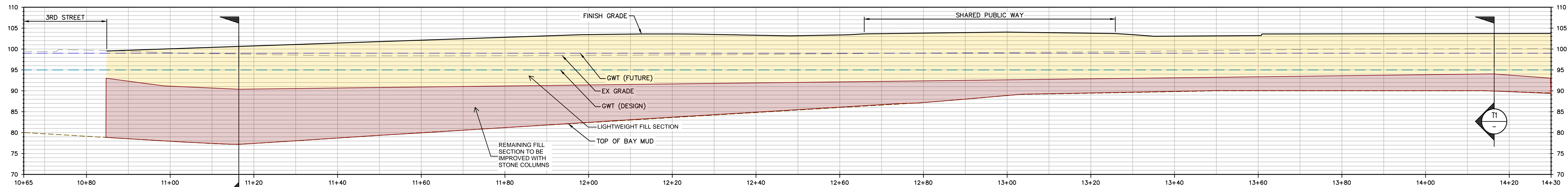
**T4 LONG BRIDGE STREET SECTION**  
1" = 10'



**T5 BRIDGEVIEW STREET SECTION**  
 $1'' = 10'$



**T6 BRIDGEVIEW STREET SECTION**  
1" = 10'



#### Stone Column Notes:

3-foot-diameter stone columns

Spaced in a triangular pattern 6- to 8-feet on-center depending on the results of a test program as described in the Final Geotechnical Report

Stone columns will be installed from the bottom of the lightweight fill section and be embedded into the underlying Bay Mud

Preliminary-For Discussion/Illustrative  
Purposes Only

NOT FOR CONSTRUCTION

Revised 6/12/2019  
Based on open cell LCC placed below  
Elevation 99.5 feet and closed cell above  
Mission Rock Development  
750604203

### LEGEND

-

Mayor ED 17-02 Priority permit

<b>MISSION ROCK COMPENSATING FILL SECTION:</b> Original Ground Surface ft = Bottom of existing fill = Observed high groundwater elevation =	<b>T3 Shared Public Way</b> <div>98 ft MBD                      Fill Thickness ft. = 11</div> <div>87 ft MBD                      Grades raised = 6.0</div> <div>94 ft MBD</div>			
<b>Element</b>	<b>Effective Unit Wt (pcf)</b>	<b>Bottom Elev. (MBD)</b>	<b>Thickness (feet)</b>	<b>Effective Weight (lbs)</b>
<b>New Section Lightweight Fill at 33 pcf above El. 99.5 and 27 pcf below El. 99.5</b>				
approximate new grade		104.0		
composite unit weight upper 6 feet of new section	79	98.0	6.0	474.0
lightweight fill @ 27 pcf above El. 94 feet to El. 99.5 feet	27	94.0	4.0	108.0
effective lightweight fill weight (79 pcf - 63 pcf) below El. 94 feet	16	89.5	4.5	72.0
remaining fill effective weight with additional weight due to stone columns [(125 pcf +10 pcf) - 63 pcf]	72	87.0	2.5	180.0
Total				834.0
<b>Existing Fill Section</b>				
existing grade		98.0		
fill above El. 94 feet	125	94.0	4.0	500.0
effective fill weight (125 pcf - 63 pcf) below El. 94 feet	62	87.0	7.0	434.0
Total		89.5	11.0	934.0

<<<---- 33 pcf for closed cell LCC to be used above the future high water table and 27 pcf for open cell LCC below the future high water table  
<<<---- new composite section calculated on page J-9  
<<<---- observed high groundwater level (El. 94 feet)  
  
<<<---- stone columns will increase the weight of the remaining fill section  
remaining fill depth is averaged over the entire ROW

<b>Check Load Compensation</b>	
Weight of Existing Section (lbs)	934.0
Weight of New Section (lbs)	834.0
% Old/New: Goal is > 110%	112.0% ✓

<b>Check Crushing</b>	
Maximum load on 1 square foot column (lbs)	834.0
Compressive Strength (psi)	40.0
Compressive Strength (psf)	5,760.0
Compressive Strength/Actual Load	690.6% ✓

<<<---- assumes everything below Elevation 99.5 feet has a saturated unit weight of 84 pcf  
<<<---- minimum compressive strength for Class III closed cell LCC

<b>Hydrostatic Uplift at the Bottom of the New Lightweight Fill Section</b>	
Elevation of future mid-range water table (MBD)	97.0
Elevation of future high-range water table (MBD)	99.5
Elevation bottom of light wt fill (MBD)	89.5
Groundwater pressure head mid-range (ft)	7.5
Groundwater pressure head high-range (ft)	10.0
Unit weight of water (pcf)	63.0
Hydrostatic uplift for mid-range Elevation 97 feet (lbs)	472.5
Hydrostatic uplift for high-range Elevation 99.5 feet (lbs)	630.0

<<<---- 2100 estimates of sea level rise per FEMA guidelines is 36 inches (El. 94 + 3 feet)  
<<<---- 2100 estimates of sea level rise per FEMA guidelines is 66 inches (El. 94 + 5.5 feet)

<b>Factor of Safety (FOS) Against Uplift (Assumes worst case if all closed cell LCC was used)</b>	
New section with water at mid-range Elevation 97 feet (new section weight / hydrostatic uplift)	1.6
New section with water at high-range Elevation 99.5 feet (new section weight / hydrostatic uplift)	1.2

<<<---- FOS against uplift assumes lightweight fill below water is all 33 pcf and that the hydrostatic pressure acts at the bottom of the section  
<<<----Since open cell LCC is proposed below Elevation 99.5 feet, no hydrostatic pressure should develop below or within the LCC section so FOS noted here is conservative. However, if all closed cell LCC was used, there would still be an adequate FOS

- Notes:
1. Calculation estimates the weight of the new section compared to the total fill section
  2. MBD = Mission Bay Datum, which is old San Francisco Datum +100'
  3. Calculations are for 1 square foot section of new ROW
  4. Factor of Safety against uplift assumes that the hydrostatic pressure acts act the bottom of the section

\*Not for construction; sections will be finalized once grades are finalized

Mission Rock Development Streets  
Compensating Fill Section Calculations  
Revised 30 May 2019  
750604203



Figure J-5

Mayor ED 17-02 Priority permit

<b>MISSION ROCK COMPENSATING FILL SECTION:</b> Original Ground Surface ft = Bottom of existing fill = Observed high groundwater elevation =	<b>T2 Exposition Street</b> <div><div>99 ft MBD</div><div>78 ft MBD</div><div>94 ft MBD</div></div> <div><div>Fill Thickness ft. = 21</div><div>Grades raised = 2.0</div></div>			
<b>Element</b>	<b>Effective Unit Wt (pcf)</b>	<b>Bottom Elev. (MBD)</b>	<b>Thickness (feet)</b>	<b>Effective Weight (lbs)</b>
<b>New Section Lightweight Fill at 33 pcf above El. 99.5 and 27 pcf below El. 99.5</b> approximate new grade composite unit weight upper 6 feet of new section lightweight fill @ 27 pcf above El. 94 feet to El. 99.5 feet effective lightweight fill weight (79 pcf - 63 pcf) below El. 94 feet remaining fill effective weight with additional weight due to stone columns [(125 pcf +10 pcf) - 63 pcf] Total	<div>79</div> <div>27</div> <div>16</div> <div>72</div>	<div>101.0</div> <div>95.0</div> <div>94.0</div> <div>90.5</div> <div>78.0</div>	<div>6.0</div> <div>1.0</div> <div>3.5</div> <div>12.5</div>	<div>474.0</div> <div>27.0</div> <div>56.0</div> <div>900.0</div> <div>1,457.0</div>
<b>Existing Fill Section</b> existing grade fill above El. 94 feet effective fill weight (125 pcf - 63 pcf) below El. 94 feet Total	<div>125</div> <div>62</div>	<div>99.0</div> <div>94.0</div> <div>78.0</div> <div>90.5</div>	<div>5.0</div> <div>16.0</div> <div>21.0</div>	<div>625.0</div> <div>992.0</div> <div>1,617.0</div>

<<<---- 33 pcf for closed cell LCC to be used above the future high water table and 27 pcf for open cell LCC below the future high water table  
<<<---- new composite section calculated on page J-9  
<<<---- observed high groundwater level (El. 94 feet)  
  
<<<---- stone columns will increase the weight of the remaining fill section  
remaining fill depth is averaged over the entire ROW

<b>Check Load Compensation</b> Weight of Existing Section (lbs) Weight of New Section (lbs) % Old/New: Goal is > 110%	<div>1,617.0</div> <div>1,457.0</div> <div>111.0% ✓</div>
--	---

<b>Check Crushing</b> Maximum load on 1 square foot column (lbs) Compressive Strength (psi) Compressive Strength (psf) Compressive Strength/Actual Load	<div>1,457.0</div> <div>40.0</div> <div>5,760.0</div> <div>395.3% ✓</div>
---	---

<<<---- assumes everything below Elevation 99.5 feet has a saturated unit weight of 84 pcf  
<<<---- minimum compressive strength for Class III closed cell LCC

<b>Hydrostatic Uplift at the Bottom of the New Lightweight Fill Section</b> Elevation of future mid-range water table (MBD) Elevation of future high-range water table (MBD) Elevation bottom of light wt fill (MBD) Groundwater pressure head mid-range (ft) Groundwater pressure head high-range (ft) Unit weight of water (pcf) Hydrostatic uplift for mid-range Elevation 97 feet (lbs) Hydrostatic uplift for high-range Elevation 99.5 feet (lbs)	<div>97.0</div> <div>99.5</div> <div>90.5</div> <div>6.5</div> <div>9.0</div> <div>63.0</div> <div>409.5</div> <div>567.0</div>
---	---

<<<---- 2100 estimates of sea level rise per FEMA guidelines is 36 inches (El. 94 + 3 feet)  
<<<---- 2100 estimates of sea level rise per FEMA guidelines is 66 inches (El. 94 + 5.5 feet)

<b>Factor of Safety (FOS) Against Uplift (Assumes worst case if all closed cell LCC was used)</b> New section with water at mid-range Elevation 97 feet (new section weight / hydrostatic uplift)	<div>1.5</div>
New section with water at high-range Elevation 99.5 feet (new section weight / hydrostatic uplift)	<div>1.1</div>

<<<---- FOS against uplift assumes lightweight fill below water is all 33 pcf and that the hydrostatic pressure acts at the bottom of the section  
<<<----Since open cell LCC is proposed below Elevation 99.5 feet, no hydrostatic pressure should develop below or within the LCC section so FOS noted here is conservative. However, if all closed cell LCC was used, there would still be an adequate FOS

- Notes:
- Calculation estimates the weight of the new section compared to the total fill section
  - MBD = Mission Bay Datum, which is old San Francisco Datum +100'
  - Calculations are for 1 square foot section of new ROW
  - Factor of Safety against uplift assumes that the hydrostatic pressure acts act the bottom of the section

\*Not for construction; sections will be finalized once grades are finalized

Mission Rock Development Streets  
Compensating Fill Section Calculations  
Revised 30 May 2019  
750604203



Figure J-4



Mayor ED 17-02 Priority permit

<b>MISSION ROCK COMPENSATING FILL SECTION:</b> Original Ground Surface ft = Bottom of existing fill = Observed high groundwater elevation =	<b>T3 Shared Public Way</b> <div><div>98</div>ft MBD<div>Fill Thickness ft. = 11</div></div> <div><div>87</div>ft MBD<div>Grades raised = 6.0</div></div> <div><div>94</div>ft MBD</div>			
<b>Element</b>	<b>Effective Unit Wt (pcf)</b>	<b>Bottom Elev. (MBD)</b>	<b>Thickness (feet)</b>	<b>Effective Weight (lbs)</b>
<b>New Section Lightweight Fill at 33 pcf above El. 99.5 and 27 pcf below El. 99.5</b>				
approximate new grade		104.0		
composite unit weight upper 6 feet of new section	79	98.0	6.0	474.0
lightweight fill @ 27 pcf above El. 94 feet to El. 99.5 feet	27	94.0	4.0	108.0
effective lightweight fill weight (79 pcf - 63 pcf) below El. 94 feet	16	89.5	4.5	72.0
remaining fill effective weight with additional weight due to stone columns [(125 pcf +10 pcf) - 63 pcf]	72	87.0	2.5	180.0
Total				834.0
<b>Existing Fill Section</b>				
existing grade		98.0		
fill above El. 94 feet	125	94.0	4.0	500.0
effective fill weight (125 pcf - 63 pcf) below El. 94 feet	62	87.0	7.0	434.0
Total		89.5	11.0	934.0

<<<---- 33 pcf for closed cell LCC to be used above the future high water table and 27 pcf for open cell LCC below the future high water table  
<<<---- new composite section calculated on page J-9  
<<<---- observed high groundwater level (El. 94 feet)  
  
<<<---- stone columns will increase the weight of the remaining fill section  
remaining fill depth is averaged over the entire ROW

<b>Check Load Compensation</b>	
Weight of Existing Section (lbs)	934.0
Weight of New Section (lbs)	834.0
% Old/New: Goal is > 110%	112.0% ✓

<b>Check Crushing</b>	
Maximum load on 1 square foot column (lbs)	834.0
Compressive Strength (psi)	40.0
Compressive Strength (psf)	5,760.0
Compressive Strength/Actual Load	690.6% ✓

<<<---- assumes everything below Elevation 99.5 feet has a saturated unit weight of 84 pcf  
<<<---- minimum compressive strength for Class III closed cell LCC

<b>Hydrostatic Uplift at the Bottom of the New Lightweight Fill Section</b>	
Elevation of future mid-range water table (MBD)	97.0
Elevation of future high-range water table (MBD)	99.5
Elevation bottom of light wt fill (MBD)	89.5
Groundwater pressure head mid-range (ft)	7.5
Groundwater pressure head high-range (ft)	10.0
Unit weight of water (pcf)	63.0
Hydrostatic uplift for mid-range Elevation 97 feet (lbs)	472.5
Hydrostatic uplift for high-range Elevation 99.5 feet (lbs)	630.0

<<<---- 2100 estimates of sea level rise per FEMA guidelines is 36 inches (El. 94 + 3 feet)  
<<<---- 2100 estimates of sea level rise per FEMA guidelines is 66 inches (El. 94 + 5.5 feet)

<b>Factor of Safety (FOS) Against Uplift (Assumes worst case if all closed cell LCC was used)</b>	
New section with water at mid-range Elevation 97 feet (new section weight / hydrostatic uplift)	1.6
New section with water at high-range Elevation 99.5 feet (new section weight / hydrostatic uplift)	1.2

<<<---- FOS against uplift assumes lightweight fill below water is all 33 pcf and that the hydrostatic pressure acts at the bottom of the section  
<<<----Since open cell LCC is proposed below Elevation 99.5 feet, no hydrostatic pressure should develop below or within the LCC section so FOS noted here is conservative. However, if all closed cell LCC was used, there would still be an adequate FOS

- Notes:
1. Calculation estimates the weight of the new section compared to the total fill section
  2. MBD = Mission Bay Datum, which is old San Francisco Datum +100'
  3. Calculations are for 1 square foot section of new ROW
  4. Factor of Safety against uplift assumes that the hydrostatic pressure acts act the bottom of the section

\*Not for construction; sections will be finalized once grades are finalized

Mission Rock Development Streets  
Compensating Fill Section Calculations  
Revised 30 May 2019  
750604203



Figure J-5

Mayor ED 17-02 Priority permit

<b>MISSION ROCK COMPENSATING FILL SECTION:</b> Original Ground Surface ft = Bottom of existing fill = Observed high groundwater elevation =	<b>T4 Long Bridge Street</b> <div><div>99</div>ft MBD<div>Fill Thickness ft. = 18</div></div> <div><div>81</div>ft MBD<div>Grades raised = 5.0</div></div> <div><div>94</div>ft MBD</div>			
<b>Element</b>	<b>Effective Unit Wt (pcf)</b>	<b>Bottom Elev. (MBD)</b>	<b>Thickness (feet)</b>	<b>Effective Weight (lbs)</b>
<b>New Section Lightweight Fill at 33 pcf above El. 99.5 and 27 pcf below El. 99.5</b>				
approximate new grade		104.0		
composite unit weight upper 6 feet of new section	79	98.0	6.0	474.0
lightweight fill @ 27 pcf above El. 94 feet to El. 99.5 feet	27	94.0	4.0	108.0
effective lightweight fill weight (79 pcf - 63 pcf) below El. 94 feet	16	90.0	4.0	64.0
remaining fill effective weight with additional weight due to stone columns [(125 pcf +10 pcf) - 63 pcf]	72	81.0	9.0	648.0
Total				1,294.0
<b>Existing Fill Section</b>				
existing grade		99.0		
fill above El. 94 feet	125	94.0	5.0	625.0
effective fill weight (125 pcf - 63 pcf) below El. 94 feet	62	81.0	13.0	806.0
Total		90.0	18.0	1,431.0

<<<---- 33 pcf for closed cell LCC to be used above the future high water table and 27 pcf for open cell LCC below the future high water table  
<<<---- new composite section calculated on page J-9  
<<<---- observed high groundwater level (El. 94 feet)  
  
<<<---- stone columns will increase the weight of the remaining fill section  
remaining fill depth is averaged over the entire ROW

Check Load Compensation

Weight of Existing Section (lbs)	1,431.0
Weight of New Section (lbs)	1,294.0
% Old/New: Goal is > 110%	110.6% ✓

Check Crushing

Maximum load on 1 square foot column (lbs)	1,294.0
Compressive Strength (psi)	40.0
Compressive Strength (psf)	5,760.0
Compressive Strength/Actual Load	445.1% ✓

<<<---- assumes everything below Elevation 99.5 feet has a saturated unit weight of 84 pcf  
<<<---- minimum compressive strength for Class III closed cell LCC

Hydrostatic Uplift at the Bottom of the New Lightweight Fill Section

Elevation of future mid-range water table (MBD)	97.0
Elevation of future high-range water table (MBD)	99.5
Elevation bottom of light wt fill (MBD)	90.0
Groundwater pressure head mid-range (ft)	7.0
Groundwater pressure head high-range (ft)	9.5
Unit weight of water (pcf)	63.0
Hydrostatic uplift for mid-range Elevation 97 feet (lbs)	441.0
Hydrostatic uplift for high-range Elevation 99.5 feet (lbs)	598.5

<<<---- 2100 estimates of sea level rise per FEMA guidelines is 36 inches (El. 94 + 3 feet)  
<<<---- 2100 estimates of sea level rise per FEMA guidelines is 66 inches (El. 94 + 5.5 feet)

Factor of Safety (FOS) Against Uplift (Assumes worst case if all closed cell LCC was used)

New section with water at mid-range Elevation 97 feet (new section weight / hydrostatic uplift)	1.7
New section with water at high-range Elevation 99.5 feet (new section weight / hydrostatic uplift)	1.2

<<<---- FOS against uplift assumes lightweight fill below water is all 33 pcf and that the hydrostatic pressure acts at the bottom of the section  
<<<----Since open cell LCC is proposed below Elevation 99.5 feet, no hydrostatic pressure should develop below or within the LCC section so FOS noted here is conservative. However, if all closed cell LCC was used, there would still be an adequate FOS

- Notes:
1. Calculation estimates the weight of the new section compared to the total fill section
  2. MBD = Mission Bay Datum, which is old San Francisco Datum +100'
  3. Calculations are for 1 square foot section of new ROW
  4. Factor of Safety against uplift assumes that the hydrostatic pressure acts act the bottom of the section

\*Not for construction; sections will be finalized once grades are finalized

Mission Rock Development Streets  
Compensating Fill Section Calculations  
Revised 30 May 2019  
750604203



Figure J-6

Mayor ED 17-02 Priority permit

<b>MISSION ROCK COMPENSATING FILL SECTION:</b> Original Ground Surface ft = Bottom of existing fill = Observed high groundwater elevation =	<b>T5 Bridgeview Street</b> <div><div>98</div>ft MBD<div>Fill Thickness ft. = 8</div></div> <div><div>90</div>ft MBD<div>Grades raised = 4.0</div></div> <div><div>94</div>ft MBD</div>			
<b>Element</b>	<b>Effective Unit Wt (pcf)</b>	<b>Bottom Elev. (MBD)</b>	<b>Thickness (feet)</b>	<b>Effective Weight (lbs)</b>
<b>New Section Lightweight Fill at 33 pcf above El. 99.5 and 27 pcf below El. 99.5</b>				
approximate new grade		102.0		
composite unit weight upper 6 feet of new section	79	96.0	6.0	474.0
lightweight fill @ 27 pcf above El. 94 feet to El. 99.5 feet	27	94.0	2.0	54.0
effective lightweight fill weight (79 pcf - 63 pcf) below El. 94 feet	16	91.5	2.5	40.0
remaining fill effective weight with additional weight due to stone columns [(125 pcf +10 pcf) - 63 pcf]	72	90.0	1.5	108.0
Total				676.0
<b>Existing Fill Section</b>				
existing grade		98.0		
fill above El. 94 feet	125	94.0	4.0	500.0
effective fill weight (125 pcf - 63 pcf) below El. 94 feet	62	90.0	4.0	248.0
Total		91.5	8.0	748.0

<<<---- 33 pcf for closed cell LCC to be used above the future high water table and 27 pcf for open cell LCC below the future high water table  
<<<---- new composite section calculated on page J-9  
<<<---- observed high groundwater level (El. 94 feet)  
  
<<<---- stone columns will increase the weight of the remaining fill section  
remaining fill depth is averaged over the entire ROW

<b>Check Load Compensation</b>	
Weight of Existing Section (lbs)	748.0
Weight of New Section (lbs)	676.0
% Old/New: Goal is > 110%	110.7% ✓

<b>Check Crushing</b>	
Maximum load on 1 square foot column (lbs)	676.0
Compressive Strength (psi)	40.0
Compressive Strength (psf)	5,760.0
Compressive Strength/Actual Load	852.1% ✓

<<<---- assumes everything below Elevation 99.5 feet has a saturated unit weight of 84 pcf  
<<<---- minimum compressive strength for Class III closed cell LCC

<b>Hydrostatic Uplift at the Bottom of the New Lightweight Fill Section</b>	
Elevation of future mid-range water table (MBD)	97.0
Elevation of future high-range water table (MBD)	99.5
Elevation bottom of light wt fill (MBD)	91.5
Groundwater pressure head mid-range (ft)	5.5
Groundwater pressure head high-range (ft)	8.0
Unit weight of water (pcf)	63.0
Hydrostatic uplift for mid-range Elevation 97 feet (lbs)	346.5
Hydrostatic uplift for high-range Elevation 99.5 feet (lbs)	504.0

<<<---- 2100 estimates of sea level rise per FEMA guidelines is 36 inches (El. 94 + 3 feet)  
<<<---- 2100 estimates of sea level rise per FEMA guidelines is 66 inches (El. 94 + 5.5 feet)

<b>Factor of Safety (FOS) Against Uplift (Assumes worst case if all closed cell LCC was used)</b>	
New section with water at mid-range Elevation 97 feet (new section weight / hydrostatic uplift)	1.8
New section with water at high-range Elevation 99.5 feet (new section weight / hydrostatic uplift)	1.2

<<<---- FOS against uplift assumes lightweight fill below water is all 33 pcf and that the hydrostatic pressure acts at the bottom of the section  
<<<----Since open cell LCC is proposed below Elevation 99.5 feet, no hydrostatic pressure should develop below or within the LCC section so FOS noted here is conservative.  
However, if all closed cell LCC was used, there would still be an adequate FOS

- Notes:
1. Calculation estimates the weight of the new section compared to the total fill section
  2. MBD = Mission Bay Datum, which is old San Francisco Datum +100'
  3. Calculations are for 1 square foot section of new ROW
  4. Factor of Safety against uplift assumes that the hydrostatic pressure acts act the bottom of the section

\*Not for construction; sections will be finalized once grades are finalized

Mission Rock Development Streets  
Compensating Fill Section Calculations  
Revised 30 May 2019  
750604203



Figure J-7



Mayor ED 17-02 Priority permit

<b>MISSION ROCK COMPENSATING FILL SECTION:</b> Original Ground Surface ft = Bottom of existing fill = Observed high groundwater elevation =	<b>T6 Bridgeview Street</b> <div><div>99</div>ft MBD<div>72</div>ft MBD<div>94</div>ft MBD</div> <div>Fill Thickness ft. = <div>27</div> Grades raised = <div>4.0</div></div>			
<b>Element</b>	<b>Effective Unit Wt (pcf)</b>	<b>Bottom Elev. (MBD)</b>	<b>Thickness (feet)</b>	<b>Effective Weight (lbs)</b>
<b>New Section Lightweight Fill at 33 pcf above El. 99.5 and 27 pcf below El. 99.5</b> approximate new grade composite unit weight upper 6 feet of new section lightweight fill @ 27 pcf above El. 94 feet to El. 99.5 feet effective lightweight fill weight (79 pcf - 63 pcf) below El. 94 feet remaining fill effective weight with additional weight due to stone columns [(125 pcf +10 pcf) - 63 pcf] Total	<div>79</div> <div>27</div> <div>16</div> <div>72</div>	<div>103.0</div> <div>97.0</div> <div>94.0</div> <div>88.0</div> <div>72.0</div>	<div>6.0</div> <div>3.0</div> <div>6.0</div> <div>16.0</div>	<div>474.0</div> <div>81.0</div> <div>96.0</div> <div>1,152.0</div> <div>1,803.0</div>
<b>Existing Fill Section</b> existing grade fill above El. 94 feet effective fill weight (125 pcf - 63 pcf) below El. 94 feet Total	<div>125</div> <div>62</div>	<div>99.0</div> <div>94.0</div> <div>72.0</div> <div>88.0</div>	<div>5.0</div> <div>22.0</div> <div>27.0</div>	<div>625.0</div> <div>1,364.0</div> <div>1,989.0</div>

<<<---- 33 pcf for closed cell LCC to be used above the future high water table and 27 pcf for open cell LCC below the future high water table  
<<<---- new composite section calculated on page J-9  
<<<---- observed high groundwater level (El. 94 feet)  
  
<<<---- stone columns will increase the weight of the remaining fill section  
remaining fill depth is averaged over the entire ROW

<b>Check Load Compensation</b> Weight of Existing Section (lbs) Weight of New Section (lbs) % Old/New: Goal is > 110%	<div>1,989.0</div> <div>1,803.0</div> <div>110.3% ✓</div>
--	---

<b>Check Crushing</b> Maximum load on 1 square foot column (lbs) Compressive Strength (psi) Compressive Strength (psf) Compressive Strength/Actual Load	<div>1,803.0</div> <div>40.0</div> <div>5,760.0</div> <div>319.5% ✓</div>
---	---

<<<---- assumes everything below Elevation 99.5 feet has a saturated unit weight of 84 pcf  
<<<---- minimum compressive strength for Class III closed cell LCC

<b>Hydrostatic Uplift at the Bottom of the New Lightweight Fill Section</b> Elevation of future mid-range water table (MBD) Elevation of future high-range water table (MBD) Elevation bottom of light wt fill (MBD) Groundwater pressure head mid-range (ft) Groundwater pressure head high-range (ft) Unit weight of water (pcf) Hydrostatic uplift for mid-range Elevation 97 feet (lbs) Hydrostatic uplift for high-range Elevation 99.5 feet (lbs)	<div>97.0</div> <div>99.5</div> <div>88.0</div> <div>9.0</div> <div>11.5</div> <div>63.0</div> <div>567.0</div> <div>724.5</div>
---	--

<<<---- 2100 estimates of sea level rise per FEMA guidelines is 36 inches (El. 94 + 3 feet)  
<<<---- 2100 estimates of sea level rise per FEMA guidelines is 66 inches (El. 94 + 5.5 feet)

<b>Factor of Safety (FOS) Against Uplift (Assumes worst case if all closed cell LCC was used)</b> New section with water at mid-range Elevation 97 feet (new section weight / hydrostatic uplift)	<div>1.4</div>
New section with water at high-range Elevation 99.5 feet (new section weight / hydrostatic uplift)	<div>1.1</div>

<<<---- FOS against uplift assumes lightweight fill below water is all 33 pcf and that the hydrostatic pressure acts at the bottom of the section  
<<<----Since open cell LCC is proposed below Elevation 99.5 feet, no hydrostatic pressure should develop below or within the LCC section so FOS noted here is conservative. However, if all closed cell LCC was used, there would still be an adequate FOS

- Notes:
1. Calculation estimates the weight of the new section compared to the total fill section
  2. MBD = Mission Bay Datum, which is old San Francisco Datum +100'
  3. Calculations are for 1 square foot section of new ROW
  4. Factor of Safety against uplift assumes that the hydrostatic pressure acts act the bottom of the section

\*Not for construction; sections will be finalized once grades are finalized

Mission Rock Development Streets  
Compensating Fill Section Calculations  
Revised 30 May 2019  
750604203



Figure J-8

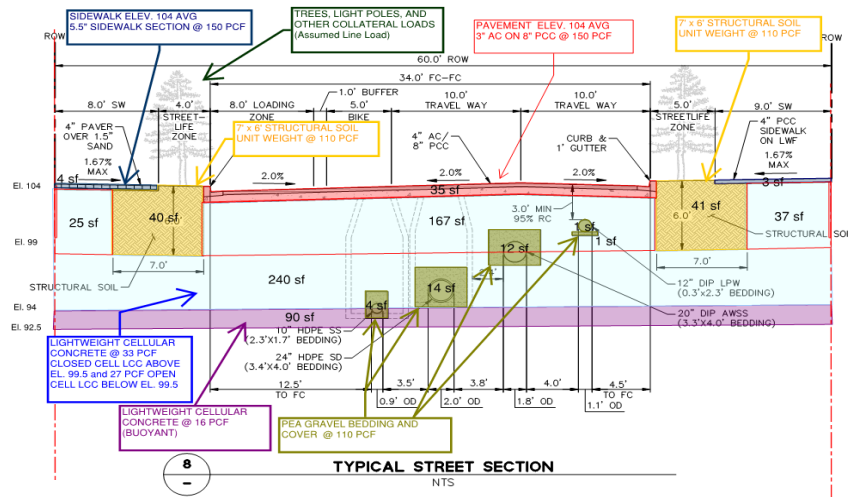
# Mayor ED 17-02 Priority permit

### New Composite Fill Average Unit Weight Calculation

	Area (sf)	Total Unit Weight (psf/ft)	Total Weight (plf)	
Structural Soil)	81	110	8910	
Trees, light poles, and other collateral weight	14	86	1204	<--average line load placed on top of Structural Soil area
Utilities, bedding, and shading (See calc. above for area)	32	-	3486	<--assumed to be within the upper 6 feet for ease in calculation
Sidewalk and Pavers	7	150	1050	
4" AB under Sidewalk, Pavers, Streets	16	130	2080	
Street Pavement Section	35	150	5250	area of LCC subtracted by the area of utilities, bedding, and shading
Remainder of 60 foot ROW is lightweight fill	181	32	5792	<-- total unit weight based on 1.5 feet of 27 pcf and 4.5 feet of 33 pcf LCC
Total	352	-	27772	(25+167+37)-total of utility, bedding, and shading area
<b>Average unit weight (total weight/total area)</b>		<b>79</b>		

Notes:

1. Typical Street Section prepared by BKF Engineers
2. Calculation averages the unit weight of the upper 5 feet of the lightweight fill section below the new pavement section and assumes the structural soil, utility bedding, utility shading, utilities, and lightweight fill are in that 5 foot section
3. Area of utilities and utility bedding and shading taken from a typical street section prepared by BKF Engineers
4. Assumes the entire unit weight of the utilities, bedding, and shading is 110 pcf
5. Unit weight of saturated structural soil assumed to be 110 pcf



	Bedding and cushion		Unit wt = 110		PCF				
	Width (ft)	Depth (ft)	Pipe diameter (ft)	Area of bedding and shading (sf)	Area of pipe (sf)	Weight of bedding and shading (plf)	Weight of pipe (plf)	Weight of fluid in pipe assuming full (plf)	Total weight (plf)
10" SS*	1.7	2.3	0.9	3.3	0.6	360	65	48	473
24" SD*	4.0	3.4	2.0	10.5	3.1	1,151	253	236	1,404
20" AWSS*	4.0	3.3	1.8	10.7	2.5	1,172	265	191	1,437
12" LPW	2.3	0.3	1.0	0.7	0.8	76	96	59	172
<b>Total</b>				<b>25.1</b>	<b>7.1</b>				<b>3,486</b>
*Assumed unit weight of bedding and shading = 110 pcf							Total Area (sf) =	32	
*Assumed unit weight of fluid in pipe = 75 pcf							Total Weight (plf) =	3,486	

Composite Fill Average Unit Weight Calculation  
Mission Rock Development Streets  
750604203  
1 February 2019

**LANGAN**

Figure J-9