**4/23/2020 Teams Call re: LCC at Mission Rock**

**City – TAP - MRP**

1. Review of report – Patrick reviewed the organization of the final addendum to the technical review report as outlined last week. Reviewing the Table of Contents, omitted sections are indicated in yellow; new, updated, and revised sections are included in these five volumes; and as the TAP finishes drafting sections, they will be seeded into this framework. There are bookmarks in the .pdf file to help readers navigate quicker to certain sections.
2. Factor of Safety (comment #22)

Scott Walker (Langan) described how the factor of safety has been updated and oriented to lightweight cellular concrete with changes reflected in the geotechnical report. The vast majority of the project has a factor of safety meeting 1.2 during the expected Sea Level Rise. With Sea Level Rise (66” at year 2100), the factor of safety reduces in small areas at worst case to 1.14. This occurs where thicker layers of Bay Mud or where the improvements are not as heavy at the edges. The elevation, per project datum is 99.5. John Thomas has noted the SLR guidance has changed over time. Scott says elevation 99.5 is about 6” below the finish elevation of Third Street.

Iqbhal discussed whether a higher factor of safety is needed because:

* 1. Ground water level (94.0) established based on 2 summers of data. Expected to be higher during rainy periods. Kit Tung states the memo correlates rain with groundwater
  2. Most likely SLR is 36”
     1. MRP has 94 + 3 = 97” which meets SLR
     2. What about storm surge? Over 100 years, that is 3.5 feet – How will that affect ground water elevation change?

Scott notes that the factor of safety is very conservative on all numbers. Langan has data from Mission Bay projects and the Pilot. Notes that spikes in elevation dissipate quickly and tidal lags as well. Can look into more data from other sites (Mission Bay). Kit believes the factor of safety figure should account for uncertainties.

Steve Bartlett (TAP member) argues against changing factors of safety that are industry norm. Instead asks whether the approach captured the best estimate of capacity/demand and captured the uncertainties. Noted the Pilot demonstrated no buoyancy at elevation 93. During rapid flooding of the pilot, there were no signs of uplift in the most extreme case when raising the elevation to 95.

Iqbhal – 1.1 to 1.2 factor of safety

Ray Lui observed the buoyancy test and is not arguing the uplift. Notes the potential problem is the **transition** zones, where there is not as much weight but the same buoyancy forces. Scott provided transition calculations that have a factor of safety of 1.3. Ray glanced at that and needs to dive into that analysis but he is concerned that 50 pcf (saturated desnisty) is the right number.

**TAP needs to opine that 50 is the right number**

Pilot data was seemingly all over the place – And saturation data ranged from 30 to 68

Stan Peters (TAP member) states the saturated densities were higher than target and tend to be higher in small placements when dialing in and tweaking the initial product. Can control the density very well even though foam voids are variable. Stan explains why permeability differs from field testing compared with laboratory testing, saturated density as well. Scott has higher confidence in the laboratory results.

Kit reviewing NCHRP report 529 notes is a standard for geofoam and may not be appropriate for LCC. Steve Bartlett notes that factor of safety is for geofoam but disagrees that a different factor of safety should be used. Steve notes a 1.2 factor of safety for buoyancy has become the standard. Kit asks even though LCC is not as consistent?

Steve disagrees that you should change factor of safety based on material. Kit found Bartlett paper noting 1.3 Factor of safety. Bartlett notes that the factor of safety is different because of design event, not because of a difference in the material type. Bartlett continues to stand by his opinion.

Scott has calculations to show something helpful about the factor of safety. Scott has calculations in the Supplemental Recommendations 12 Feb 2020 that described the calculation of the 50 pcf and the 68 pcf and that they used 50 pcf taken from the Pilot project test data.

**What is the rationale or how did they come up with the 50?**

**Same question for the 68? Show the calculations from the excel tables**

Suzanne notes they continue to be concerned about the factor of safety.

1. Settlement Issue (comment nos. 7 and 31)

Scott states the October 2019 geotechnical report recommends 1.5 inches of heave and 1.5 inches of settlement over the life project wide (see page 21). This is needed due to unloading of the Bay Mud due to long term raising of groundwater will result in buoyant forces and rebound swell. In neighboring areas of Mission Bay, one would expect to see in excess of 1 inch of heave.

Settlement is highly variable. They don’t expect much settlement but believe 1.5 inches is prudent. James Dallosta has allowed for 1.5” over 75 feet per the Langan recommendations. Pipelines are lower and deeper to account for this recommendation. BKF has included considerations for heave and settlement in the design and can be accommodated through the gravity flows placement and the flexible connections.

Iqbhal asked if there is net unloading? Scott confirmed yes. And settlement between buildings and streets could be 1.5” up or down? Scott confirmed yes. Then will adjustment occur on the private side of ROW? Steve Minden (MRP) confirmed true, the architects on private buildings will provide 4-6 feet vestibule which could be adjusted by changing the slope or will adjust some other way inside the building.

Iqbhal asked if crosswalks would potentially have accessibility concerns. Streets have ACWS. Without knowing where heave occurs, the maintenance strategy may be grind and overlay to adjust. Julian Pancoast (MRP) stated the City’s Jurisdictional MOU has the Port responsible for repairs to sidewalks – the Port would contract this out to the Master HOA. Street corners are excluded along with curb ramps.

Derek Adams (SFPUC) states their projects have a 0.5 inch settlement criteria to ensure pipes operate through sagging and keep from breaking. Derek asked if 0.5 inch localized differential settlement is achievable? Steve Bartlett says the practice to calculate differential settlement is to take global settlement of 1.5 inches and divide by 2 to get 0.75 inches. It is hard to know where this type of settlement may occur. Scott notes that this project is not like an off the shelf project.

Derek asked whether the resiliency built into the project applies to the only the slope of the pipe or helps with things like damage to manholes. Derek notes that he thinks if there was a damaged pipe then MRP would just state that the damage was due to lack of maintenance. Need follow up settlement monitoring program so that if there is settlement and then there is damage there is a way to trigger warranty. Derek would like 0.5 inch differential settlement to be the 10 year warranty standard. Not as concerned with localized ponding. This amount is considered damage to the system. Scott asked what is the length over 0.5 inches?

Suzanne inquired about the calculations for differential settlement – Scott says that there is not way to calculate the 1.5 inches. Suzanne says that her breath was taken away by that statement. Lori notes that there is a calculation in one report showing 1 inch settlement. Lori Simpson and Scott came up with a 1.5 number due to unknowns and variability. They cannot predict the sub surface conditions every 20 feet Lori notes that disturbing the upper Bay Mud layer needs to be accounted for since the fill layer varies in thickness and composition. Most of the uncertainty is due to SLR stresses. In the event of 10 years of SLR, Lori recommend that the design accounts for differential settlement.

Julian says that MRP proposed “failure criteria” as damage to pipes as the criteria. They do not prefer a settlement figure but would go with 1.5” for the life of the project if they had to select a measurable figure.

Derek stated 1.5” is not a great number for 10 years. There is agreement that 1.5 is not predicted for 10 years. Scott has calculated less than 0.5 inches for the heave within the 10 year window. SFPUC remains concerned about these criteria

1. Next Steps
   1. TAP responses coming – Working towards next Tues for submittal
   2. City internal discussion on factor of safety and settlement