MEMORANDUM

To: Louis A. DePasquale, City Manager

From: Brendon Roy, Construction Program Manager
David Kale, Assistant City Manager for Finance
Owen O'Riordan, Commissioner, Public Works Department

Date: September 7, 2021

Re: Response to City Council Calendar Item #4 of June 28, 2021

Introduction

The design team of Perkins Eastman and CDM Smith with input from the general contractor Rich KBE and members of the City staff assigned to the project undertook an evaluation of the Tobin Montessori and Vassal Lane Upper Schools construction project sequencing and soil management, stormwater management (1.25 MG stormwater tank), and site constraints and opportunities, and evaluated the potential to save and/or relocate the three mature oak trees to the west of the existing Tobin Montessori and Vassal Lane Schools. There are unique, overlapping, and competing needs associated with the site area, both on the surface and below. The complexity of the building demolition, site reconfiguration, and construction of the new building, stormwater tank, and open space amenities essentially negate the possibility of preserving the three large oak trees.

The new Tobin Montessori and Vassal Lane Upper Schools, when complete, will provide the very best an educational facility can provide and will do so in an architecturally handsome building that will present a welcoming community facility to the attending students and neighbors. The project when finished will also accommodate more open space than the present site. The open space will be roughly half an acre greater than that which exists today. The facility will also add an underground stormwater management tank and pumping system, the largest yet built in the city, that will accommodate over a million gallons of flood waters that would otherwise end up in neighbors' homes along the adjacent streets. The site will also include a system of swales and rain gardens allowing neighbors and children to more fully understand how natural systems can create and sustain beautiful landscapes and polish stormwater before it is ultimately released back into the adjacent river systems. Finally, the landscape plan will also provide for the planting of hundreds of additional trees, that will, at maturity more than double the preconstruction canopy over the site.

Subsequent to and in conjunction with the decision to locate the new school at the location of the existing facility, the building design team initiated the design process associated with the management of the subsurface conditions associated with the Father Callanan Playground site that is adjacent to the school. As has been discussed during the public process, there exists a significant volume of waste material around and beneath the existing school building. The challenge for the design team was how to adequately manage this material so as to allow the necessary demolition of the existing building to take place and to then put in place the necessary controls to allow the new building to be built in a safe,

environmentally sensitive and cost-effective way. The challenge was further complicated by the need to control groundwater where the groundwater table is uniquely high while building a large underground parking facility associated with the school. The underground parking facility was necessary to preserve and maximize open space associated with the site.

Preparing the site

The area was once used for clay mining. After mining activities ceased, the clay pit was used as an uncontrolled waste pit (1930s through the 1950s) prior to development of the currently existing school and recreational fields. There is significant variability in the content, consistency, and depth of the waste layer across the site. It was determined early in the design process of the existing school to leave the landfill material in place and to address remediation needs through in-situ stabilization of the soils. This process solidifies the waste materials, allowing the waste to remain in place, and stabilizes the ground for foundation and excavation support.

The following are the sequential steps associated with the site specific to soil management, building demolition and the initiation of the construction of the new school: After the above ground structure associated with the existing school is demolished, the contractor will use the existing basement floor to gain access to and stabilize the soil below that structure which will then allow that soil to be managed appropriately in the building of the below grade parking garage constructed as part of the new school. To complete this work, the soil in the surrounding area must be stabilized. A combination of methods will be used to create this soil stabilization. A soilcrete (barrier) wall will be constructed to the north of the school building running along the site from east to west and then an in-situ soil solidification system extending the entirety of the site immediately to the south of the soilcrete wall will be used as the means to successfully stabilize the remaining soil. This will enable the foundations, basement garage and the surrounding utilities to be constructed in a safe way, thus enabling the new school to be built over the old building site. A key aspect of this operation is enabling the contractor to work within the existing basement to stabilize the soil underneath it. To be able to adequately perform this task, the surrounding soil must be stabilized and operate as an impermeable barrier preventing groundwater from inundating the site. Hence the need to solidify the surrounding soil and the need to build the barrier wall to the north of the site to prevent the north-south flow of groundwater, to prevent sloughing into the excavated area, and to perform a controlled excavation of the new underground parking garage and the utilities servicing the building.

The in-situ stabilization process involves very large equipment. One option is to use an auguring drill with an auger that would be between 6 to 9 feet in diameter with the ability to drill to 25-30 feet below grade. Considering the depth to which this equipment is required to drill and recognizing that it drills in a vertical direction, the equipment will stand up to 40 feet above the surface as well. Given the extent of the stabilization work south of the soilcrete wall, the use of this equipment would require all above surface and below surface obstacles to be removed in advance. This obviously impacts our ability to save the trees.

The alternative method would be the use of very large excavators to complete this soil stabilization work. This would require the mixing of the material as it is being excavated. This method would require any and all objects that are above or below grade to be removed in advance of the excavation/mixing work taking place and would again involve the removal of the trees in advance of the excavation activity.

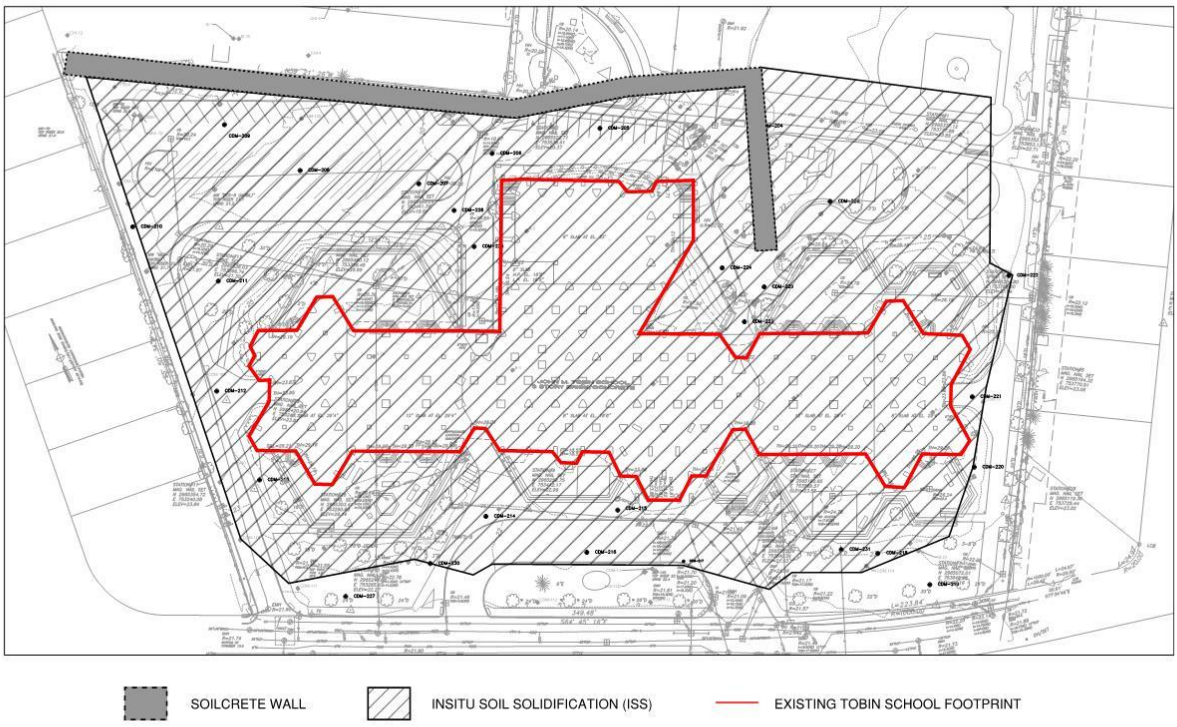

Figure 1 : Soilcrete wall and Soil Solidification area.

The Stormwater Control Facilities at the Tobin School.

The purpose of the Tobin Stormwater Tank is to reduce inundation for the 10-year, 24-hour 2070 storm event at the Vassal Lane and Standish Street intersection and at the lower reaches of the Concord Avenue catchment. A hydraulic analysis was completed in March 2019 to evaluate flood reduction performance of different system storage configurations under the targeted storm events. The selected configuration is a 1.25 million gallons (MG) below grade storage tank together with 100,000 gallons of surface storage within a bioretention rain garden. The tank would be cast-in-place concrete construction pitched towards a wet well that will contain a sump pit and submersible pumps.

The stormwater tank is to be placed underneath the proposed bus turnaround on the western side of the new school, underneath the space occupied by the oak trees that need to be felled in conjunction with the soil stabilization around the new school building. The tank location is advantageous over other locations on the site because:

(1) It is in an area that will already be stabilized (south of the soilcrete wall),

(2) The bus turnaround will provide a reasonable access area for large vehicles (vactor trucks, pump maintenance trucks etc.) associated with maintenance of the stormwater facility,

(3) The access and ventilation structures associated with the tank will be accommodatable within the bus turn around area and will not interfere with open space uses,

(4) The location is on the western side of the school near the drainage diversion structures on both Concord Avenue and Vassal Lane, minimizing new conveyance pipe construction and maximizing conveyance capacity. (These diversion structures were placed during the sewer separation projects to minimize future construction in both Vassal Lane and Concord Ave), and

(5) More stormwater needs to be conveyed to the tank from the Vassal Lane side.

Review of the Existing Design and Construction Plan

The City Council Order of June 28th requests that the departments associated with the project together with those contracted to build the new facilities report on the feasibility of reconsidering the current plan, most particularly with an eye to preserving the three oak trees on the western side of the site. In response, the project team has revisited the design and construction program to see if such could be achieved, while at the same time maintaining the schedule for the school project and preserving the various program and infrastructure elements associated with the project.

The project team met on numerous occasions over the last two months to review potential options that would allow for the three oak trees on the western side of the existing school to remain. Options reviewed included re-evaluation of the location for the soilcrete wall and soil stabilization for construction of the new building, relocation of the stormwater tank and the transplantation of the trees to an alternative location.

As was indicated earlier, the demolition of the existing school and its associated concrete patio will only be completed after the soil stabilization around the site has been completed. The concrete patios extend beyond the main building and are supported by battered timber piles that angle outward from the patios and provide lateral as well as vertical support to the patios. The project team has considered a realignment of the soilcrete wall that, rather than extending entirely to the site boundary on the western side of the site would, at the western side of the building extend in a southerly direction toward the driveway associated with the present parking lot. Given the existence of the battered piles and the necessity to excavate and place both a water pipeline [line?] and sewer service pipeline between the school and the soilcrete wall, the wall would need to extend through the trunk of the 30" oak tree and into the dripline of the southernmost 20" oak tree. The best-case scenario in considering this option would be the slight possibility of the preservation of the 20 " oak tree furthest to the west. This scenario is based on relocating the stormwater tank somewhere else on the site. It is also important to bear in mind that the large stormwater service line (42" in diameter) from the diversion structure on Vassal Lane will also need to be constructed within the stabilized soil area, thereby pushing the soilcrete wall further to the west again. The above exercise indicates that only one of the three trees *could potentially* be saved. It should be recognized that given the proximity of the construction effort associated with the soilcrete wall and the soil stabilization, preserving the remaining 20" tree from being damaged by this work would be challenging at best, if not impossible.

The stormwater tank would also need to be relocated to an alternative place within the site and would potentially need an additional soilcrete wall and soil stabilization as part of the preconstruction work associated with an alternative location. In furtherance of this exercise the team considered the Massachusetts National Guard's Armory site off Concord Avenue as an alternative location for the stormwater tank. At this time the City has just begun a discussion about potentially purchasing the property -with the Massachusetts National Guard, and there is no guarantee that there will be a positive outcome. The City's request to purchase the property is presently before the Armory Committee for review, thus limiting our ability to review this location as a feasible alternative location. The uncertainty associated with this alternative location makes it unfeasible.

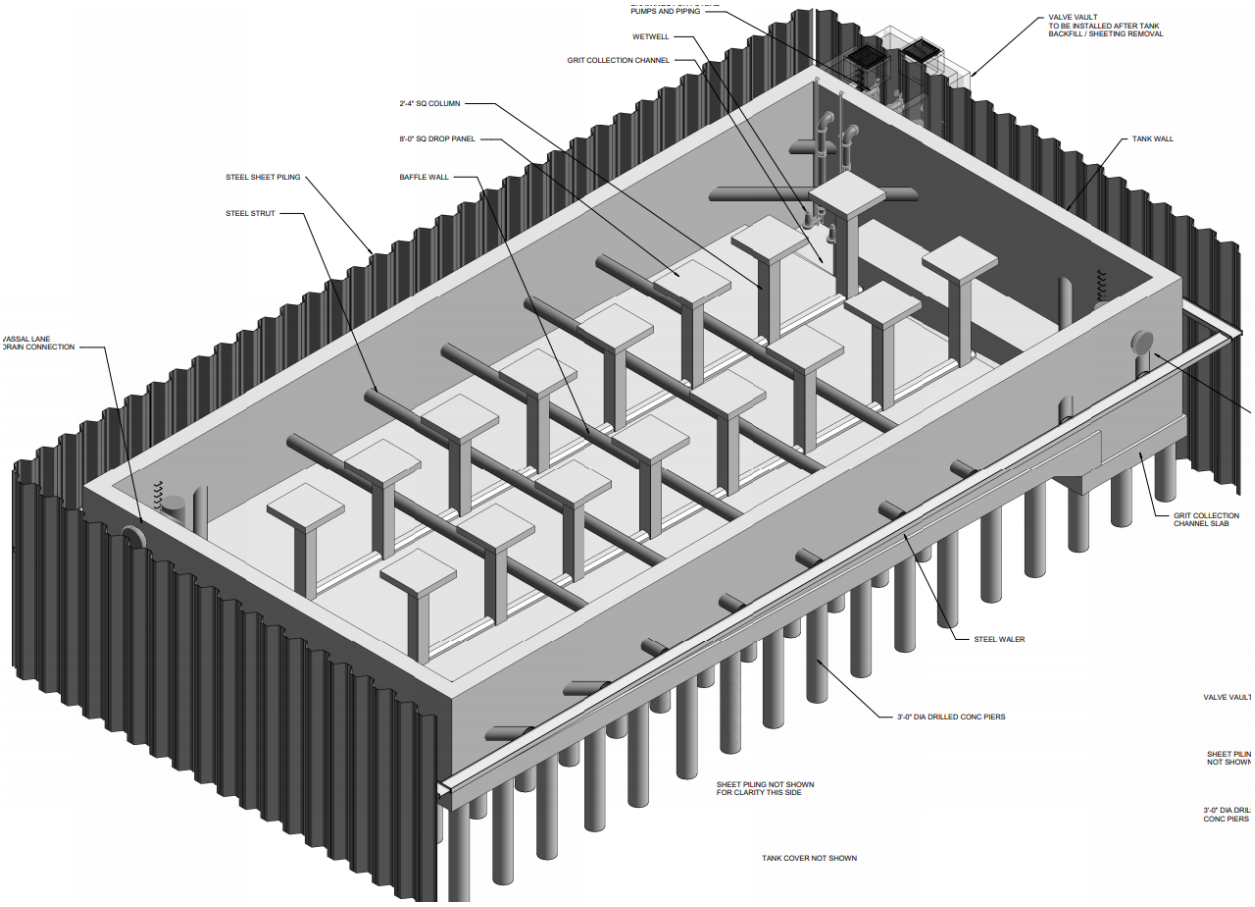

Figure 2: The stormwater tank

In completing this exercise, it should be noted that if the stormwater tank is to remain in its current location the excavation associated with the stormwater tank is much deeper than that associated with the school. The excavation extends approximately 35'-40' feet below grade and will be supported by a system of caissons which will take a considerable period to place below the tank. Given the depth associated with the tank, this work must be completed before excavation associated with the underground garage for the school commences, otherwise, it will create a significantly more challenging supportive excavation process. The above is stated to recognize that sequentially, the stormwater tank

construction must proceed as an early exercise associated with the project and is on the project's critical path. A delay in constructing the tank will lead to a delay in constructing the school.

Transplanting Feasibility

The project team reviewed the existing trees on site to see if any were suitable for transplanting, with a particular focus on the three oak trees. The team engaged the services of Matthew Foti, whose company specializes in transplanting trees. Their review was conducted on June 29, 2021, and the team received their report on July 9, 2021. The conclusion of the report was the three large oak trees are not suitable for transplanting due to the following concerns:

- A successful tree transplantation requires that the tree to be transplanted has a proportionately large root mass area that can be transplanted with it. The root area available with these trees is too limited to maintain the root mass necessary for a successful transplantation. This is primarily due to the adjacency of hard surfaces such as the existing asphalt parking lot and driveway and the patio walls associated with the school limiting the spread of the existing roots.
- The three trees lack symmetrical root systems due to the adjacent hard spaces, and transplanting trees of this size with this lack of symmetry would cause them to lack stability at their new locations.
- Lack of available locations for on-site transplanting, as the entire site will be under construction for multiple years; and
- Infeasibility of moving offsite due to the tree sizes and having to negotiate various obstacles like telephone poles and wires, other trees, etc. along the route to an alternative site.

Landscape Design associated with the new school and Callahan Field

The proposed site plan for the Tobin Montessori and Vassal Lane Upper Schools Project features a variety of site improvements for both school and community use, including several playgrounds, outdoor dining spaces, recreational fields, basketball court, multi-use paths, gardens, outdoor classrooms, and stormwater features. The new design will increase the amount of both passive and active outdoor green space, decrease impervious area, and manage on and off-site stormwater to reduce flooding and improve water quality. The proposed plan will protect 37 existing, mature trees along the perimeter of the property and introduce 374 new trees of a variety of species.

The proposed landscape design draws inspiration from the historic and natural characteristics of the site's surroundings. Research of historic maps indicate that the neighborhood surrounding Fresh Pond was classified as the "Great Swamp" from as early as the 1600s. As people settled the area and the ice industry took to Fresh Pond, buildings, roads, and train tracks were constructed amidst the diversity of forested swamps and ponds. The Tobin site was eventually quarried as a source of clay for making bricks and subsequently filled in as a waste site prior to becoming the playground and school grounds of today.

The proposed design aims to heal and restore the ecological conditions of the landscape. Multiple planting palettes will be organized across the site in groups that recreate and mimic the natural diversity the area once had. These small-scale ecosystems are arranged on site in a way that parallels the growth

of students and their sequence through the school with changes in elevation, water flows, and vegetation within the landscape. Preschool students will engage with low-lying landscape conditions and eventually graduate their way to the higher, upland-like spaces on site with dense trees and more topography. By restoring the site's diverse ecological services, the school site can remediate stormwater while being utilized as an educational tool and a vibrant outdoor space.

Highlighting and engaging environmental sustainability is a vital component to the proposed design. The large palette of native plant types will introduce biodiversity to the site with little need for supplemental water. Working together with topography, plants will capture, hold, and filter stormwater from new roof areas, neighboring streets, and on-site hardscape areas via a network of large bioretention basins, small rain gardens, and grassed swales. A portion of this water will be directed to a subsurface holding tank to be reused as a source of water to irrigate the recreation fields. The environmental features have been thoughtfully integrated into the play and gathering spaces on-site to promote engagement and interaction from the students and community members who use them. Educational signage will be placed throughout the site to assist in the educational qualities of these features, allowing the community to better understand the environmental and sustainable benefits of the proposed site as well its history and past land uses.

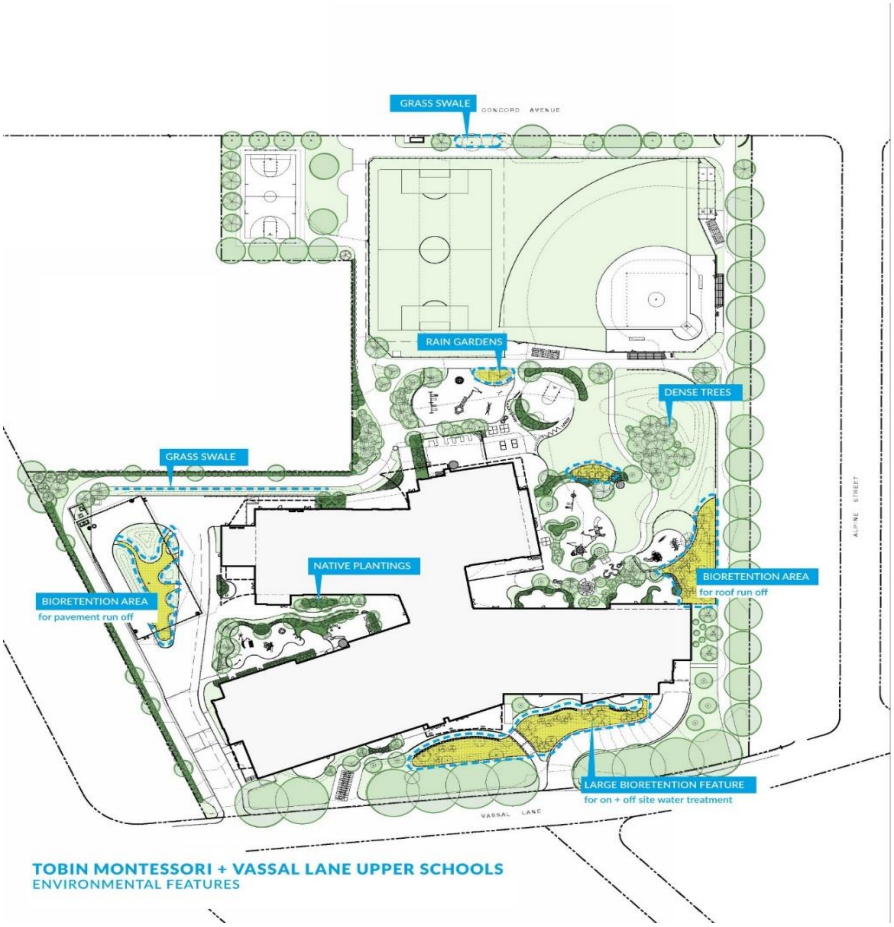

Figure 3: The proposed Landscape plan

Tree Canopy.

A primary objective of the project team at the start of the project was to insure the mature oak trees along Vassal Lane were protected and preserved as well as the oak trees along the eastern side of the site that provide a buffer between the Alpine Street neighbors and the school itself. The remaining 107 trees needed to be removed so that the project could move forward. Of those trees to be removed more than fifty percent (58 trees) were not significant as defined by the City ordinance i.e., less than 6 inches DBH. The City also removed an additional thirteen trees on, or adjacent to Concord Avenue because they were in poor condition.

While the landscape plan associated with the project is not yet final, the project presently expects to plant 374 new trees throughout the site. Most of these new trees will be four inches DBH and above at the time of planting. The new trees will be irrigated, and for those planted within the soil stabilized area south of the soilcrete wall those trees will also have a drainage system in place.

Despite the loss of canopy because of the new school construction, the proposed planting plan will provide improvements to the *quality* of the canopy across the site. By introducing a large and diverse selection of both plant species and types, the design will establish a variety of plant communities that will bring layers of ecosystem services with it and as the trees mature, they will enhance the experience for neighbors and school children as they walk the pedestrian corridors and take advantage of the recreated open spaces.

Figure 3: Illustration of Canopy Growth

Finally, over time the expectation is that, given the additional plantings that are proposed together with the additional care associated with the new trees, the canopy associated with the proposed planting will significantly exceed the canopy coverage previously provided by the old canopy (18%). It is estimated that within 5 years of the project completion i.e., 2030 the new canopy will be within 12% of the size of the existing canopy and that by 2040 the new canopy is projected to be approximately 3,000 square feet larger than the existing canopy would have been at that same time. Finally, at maturity it is expected that the project area will have a canopy coverage of 47% of the entire site, which is approximately 77% greater than the anticipated canopy coverage for the old canopy (26%) at maturity.

Figure 4: Canopy Coverage over time.

Conclusion

The building of the new Tobin Montessori and Vassal Lane Upper Schools complex and associated stormwater management systems comes with significant challenges and when considered in conjunction with the history of the site become even more daunting. It is important to finish this project by summer of 2025 so that students can move into the new building in September after having been displaced for 4 years. Any further changes to the current design program would cause significant delays. The preservation and enlargement of open space necessitated the design of an underground parking garage under the new school. Given the soil and groundwater conditions the design and construction of an underground parking garage involves elaborate, extensive, and challenging preconstruction soil stabilization work. The necessity of the soil stabilization work has ultimately led to the loss of healthy and sizable oak trees along the western edge of the site. The existing design and construction program associated with the school and the stormwater tank has been further reviewed by the various designers

and contractors for the project. While consideration was given to relocating the tank to a potential alternative location, the benefit associated with doing so would only potentially provide for the securing of one of the three oak trees with no guarantee of saving the one tree and would involve considerable increased costs associated with additional soil stabilization, redesign, schedule impacts, etc.

Given the lack of certainty associated with an alternative site for the stormwater tank, the inability to transplant the three oak trees and the need for an immediate decision to ensure the school schedule, it is concluded that the only reasonable decision is to proceed with the existing design which has been thoroughly reviewed with the school and neighborhood communities, recognizing that the three oak trees must be removed to move the project forward in accordance with the schedule to have the school open for the community's children by September 2025.