

Downtown Mall Vehicular Crossings Illustrative Repair Concepts



December 2024

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The City of Charlottesville's Downtown Pedestrian Mall Vehicular Crossings, at 4th Street East and 2nd Street West, exhibit signs of distress within the paving systems, namely the brick, granite and cast stone pavers along and within the areas defined as a "crossing." The distress within the paving system is well documented within the June 2022 Engineering Evaluation of the crossings. A summary of this evaluation is on Page 3 of this document.

Like all paving systems which carry vehicular traffic, the downtown mall crossings are subject to many different kinds of vehicular loads induced into the paving system by actions such as starting and stopping of vehicles (braking and accelerating forces), as well as forces induced into the system by the turning of vehicle wheels. Such forces can adequately be resisted by paving systems which have been designed for such loads. However, as will become evident in the case of the downtown mall's vehicular crossings - there is a conflict between the paving systems which have been installed in accordance with the original Lawrence Halprin design of the mall (which did not include vehicular crossings) and the requirements of paving systems which need to continuously resist the forces and loads induced by vehicles.

In short, the City is at a decision point in terms of what the correct approach to repair the crossings will be. If the downtown mall continues to provide vehicular crossings, then these crossings should be comprised of paving systems and installation details capable to bear the burden of vehicles. Or, conversely, if it is important to maintain the pedestrian mall's paving patterns with granite bandings located in specific and intentional intervals, then the City should consider whether or not it is appropriate for vehicles to cross the mall at all.

Which is to say: if the downtown mall will continue to provide the opportunity for vehicles to cross the mall, then an adaption to the Halprin design paving pattern is likely in order to ensure the safety and serviceability of the paving materials and those who walk (or drive) across the mall's crossings. If on the other hand, the City is willing to close the crossings to vehicles, then the repaired conditions of the downtown mall can uphold the Halprin design and paving pattern.

Certainly this decision requires careful thought and consideration. However, as the 2022 Engineering Analysis clearly presents, modular paving systems require specific installation parameters to be maintained. These parameters are presented as best practices and detailed by respected Technical Institutes. Pavers of certain sizes, orientations or within certain paving patterns may not perform as intended when subject to vehicular loads, while performing just fine under pedestrian foot traffic.

This conceptual document presents ideas related to repairing the downtown mall crossings and providing for details and installation techniques which can withstand and perform under the vehicular loads as well as ideas which close the mall to vehicles at the crossings. Within these considerations there are two primary questions which rise to the surface:

- 1) If the downtown mall crossings are to remain open to vehicles, what should the City consider as an appropriate width of the crossing which is available to vehicles? Wider or narrower crossing zones can be accomplished - with an emphasis likely on narrower crossings.
- 2) If the crossings are closed to vehicles, should the City consider extending the pedestrian mall outward toward Market Street or Water Street at 4th Street and 2nd Street. Closing the mall crossings will necessitate a vehicle management strategy to deter from turning into these streets. Each of the existing crossing streets along the downtown mall exhibit different approaches to solving this challenge.

From a purely technical perspective, both options have merit and are easily accomplished. However, given the importance of the Downtown Mall as the heart of the City's business district, and the role the Downtown Mall plays within the Charlottesville community (and the surrounding communities) this decision is not an easy matter to resolve. The concepts presented herein are offered to foster discussion and dialogue with stakeholders.



Typical condition of granite pavers. The broken pavers have been replaced with asphalt patches. The asphalt patch is not an effective edge restraint for the brick paving field so the forces acting upon the brick cannot be adequately resisted and the brick within the field of pavers have begun to deflect and move.



The failed drainage runnel, which was acting as an edge restraint (unintentionally), has allowed the brick paving field to begin to move as there is no firm edge available. However, note that the brick are still serviceable even though they have begun to become unstable. Tightly packed sand swept joints may have helped protect against some of this movement.



Photo represents the typical condition of the runnels on the downtown mall. Note the lack of mortar remaining between the original brick. (This photo was taken of a drainage runnel along the mall and not within the vehicular crossing because the vehicular crossing runnels have been covered with asphalt).



Salvaged brick banding adjacent to the concrete speed hump. Note the broken mortar, disheveled brick orientation (due to movement) and the brick paving field beginning to deflect as a result of the failed edge restraint.



Tactile warning Pavers (12"x12") adjacent to the 2nd Street East crossing. Note the condition of the tactile warning pavers in comparison to the granite bandings which run perpendicular to the flow of traffic. The granite banding is subject to substantially more frequent vehicular loads but also different loads than the tactile warning pavers.



Photograph of the 4th Street East vehicular crossing indicating the serviceable and sound condition of the vast majority of the brick pavers.

In 1976 the City of Charlottesville renovated Main Street into the pedestrian mall. The roadway was converted into a brick paved hardscape comprised of mortar set brick pavers laid at a 3:1 herringbone pattern with concrete bandings at regular intervals. The original pedestrian mall also installed two drainage runnels along either side of the mall corridor representing the location of Main Street's curb line.

In 2008-2009 the Downtown Mall was renovated, and the mortar set pavers were removed and replaced with a sand-set paving system for the vast majority of the downtown mall. The paving pattern remains a 3:1 herringbone and the original runnels were reconstructed in the original locations. The runnels were reconstructed as mortar set brick.

Brick paving systems (also referred to as clay paving systems), when designed, specified and installed properly are incredibly durable and serviceable paving sections capable to thrive in nearly any environment – pedestrian and vehicular. The disrepair observed at the Downtown Mall's vehicular crossings are a result of paving section system having been installed in a manner that was not consistent with published guidance. Within the Downtown Mall Crossings we see four programmatic elements to be considered:

DRAINAGE RUNNELS

The drainage runnels within the vehicular crossing have been constructed using salvaged brick, and have been installed in a bond patterns which have continuous joints (like stack bond). Both of these parameters lead to less than desirable conditions for clay paving systems, particularly when the drainage runnel ends up acting as an edge restraint within the paving system.

GRANITE BANDING

With few exceptions, the granite pavers within the vehicular crossings have reached a failed condition. Many of the granite pavers have been removed and patched with asphalt. Asphalt, which is a flexible paving material (as compared to a rigid paving section), is not capable of serving as an edge restraint to the brick pavers. Therefore, the brick pavers adjacent to the asphalt patches are subject to deflection and movement as is documented in the images at left.

Based on a review of the 2007 renovation construction documents the granite pavers are mortar set. No sand was visible between the joints. The granite pavers measure 12" x 24" which is a 2:1 ratio, however, the bond pattern is a stack bond, which is a bond pattern that does not effectively resist horizontal or rotational forces. Vehicles using this crossing are subject to numerous starts and stops as pedestrians have the Right-of-Way, and therefore the braking and accelerating (stopping and starting) forces on these pavers are a huge factor in the condition of the crossings.

EDGE RESTRAINTS

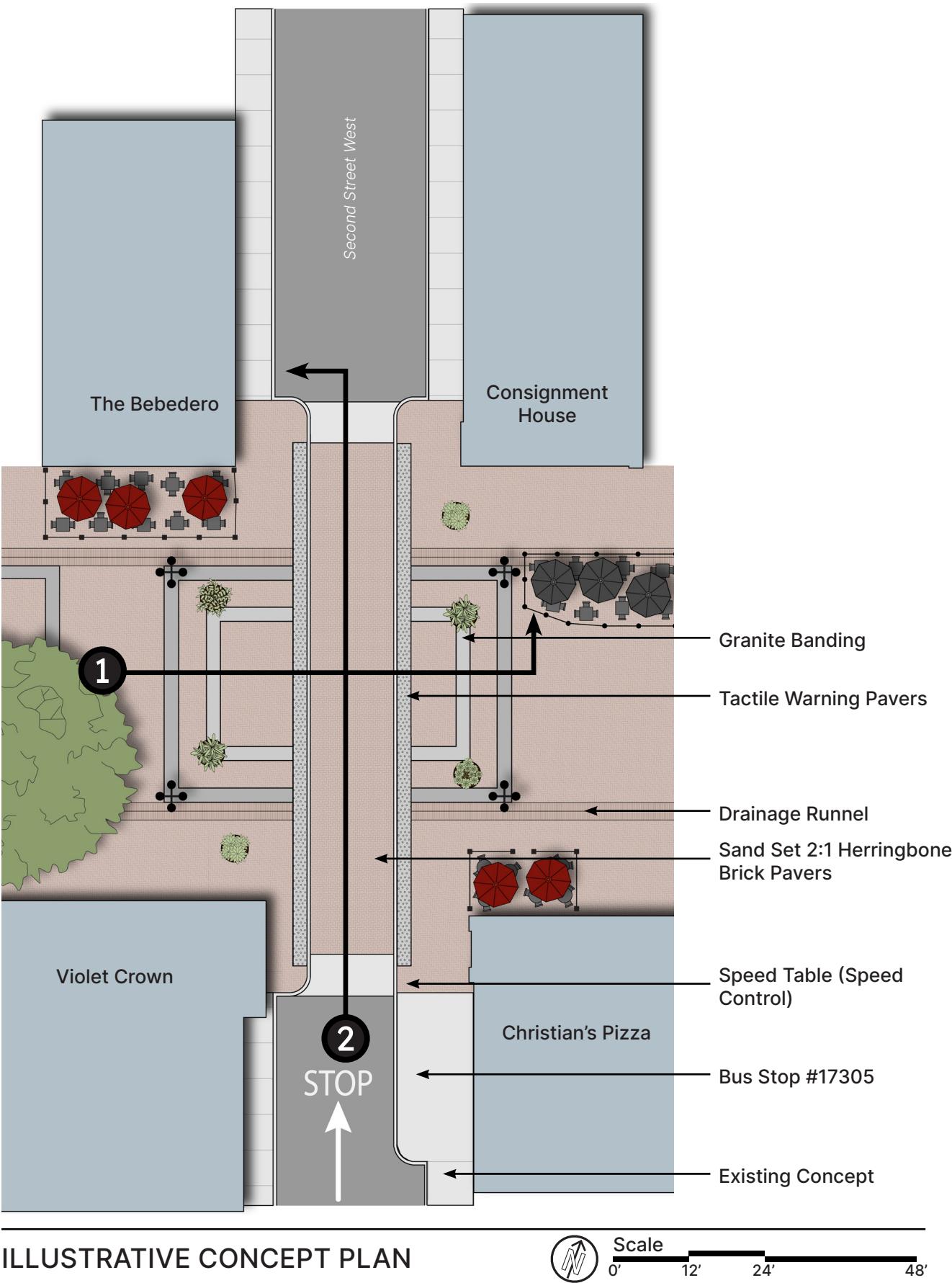
The vehicular crossings are effectively constrained on all 4 sides. Two (2) sides comprised of the ADA tactile warning pavers, and two (2) sides adjacent to the speed humps entering and leaving the vehicular crossing. The edge restraint along the entering and exiting thresholds of the vehicular crossings is not the cast-in-place concrete speed hump but the mortar set brick banding adjacent to the speed hump. Similar to the drainage runnels, this brick banding edge restraint is comprised of salvaged brick set in mortar. The mortar has broken (perhaps because a mortar with the wrong material properties was used) and the bond between the brick and mortar is non-existent. As a result, this brick banding is not capable of supplying the rigid restraint needed for the brick paving field, and the lack of a firm restraint enables the paving field to further deflect.

The edge restraints along the sides flanking the lateral edges of the vehicular crossing are comprised by the ADA tactile warning pavers which are 12"x12" pavers set in mortar. Interestingly, these pavers appear to be in much better condition than many other attributes of the vehicular crossings. With the exception of the east side of the 4th Street crossing where the ADA pavers have been replaced with a "yellow" tactile warning pad/strip (presumably because the pavers failed) all of the ADA tactile warning pavers appeared in serviceable condition. These pavers are not subject to the same forces as the rest of the pave field namely the braking and acceleration forces. That said, they are subject to rotational forces as numerous cars pull to the side of the vehicular crossing to drop off or pick up pedestrians. These rotational forces have loosened many of the ADA pavers and required many others to be replaced. Nonetheless the conditions appear serviceable.

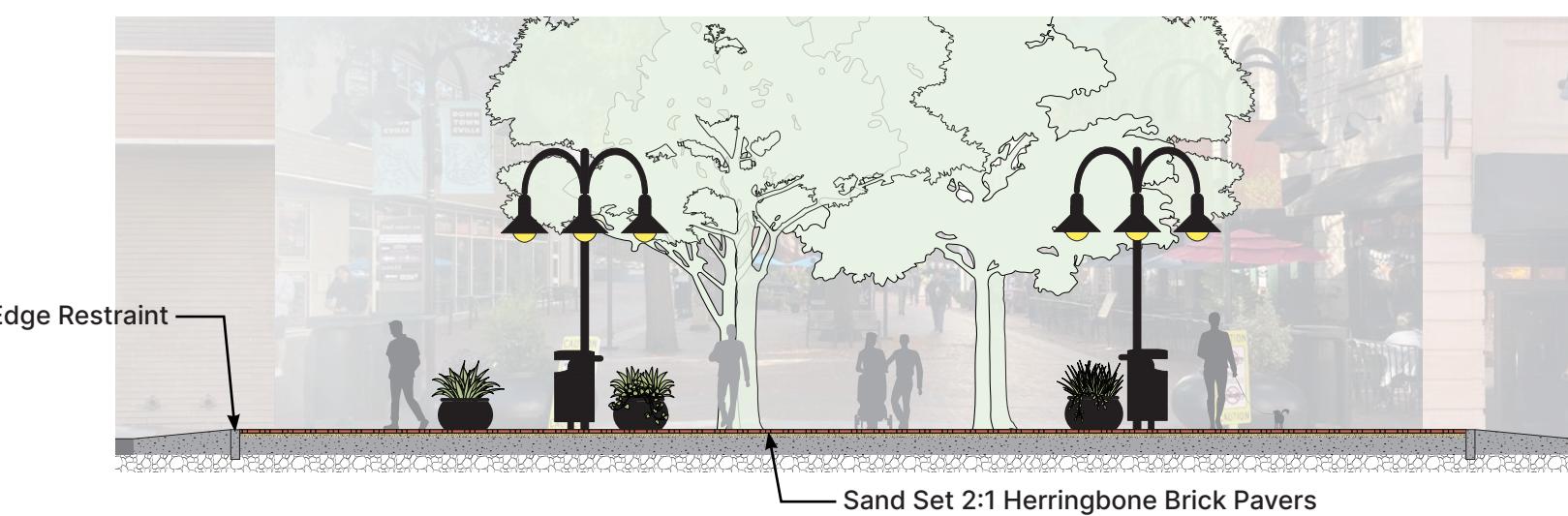
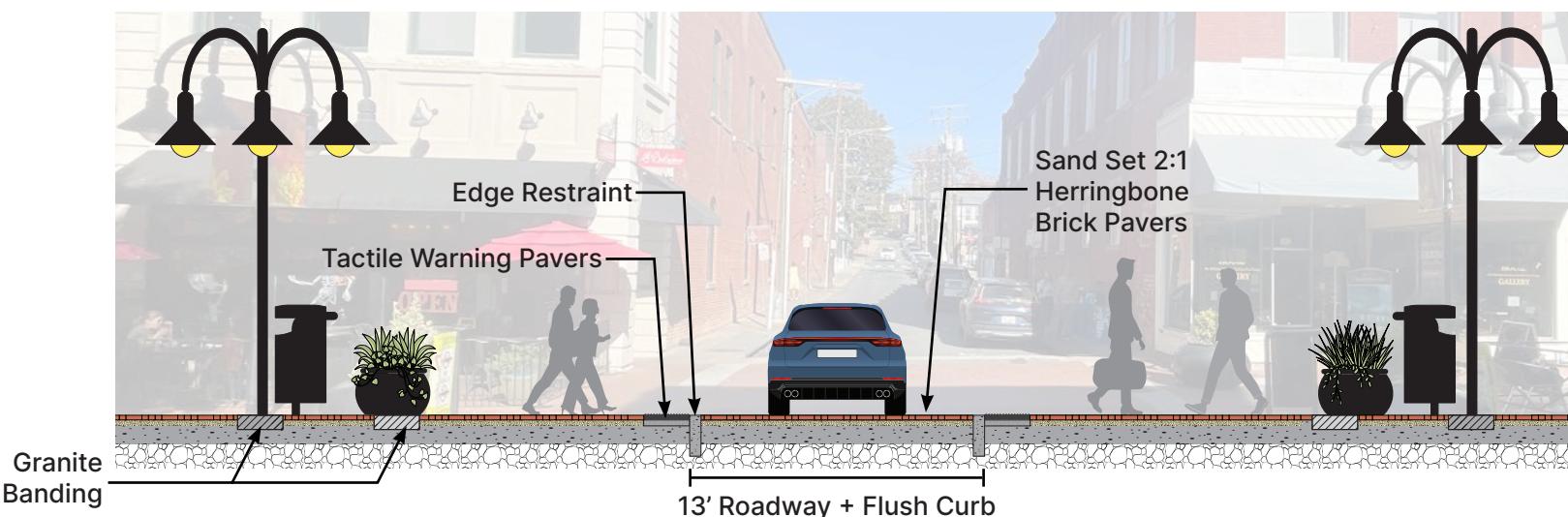
FIELD OF BRICK PAVERS

With the exception of brick pavers which are adjacent to, or near to, the failed edge restraints (these pavers have deflected, migrated or otherwise indicate disrepair) the brick paving fields themselves are in remarkable condition. This is interesting because so much of what characterized the vehicular crossings is a "failed condition". Nonetheless the brick paving fields, and by brick paving field we mean a large uninterrupted area of brick pavers, appear fully serviceable and in sound condition.

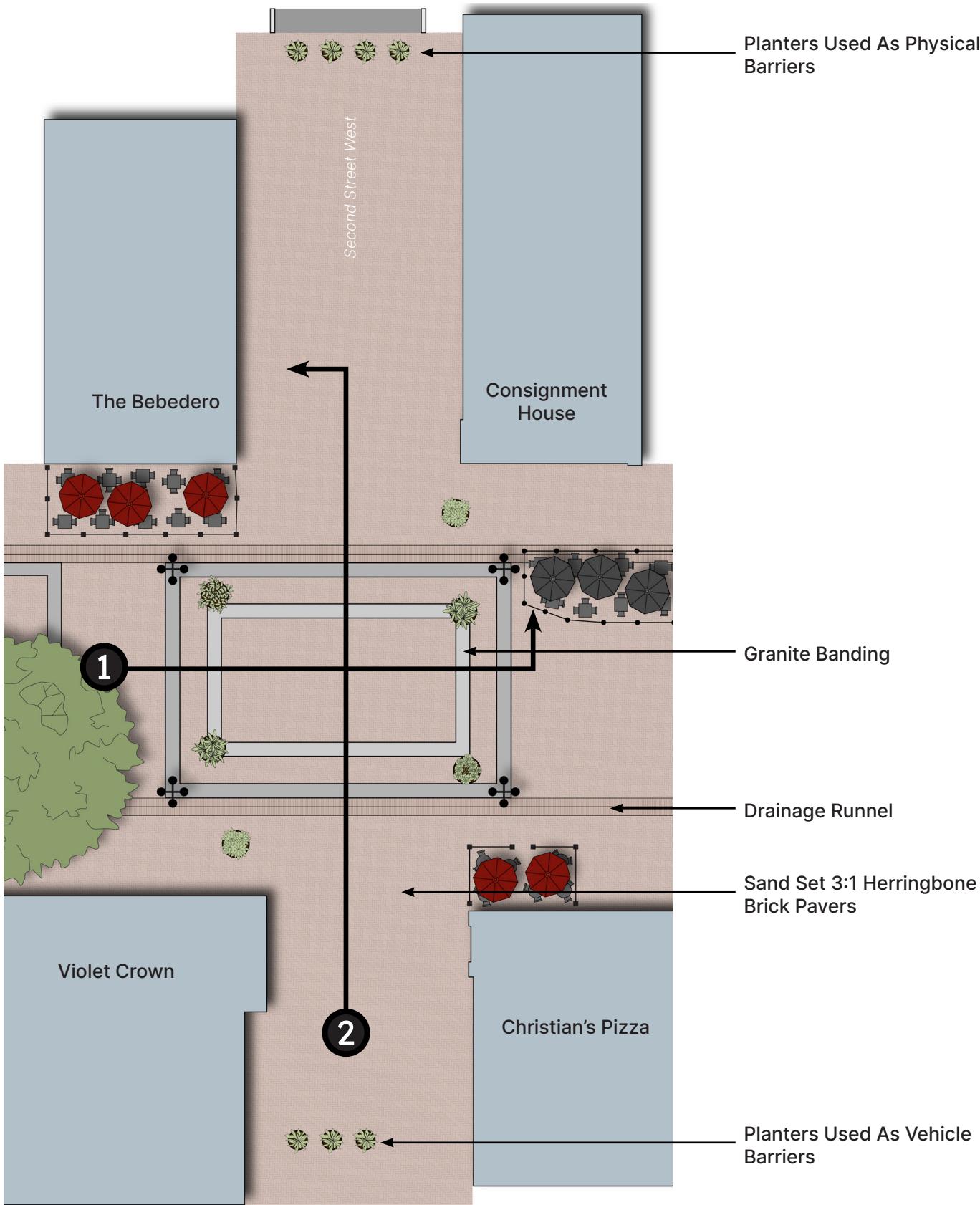
2ND STREET WEST - REPAIRED VEHICULAR CROSSING CONCEPT



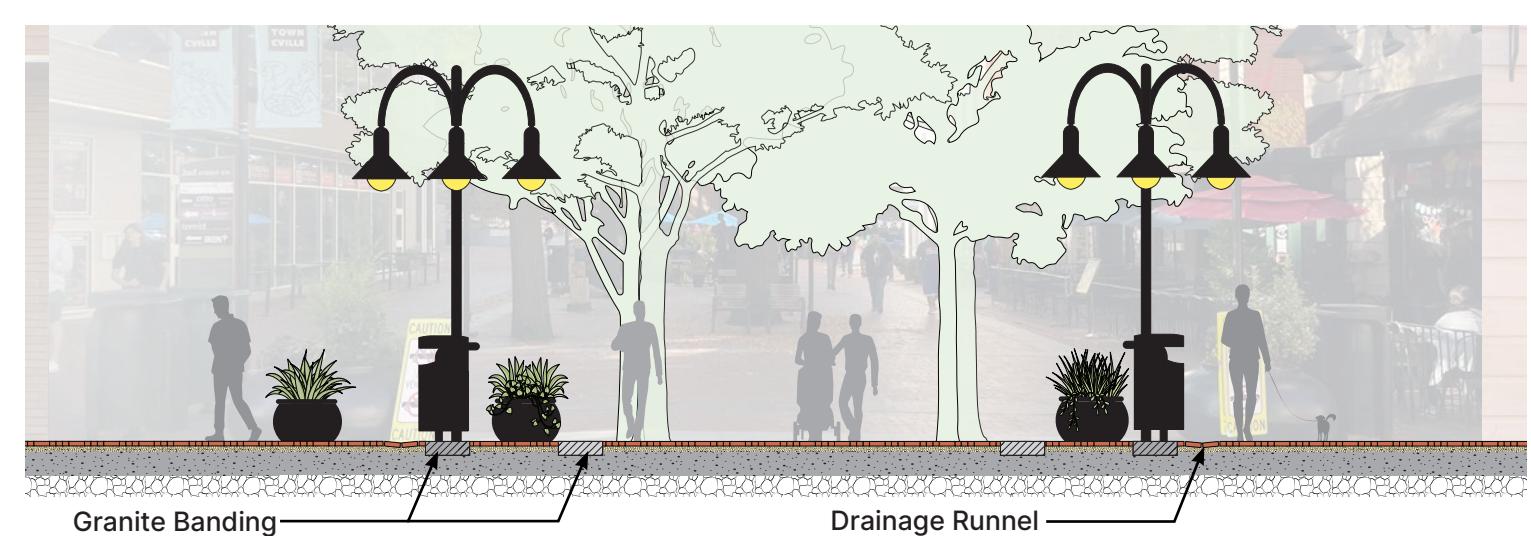
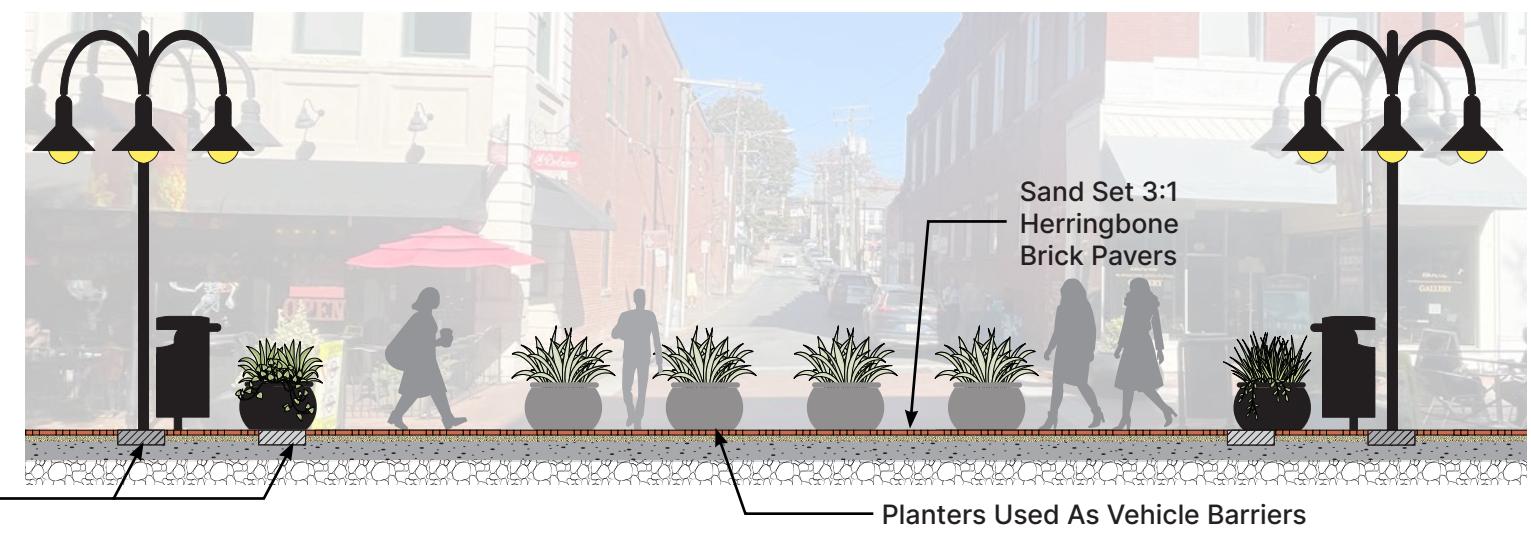
This concept proposes to repair the vehicular crossing. As can be seen in the illustrative concept plan (left) the granite banding and drainage runnel have been intentionally interrupted in order to provide a continuous 2:1 brick paving field for the full breadth and length of the vehicular crossing. The brick would be laid in a sand setting bed and in a 2:1 herringbone paving pattern. Flanking either side of the brick paving field would be concrete edge restraints cast flush with the brick surface and the tactile warning strips would be installed adjacent to the flush curb. The entering and exiting ends of the crossing would provide a "ramp up" and "ramp down" effect, similar to a speed table instead of "speed humps" currently installed. The vehicular crossing is shown at a width of 13', but this could be adjusted narrower or broader depending on preference. However, it is noteworthy to express that the narrower the crossing the more visually constricting it will feel to vehicles - which is a good thing in this environment. As proposed this concept would provide a durable and high-performing vehicular crossing which would be capable to withstand the vertical, lateral, rotational loads. The interruption in the granite banding as well as the drainage runnel is a visual cue to pedestrians about the vehicular crossing. However, that may or may not be a good thing depending on the stakeholder perspective.



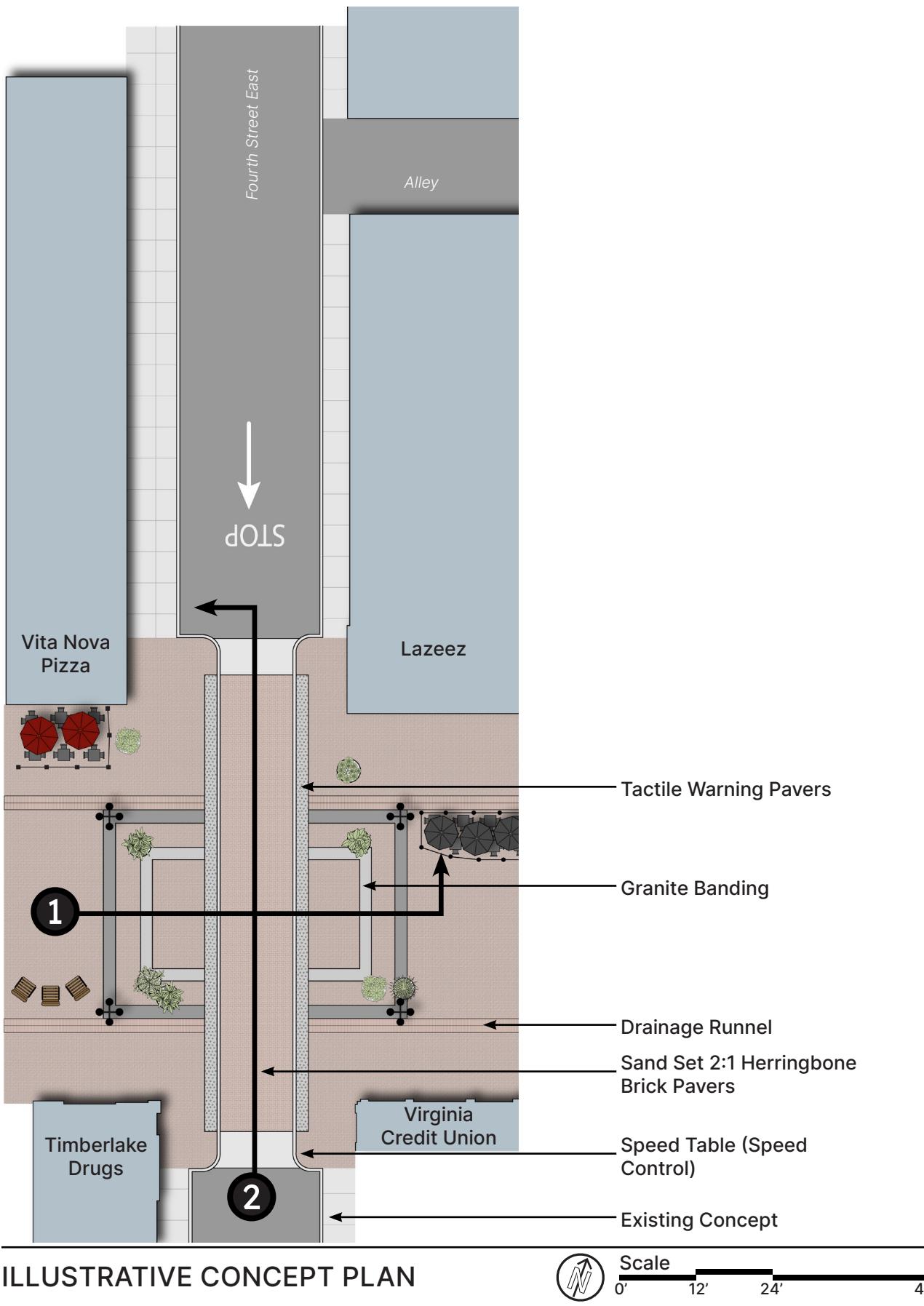
2ND STREET WEST - CLOSED VEHICULAR CROSSING CONCEPT



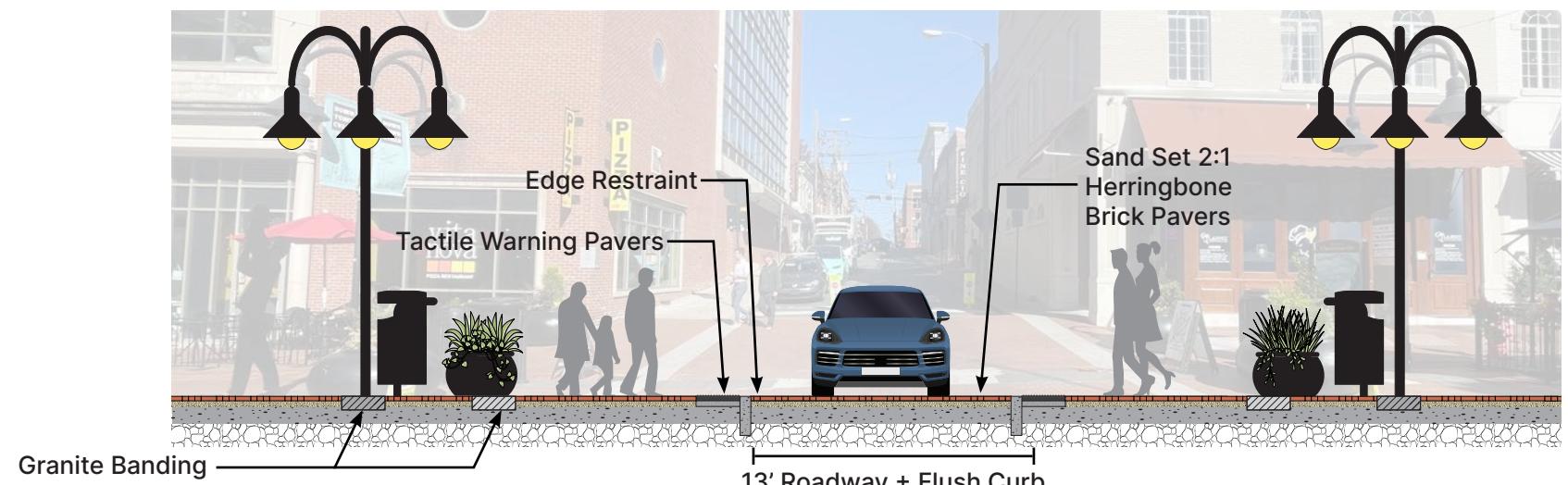
This concept proposes to repair the vehicular crossing but to close it to vehicles. As can be seen in the illustrative concept plan (left) the granite bandings and drainage runnels maintain the intended paving patterns of the Lawrence Halprin design. The crossing would be reconstructed to include the black and gray granite bandings. Because vehicles could no longer cross the mall in this location, the tactile warning pavers have been removed. Furthermore, because the paving materials would no longer be subject to the vehicular loads the system could be expected to perform as intended. One primary consideration of this option is to determine where the Pedestrian Mall would come to an end, which is to say, how far or close to Main Street should the brick paving fields extend along 2ND Street. Ideally they would extend far enough to provide a visual cue to drivers that the roadway is closed. And while it is not specifically the intention of this study to consider: if the vehicular crossings are closed, the vehicular signal at 2ND Street and Market Street could potentially be removed. The reconstruction of the vehicular crossing to restore the mall to pedestrians only at 2ND Street may or may not be a preferred option depending on stakeholder perspectives. It is noteworthy to express that if this option is selected, and the crossing is closed and reconstructed as proposed, it would not be able to convey vehicular traffic in the future as this construction detailing is not suitable for vehicle loads.



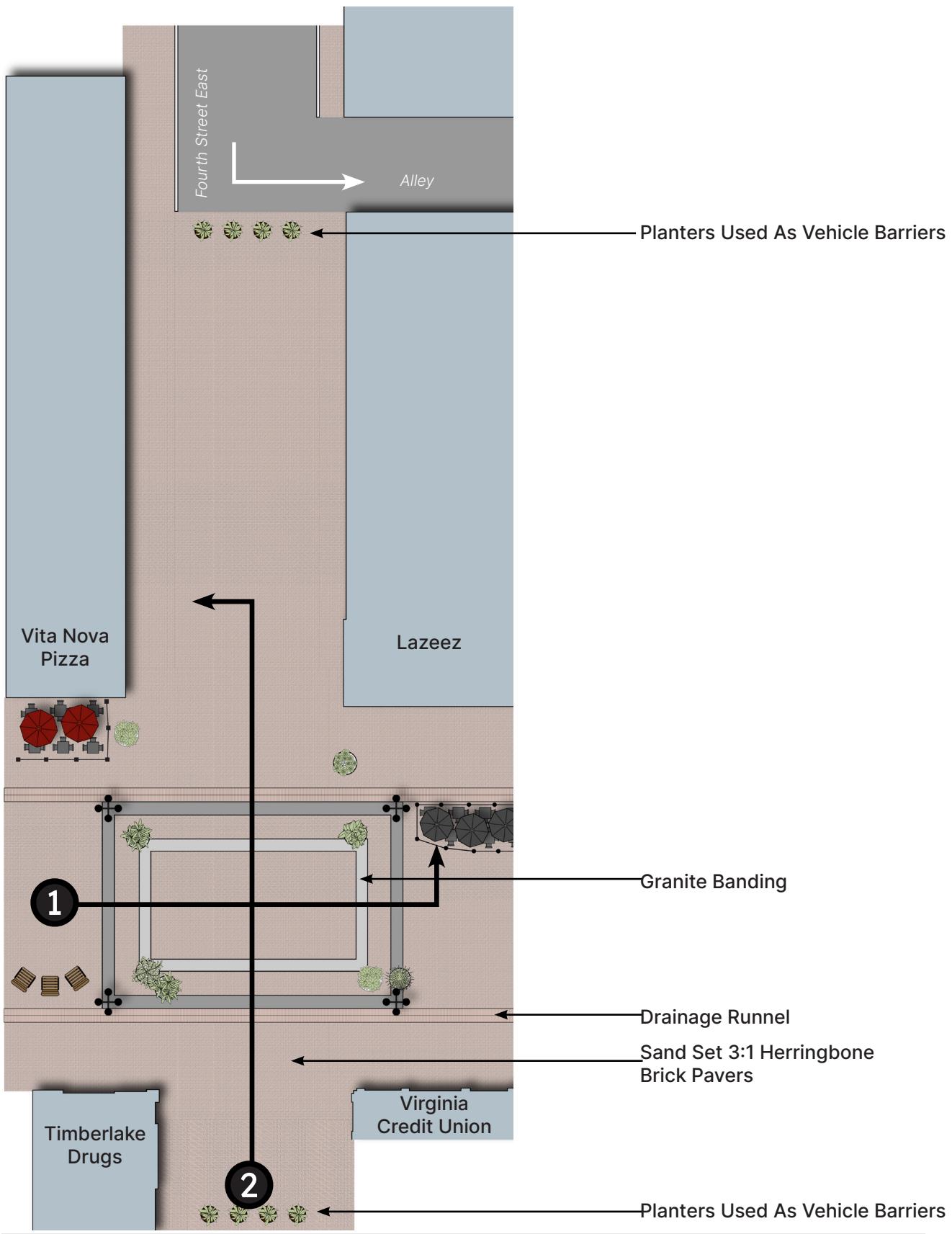
4TH STREET EAST - REPAIRED VEHICULAR CROSSING CONCEPT



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4TH STREET EAST - CLOSED VEHICULAR CROSSING CONCEPT

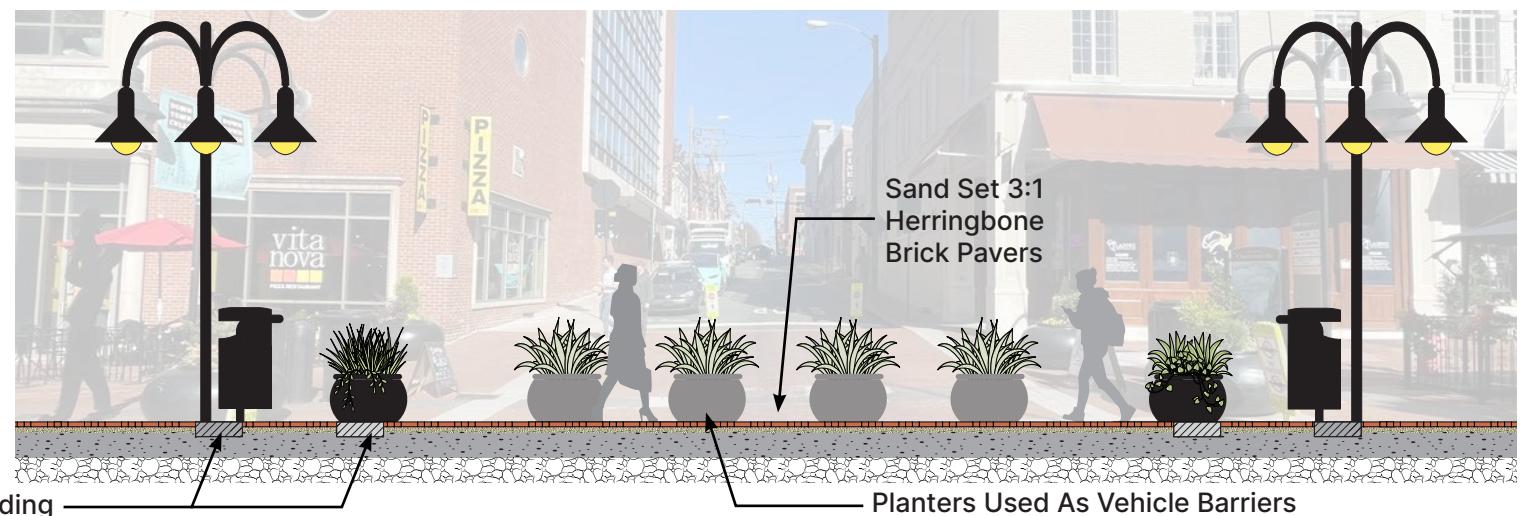


ILLUSTRATIVE CONCEPT PLAN

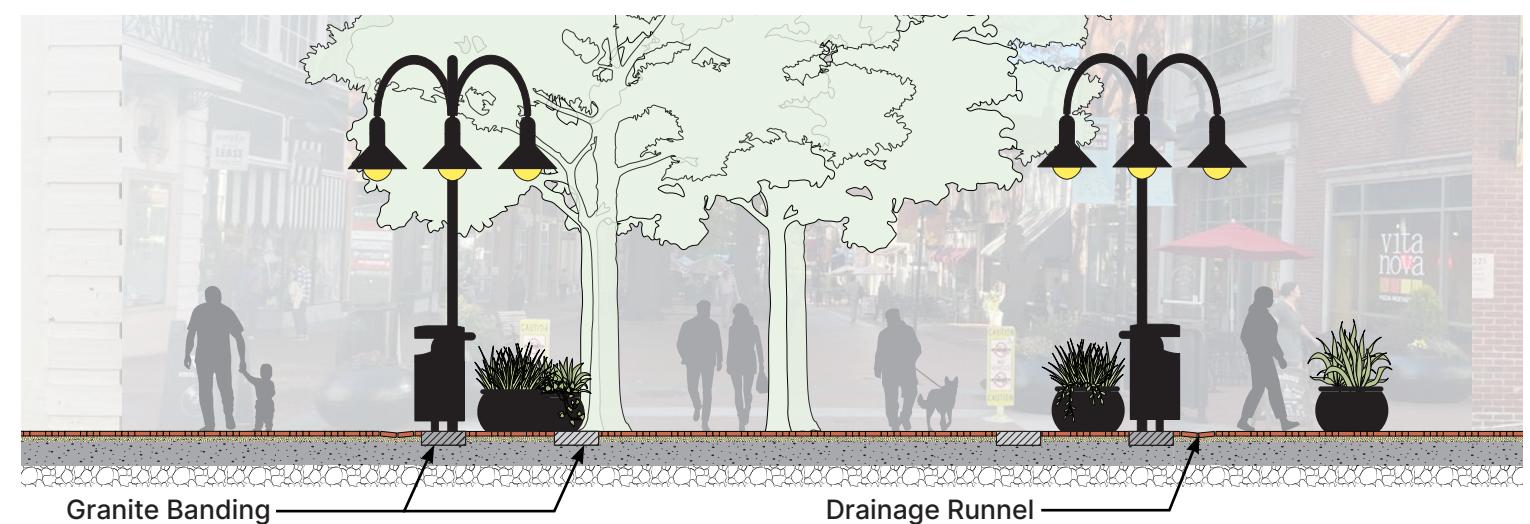


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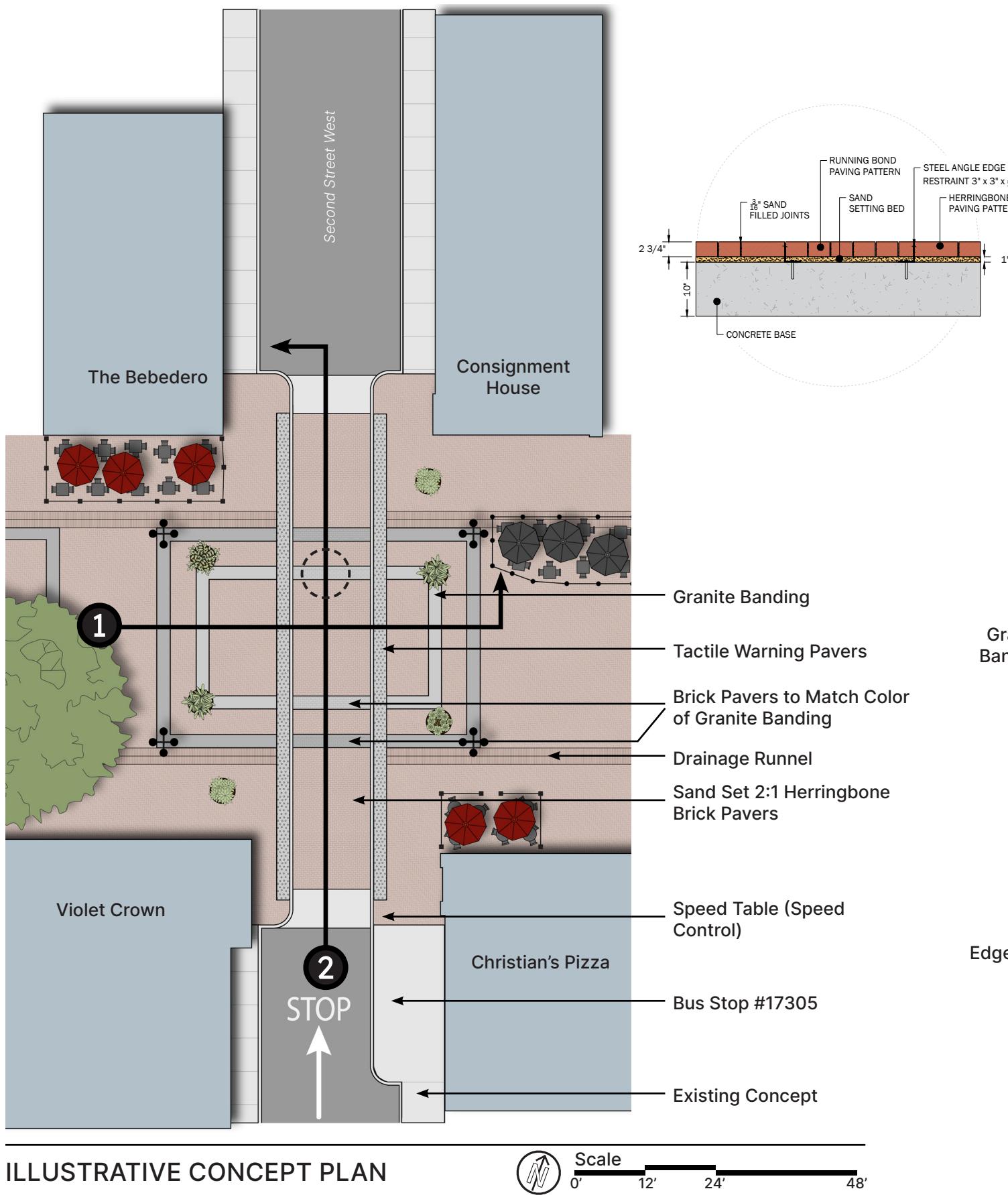
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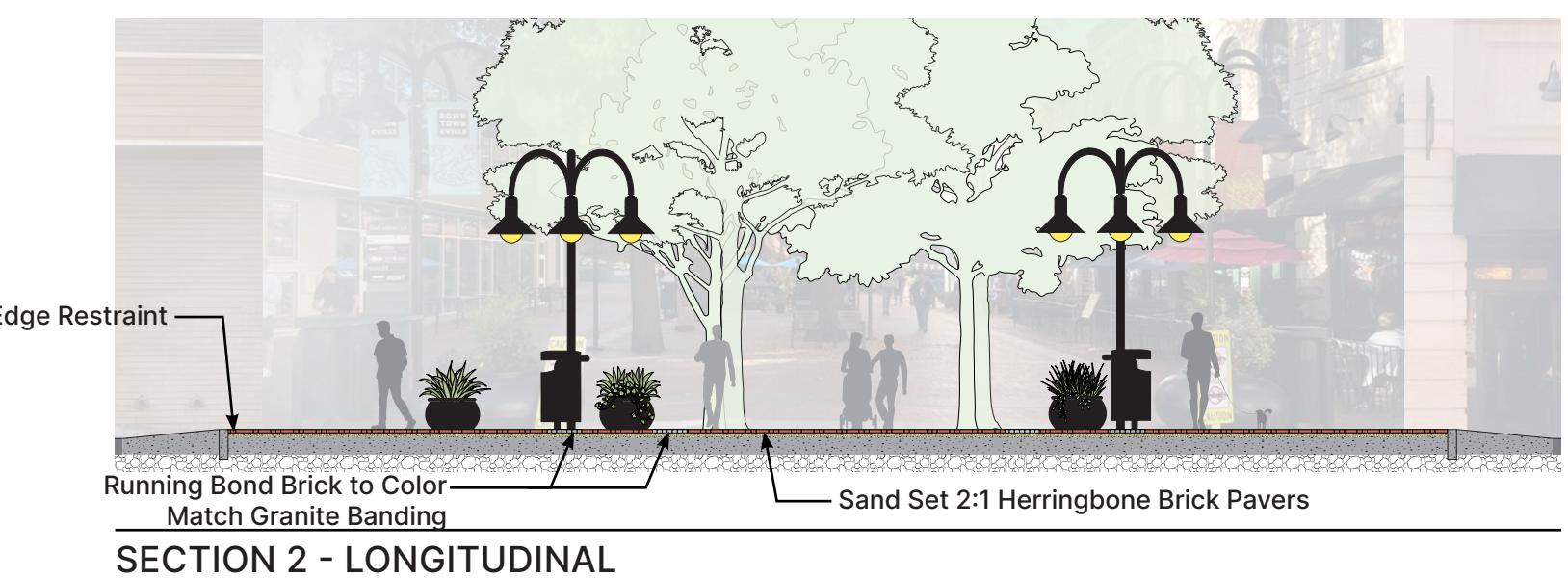
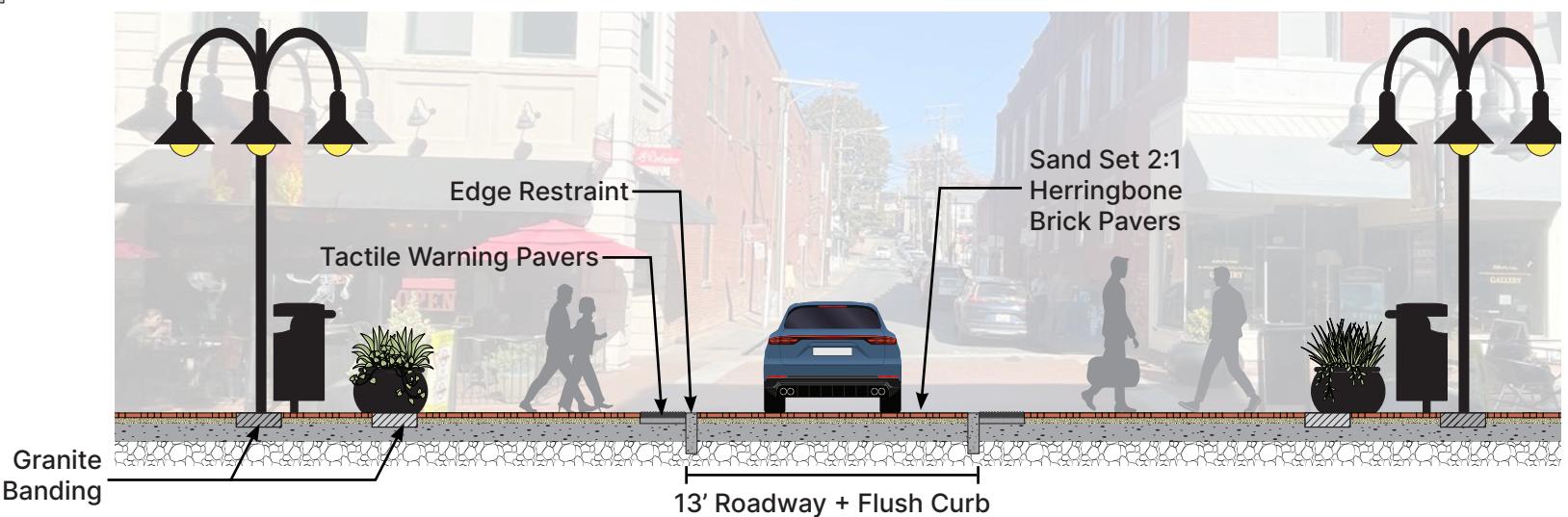
SECTION 1 - TRANSVERSE

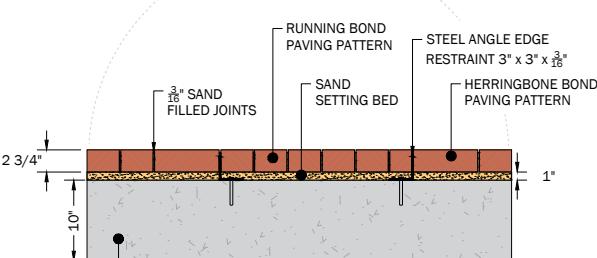
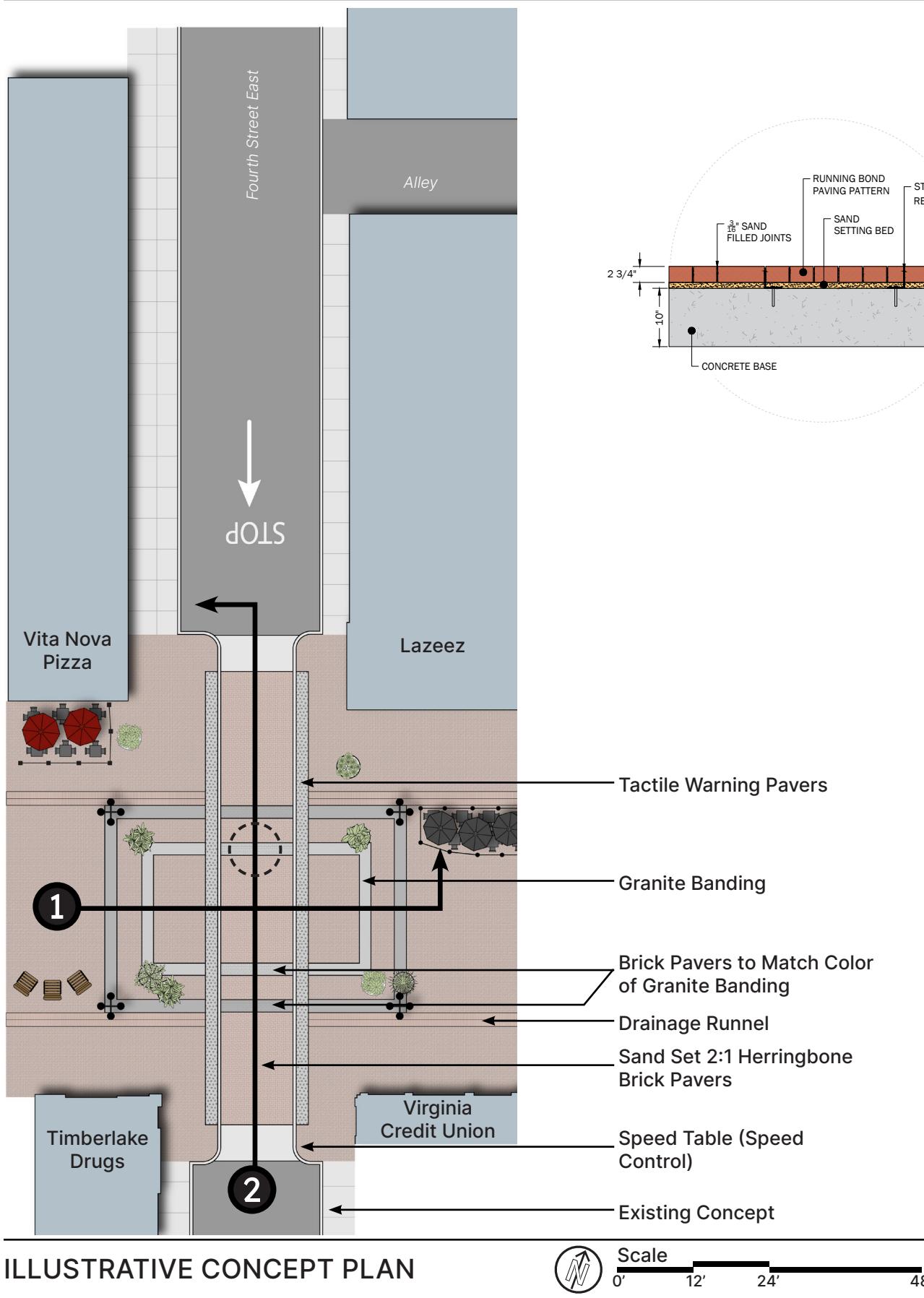


SECTION 2 - LONGITUDINAL



At the November 19 stakeholder meeting, initial concepts for a repaired vehicular crossing (pages 4 + 6) and a closed vehicular crossing (pages 5 + 7) were presented. The general consensus was that a modified version of the repaired vehicular crossing concept would be ideal, namely to maintain the visual cues of the granite banding. The concept below responds to the stakeholder feedback by balancing the design aesthetic with technical considerations. The granite banding pattern will be continued through the vehicular crossing with a color-matched brick laid in a running bond paving pattern. This running bond brick will require steel angle edge restraints to minimize movement from vehicular forces. The steel angle edge restraint will be placed on either side of color-matched brick, as shown in the detail to the left. Retractable bollards, not shown here, can be placed at either end of 2nd Street and 4th Street to allow the through streets to be temporary closed to vehicular traffic.





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