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Silva Cells & Utilities

Integrating Silva Cells into the built environment

Silva Cells and Utilities

Silva Cell overview

Integrating Silva Cells and utilities

- Running utilities through the Silva Cells
- Options for when utilities cannot be run through the frames

Planning for the Future

- Utility corridors
- Future capacity
- Utility locations
- Locating equipment
- One-call network
- Directional boring

Repairs and Maintenance

- Planned Repairs
- Emergency Repairs
- Restoration options

Conclusion

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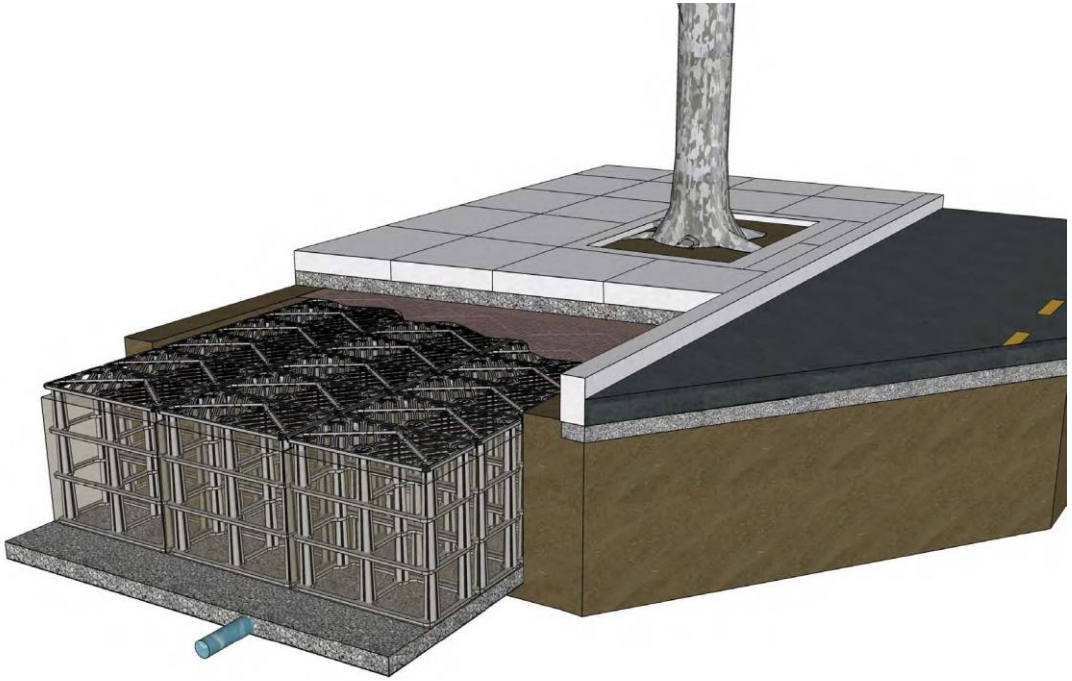
Introduction to Silva Cells

Silva Cell overview

Silva Cells are a modular shoring system used to support pavements and create void spaces between the pavement and underlying soils that can then be filled with planting soil or other media to facilitate tree growth as well as water infiltration



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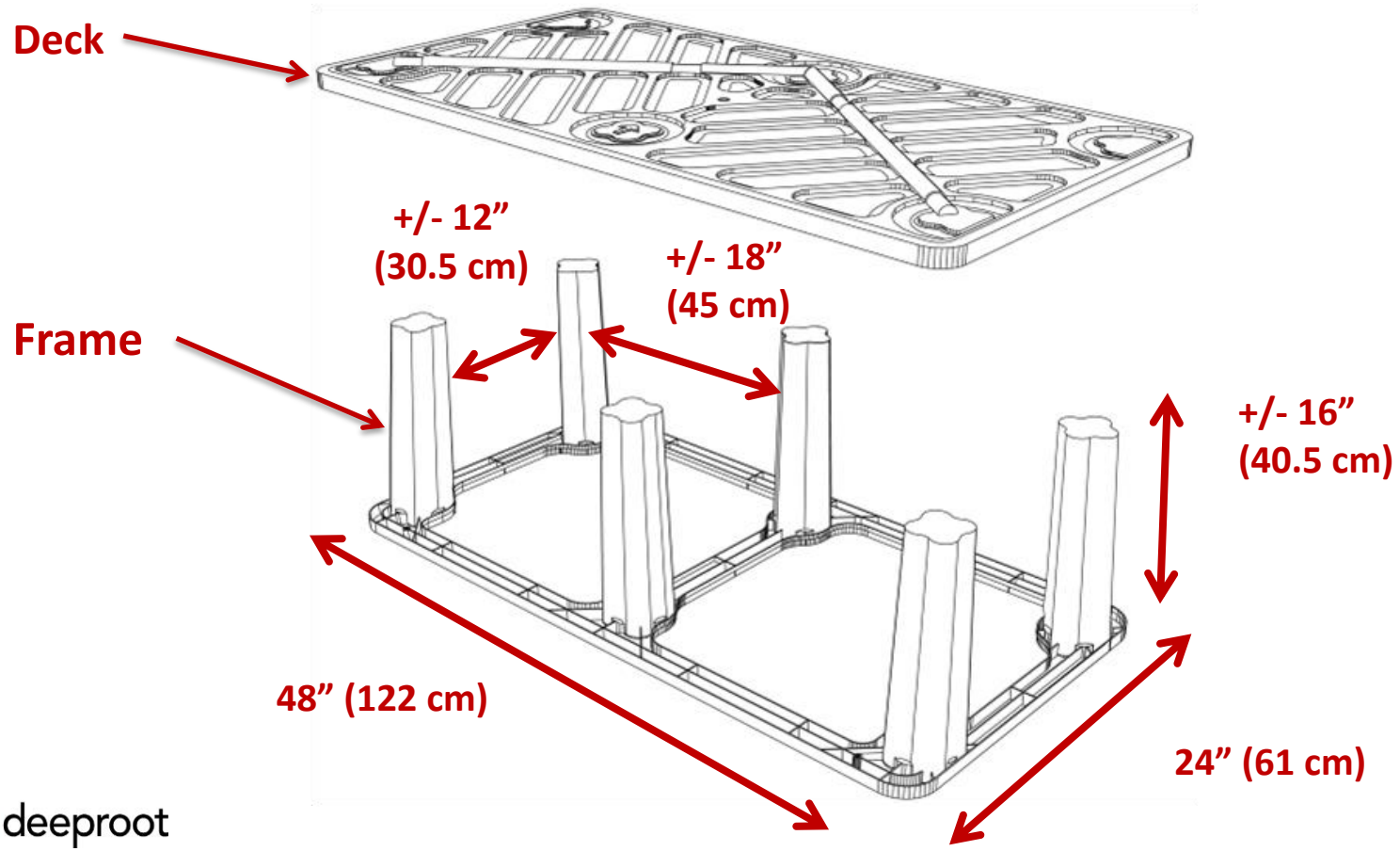
Silva Cell overview

Silva Cell system are composed of decks and frames



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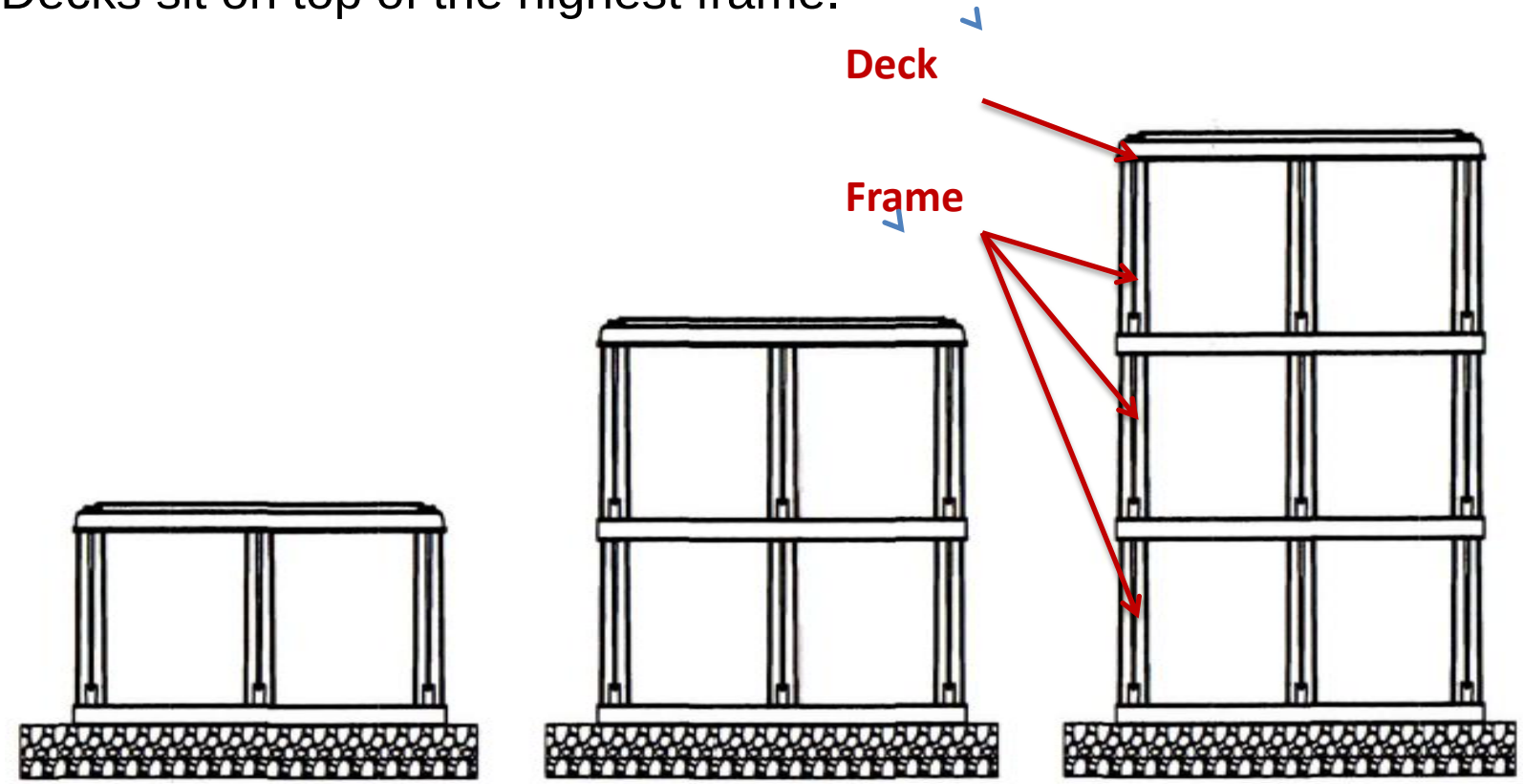
Silva Cell overview

Silva Cells frames can be stacked one, two or three high.
Decks sit on top of the highest frame.



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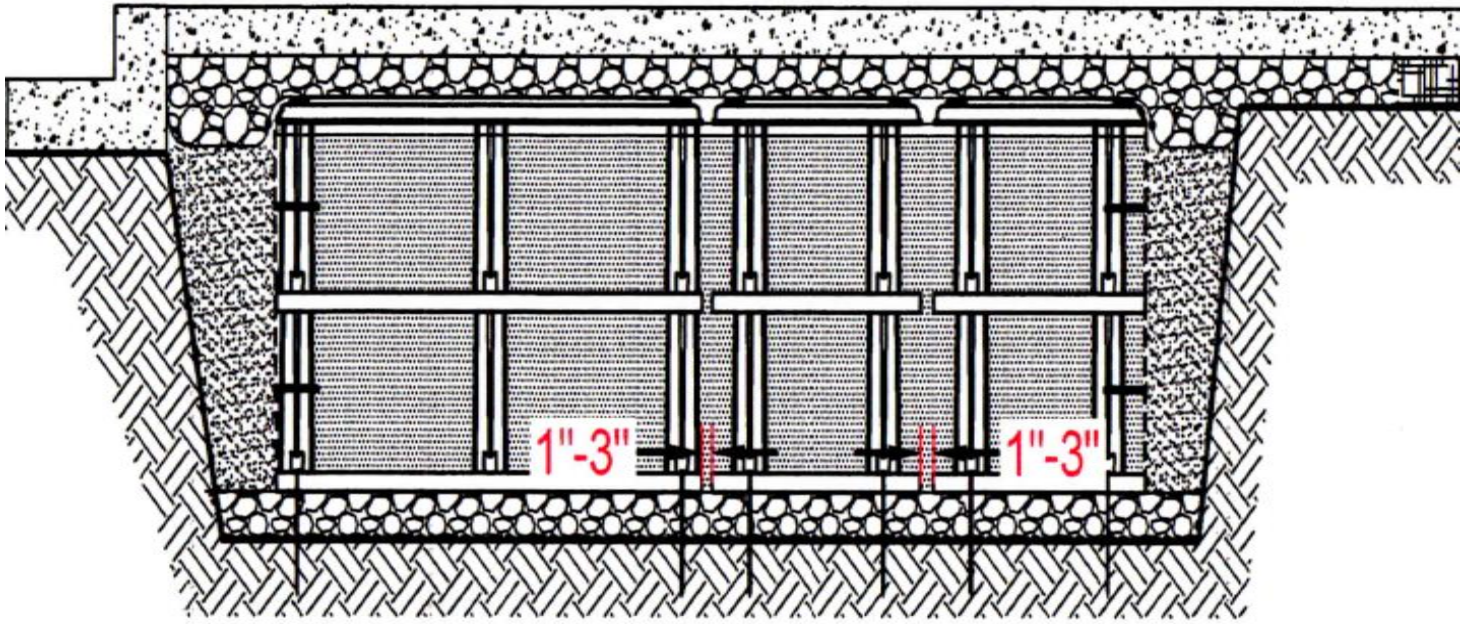
Silva Cell overview

The Silva Cell frames do not connect to each other horizontally; there is a gap of 1” to 3” (25 mm to 75 mm) between each stack. This allows individual columns of frames to be removed without disturbing the adjacent stacks.



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Integrating Silva Cells and Utilities

Integrating Silva Cells and Utilities

There are a number of different ways for integrating Silva Cells with both new and existing utilities

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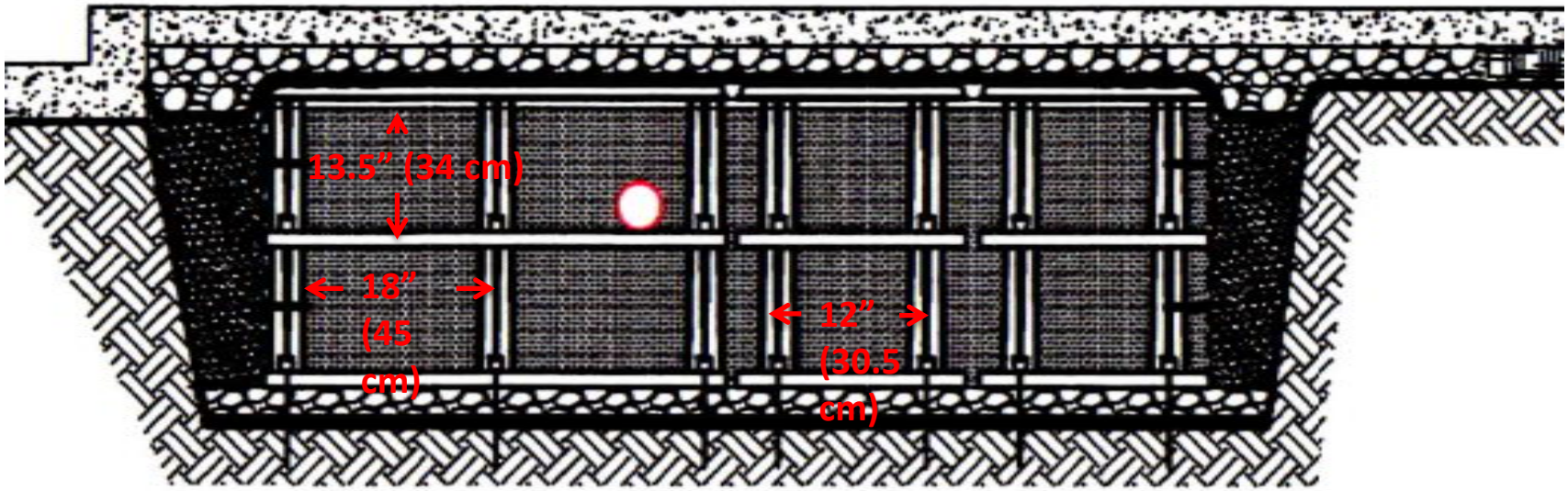
Running Utilities Through Frames

The most commonly used option is to run utilities through Silva Cells. Due to the open design of the frames, they can accommodate pipes, conduits, and other underground utilities up to 10” (250 mm) in diameter.



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Running Utilities Through Frames

Existing Telecomm lines

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Running Utilities Through Frames

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Running Utilities Through Frames

Existing street lighting conduits

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Running Utilities Through Frames

Existing gas service

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Running Utilities Through Frames

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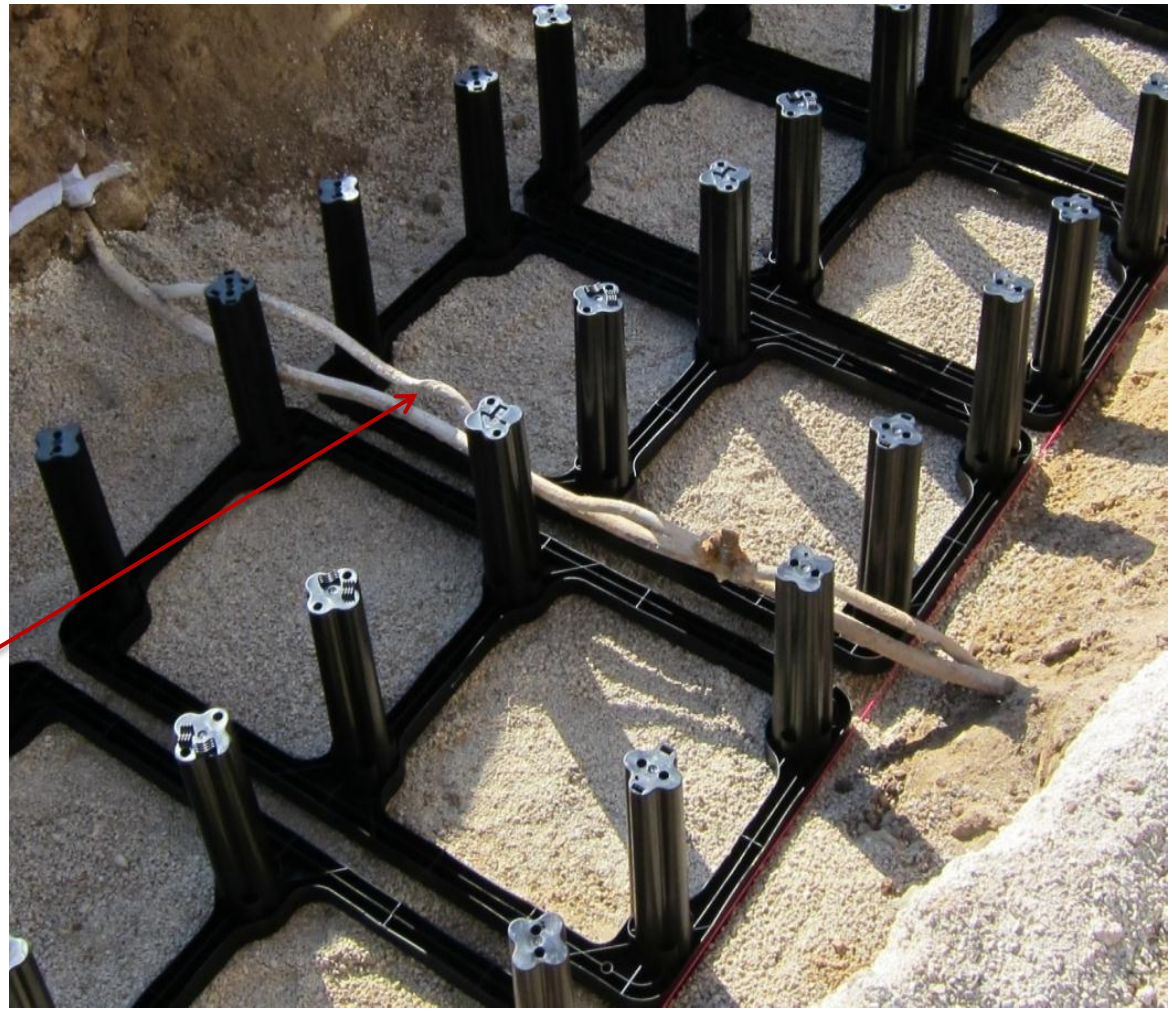
Running Utilities Through Frames



Copper water services

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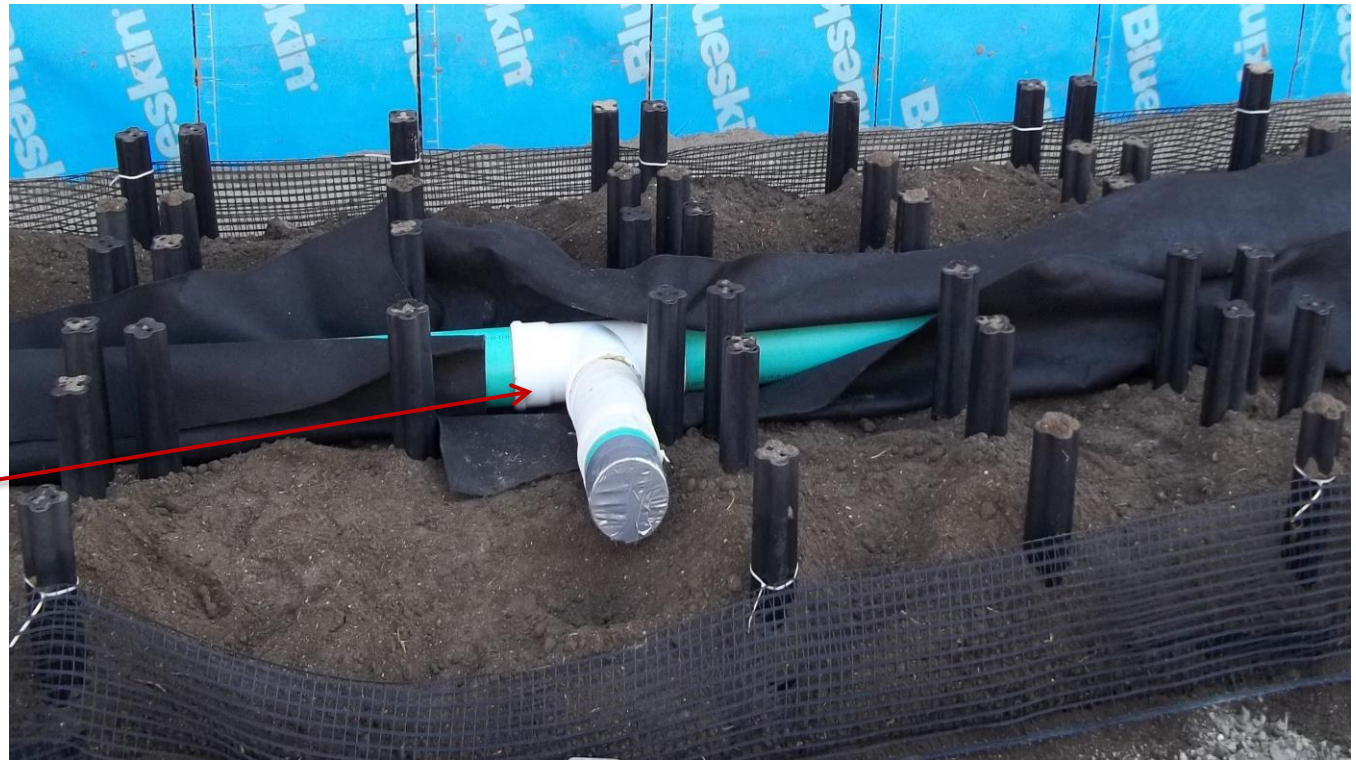
Running Utilities Through Frames

8” (200 mm) perforated PVC pipe



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Alternatives to Running Utilities Through Frames

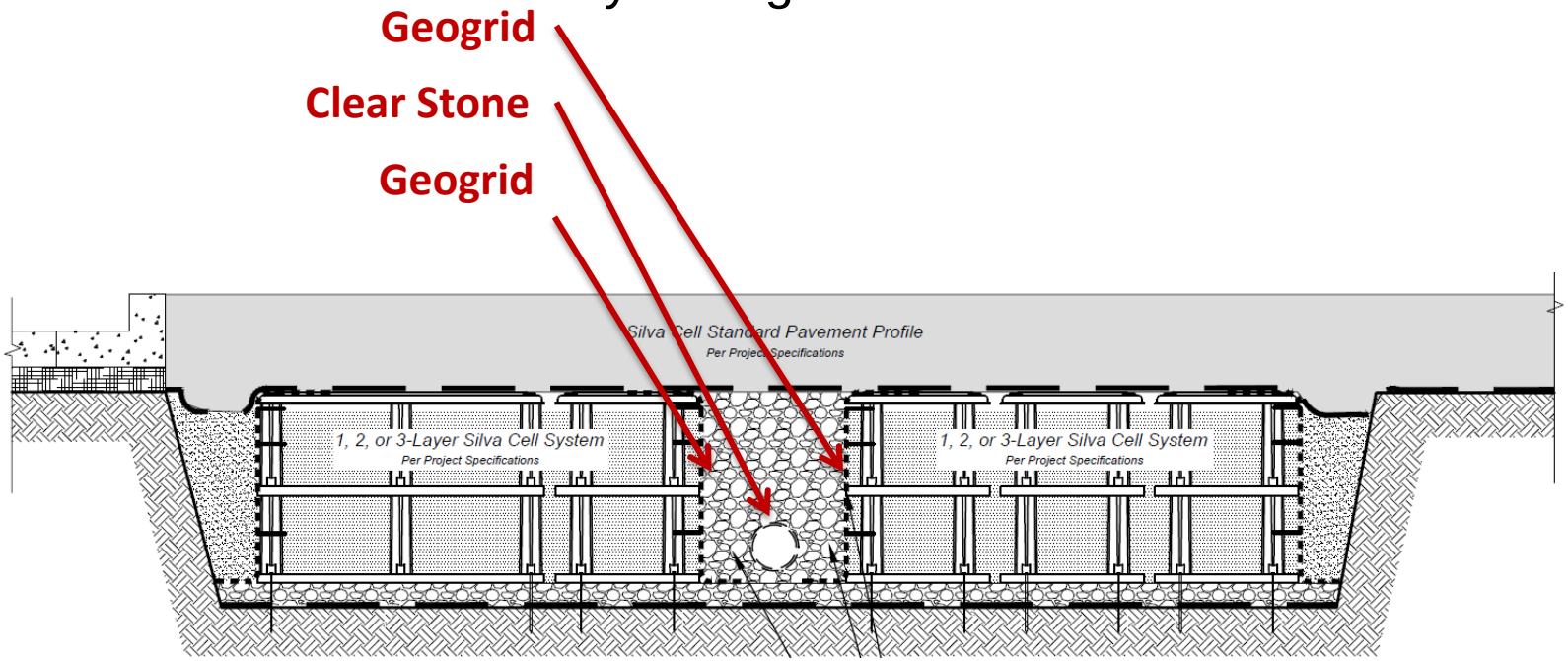
When integrating Silva Cells and utilities, it may not always be possible to run utilities through the Cells. In those cases, one of the following alternatives may be used:

- Aggregate gap detail
- Bridging utilities with Silva Cells
- Bridging utilities with small concrete slabs (< 24” wide)
- Bridging utilities with custom concrete slabs (> 24” wide)
- Running utilities outside of the Silva Cell frames but in the same excavation ares

Please refer to the details on our website (www.deeproot.com) for more information.

Aggregate Gap Bridging

One of the simplest options is to leave a gap in the Silva Cells where the Utility is. Then wrap the inside of the gap with geogrid and fill the void space with clear stone (drain rock) to make a stone column. The tree roots will work their way through the stone.



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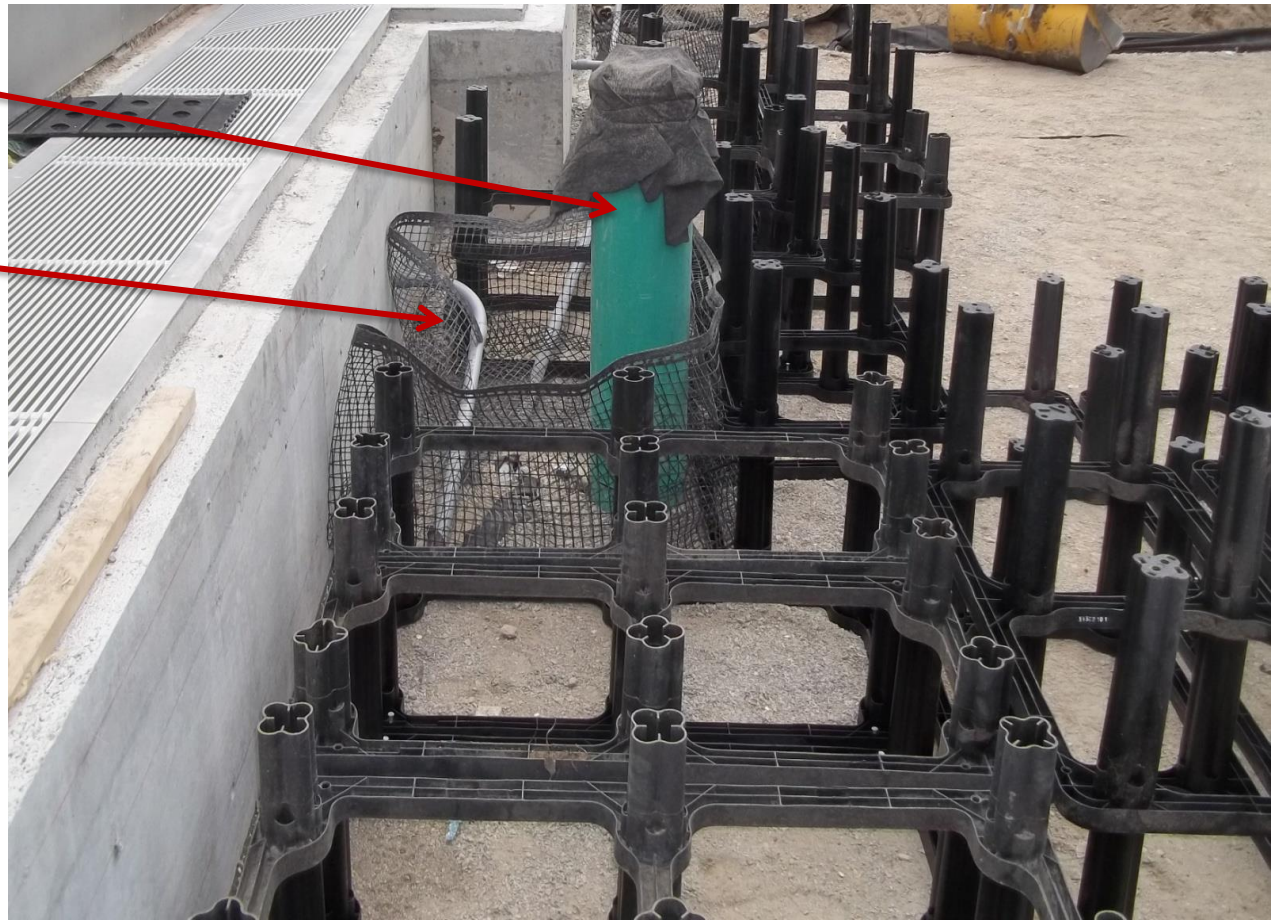
Aggregate Gap Bridging

Clean out

Geogrid is wrapped around the interior of the opening in the Silva Cells

***Clean stone will be placed inside of the geogrid**



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Aggregate Gap Bridging

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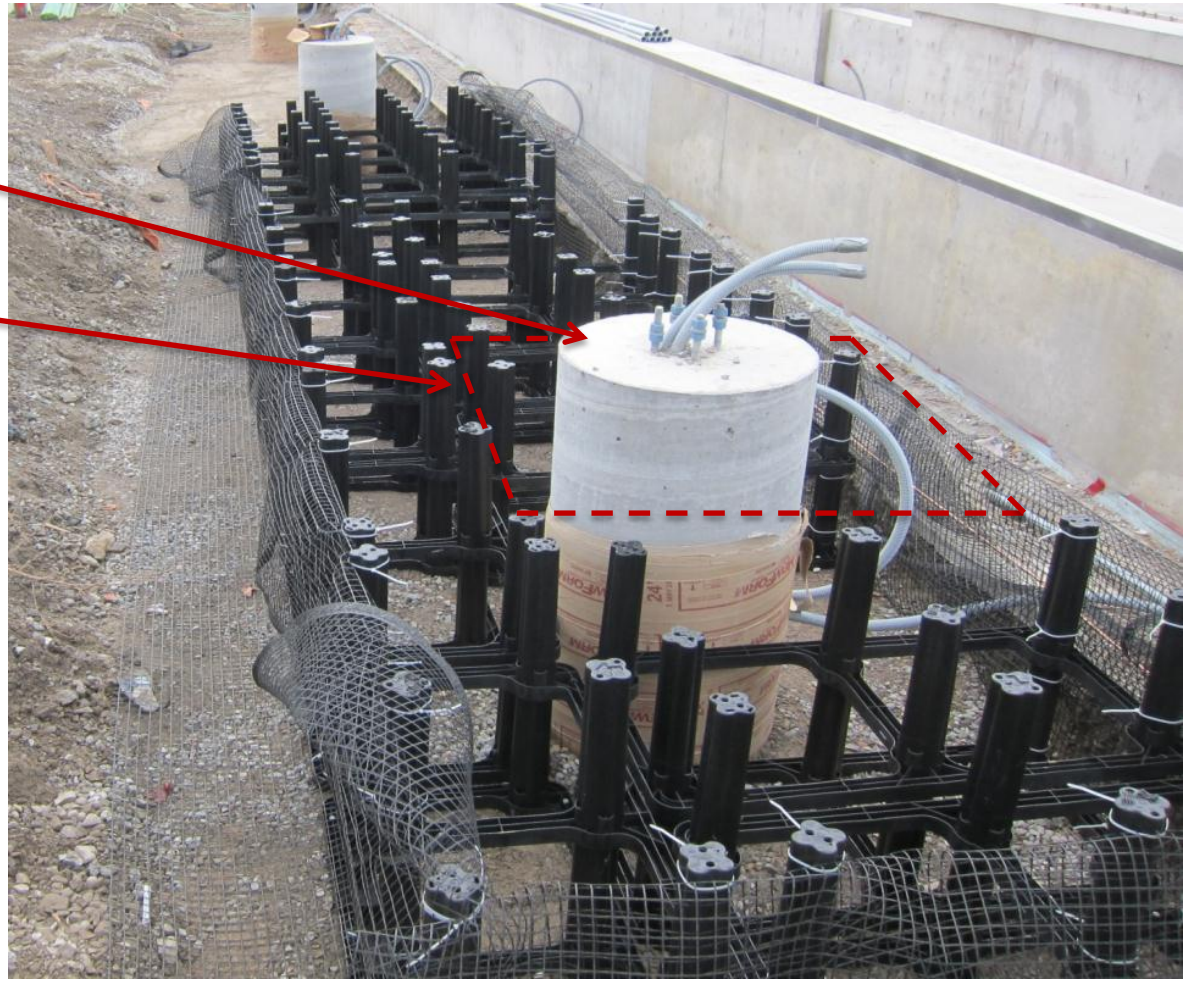
Aggregate Gap Bridging

Light pole foundation

Geogrid will be installed around the inside of the opening and filled with clean stone



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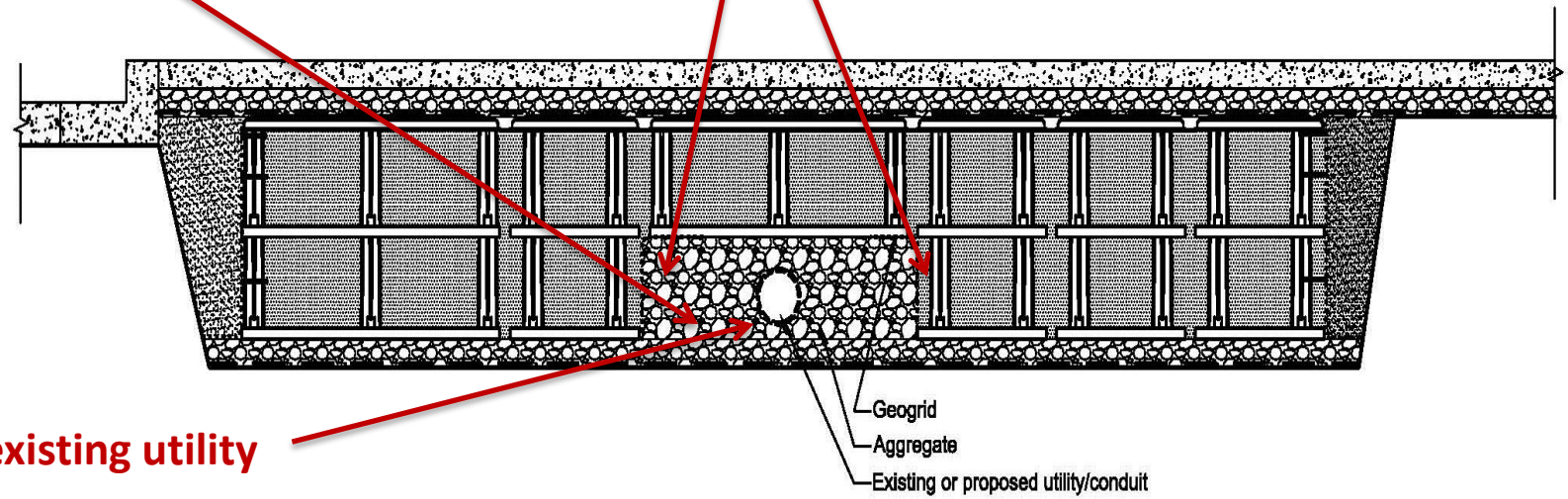
Bridging Utilities with Silva Cells

A single layer of Silva Cells can be used to bridge over existing utilities.

Geogrid at the sides of the opening

Compacted aggregate or backfill soil



New or existing utility

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Bridging Utilities with Silva Cells

Existing concrete drain pipe

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Bridging Utilities with Silva Cells

Silva Cells on either side of the pipe

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Bridging Utilities with Silva Cells

Geogrid installed around the inside perimeter of the opening for the pipe

***Geogrid is only installed to the top of the 1st layer of Silva Cells, allowing the roots to move freely through the upper layer of Silva Cells**

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Bridging Utilities with Silva Cells

The opening for the pipe is filled with suitable backfill material up to the bottom of the upper layer of Silva Cell frames, and then compacted

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Bridging Utilities with Silva Cells

Finally, the opening for the pipe is filled in with Silva Cells so that there is no interruption in the upper level of the sytem

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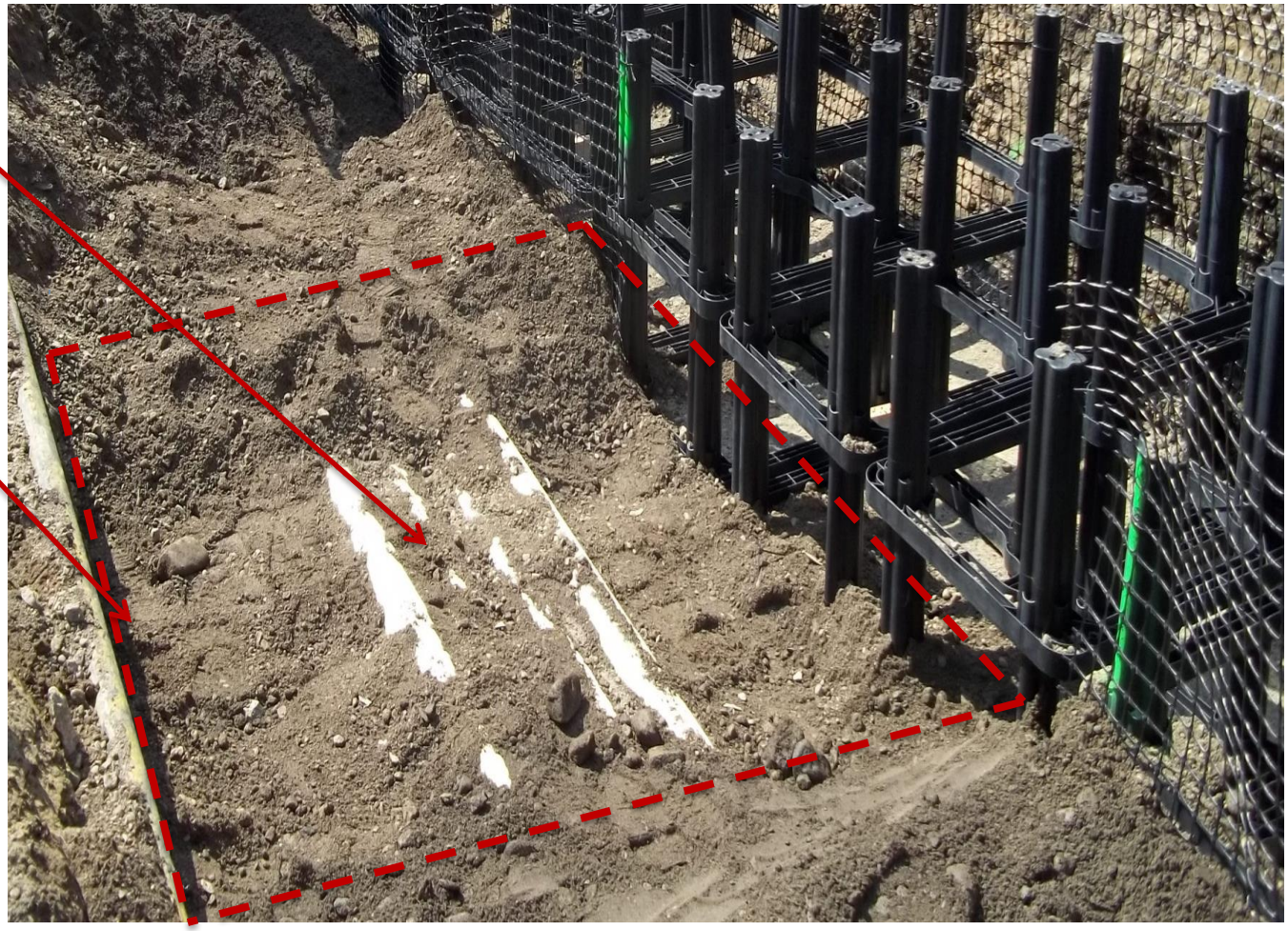
Bridging Utilities with Silva Cells

Existing electrical conduits that are in the way at the tree opening

Outline of tree opening



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Bridging Utilities with Silva Cells

Silva Cells are added at the top layer to support the tree opening

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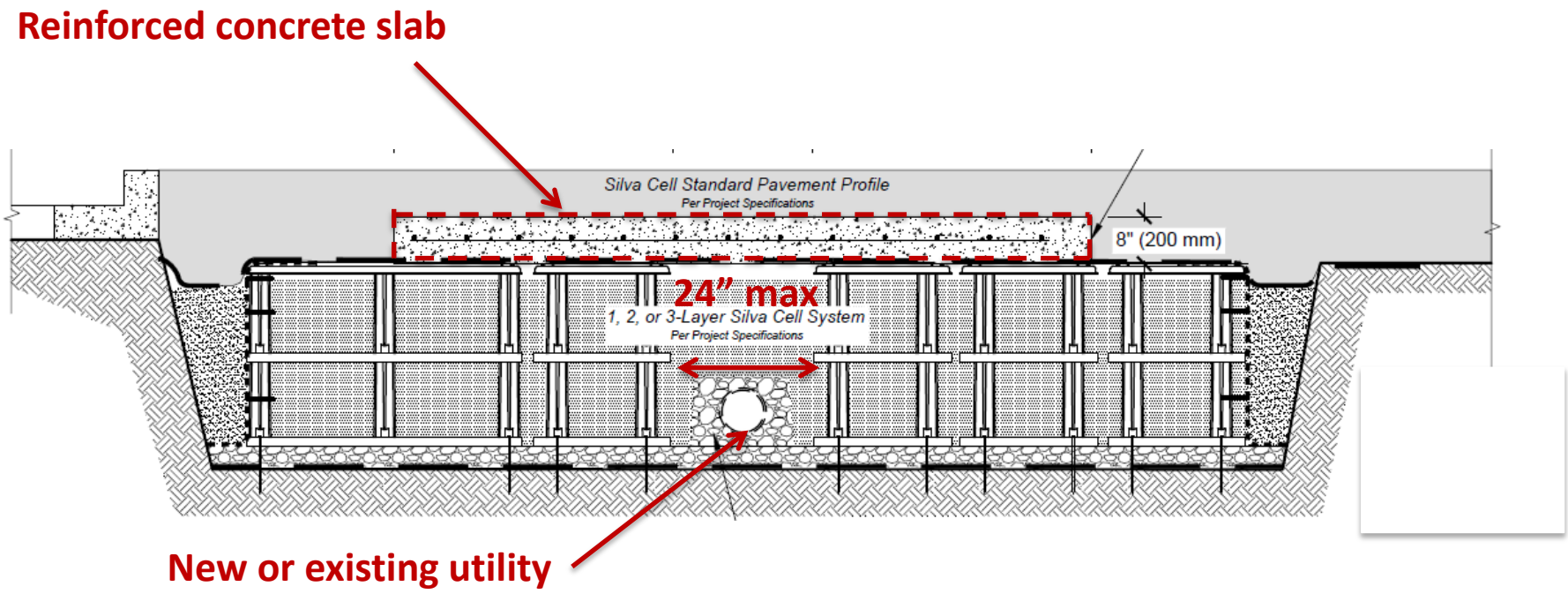
Bridging Utilities with Small Concrete Slabs

A reinforced concrete slab can be used to bridge over utilities.
DeepRoot has a standard detail for gaps up to 24” (600 mm)



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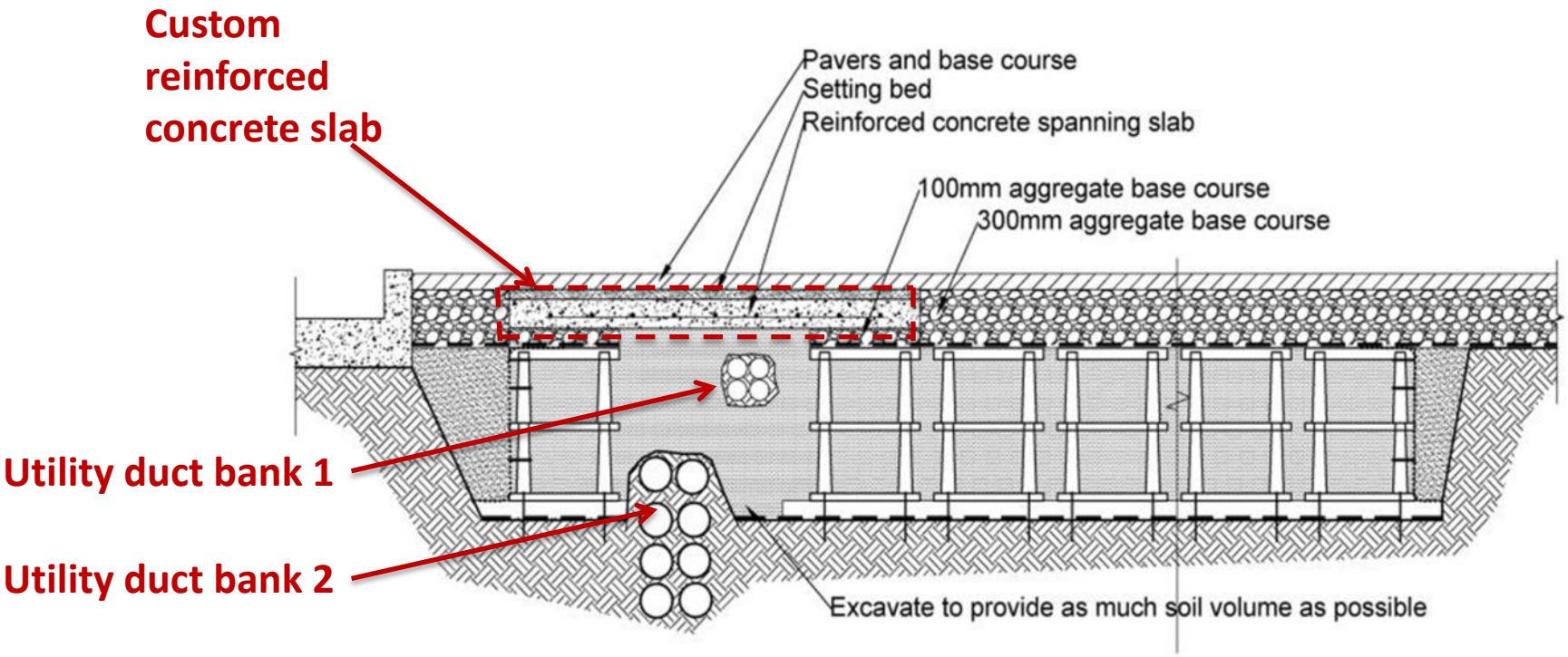
Bridging Utilities with Custom Concrete Slabs

Custom designed concrete slabs can be used to bridge gaps larger than 24” (600 mm)



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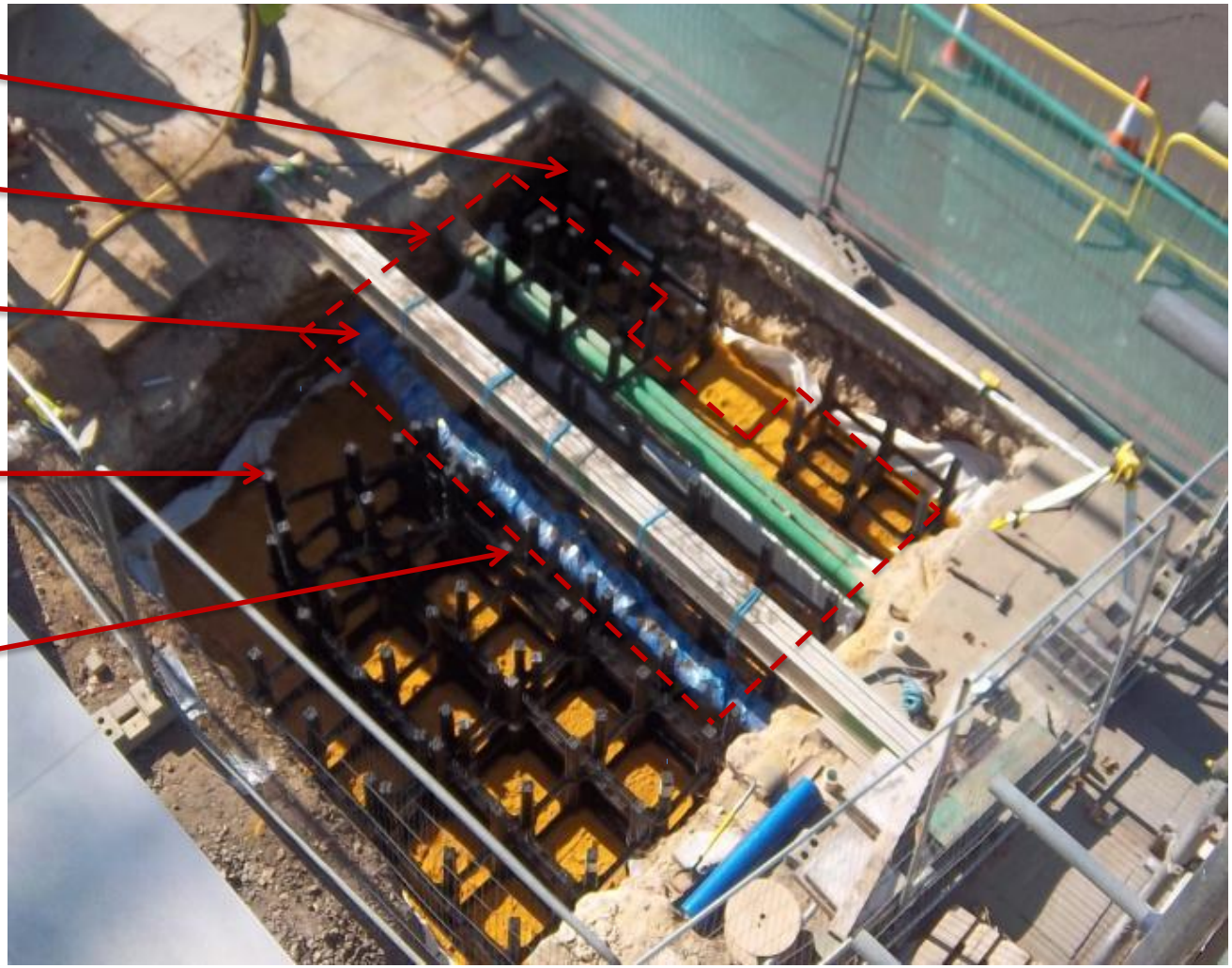
Bridging Utilities with Custom Concrete Slabs



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Bridging Utilities with Custom Concrete Slabs

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Bridging Utilities with Custom Concrete Slabs

The City Of Toronto developed their own custom utility bridging detail for using removable precast concrete panels

Typical precast panel location

Concrete header at back of curb to receive the panels on the street side

Concrete header poured at on the back side of the utility to receive panels supported by Silva Cells

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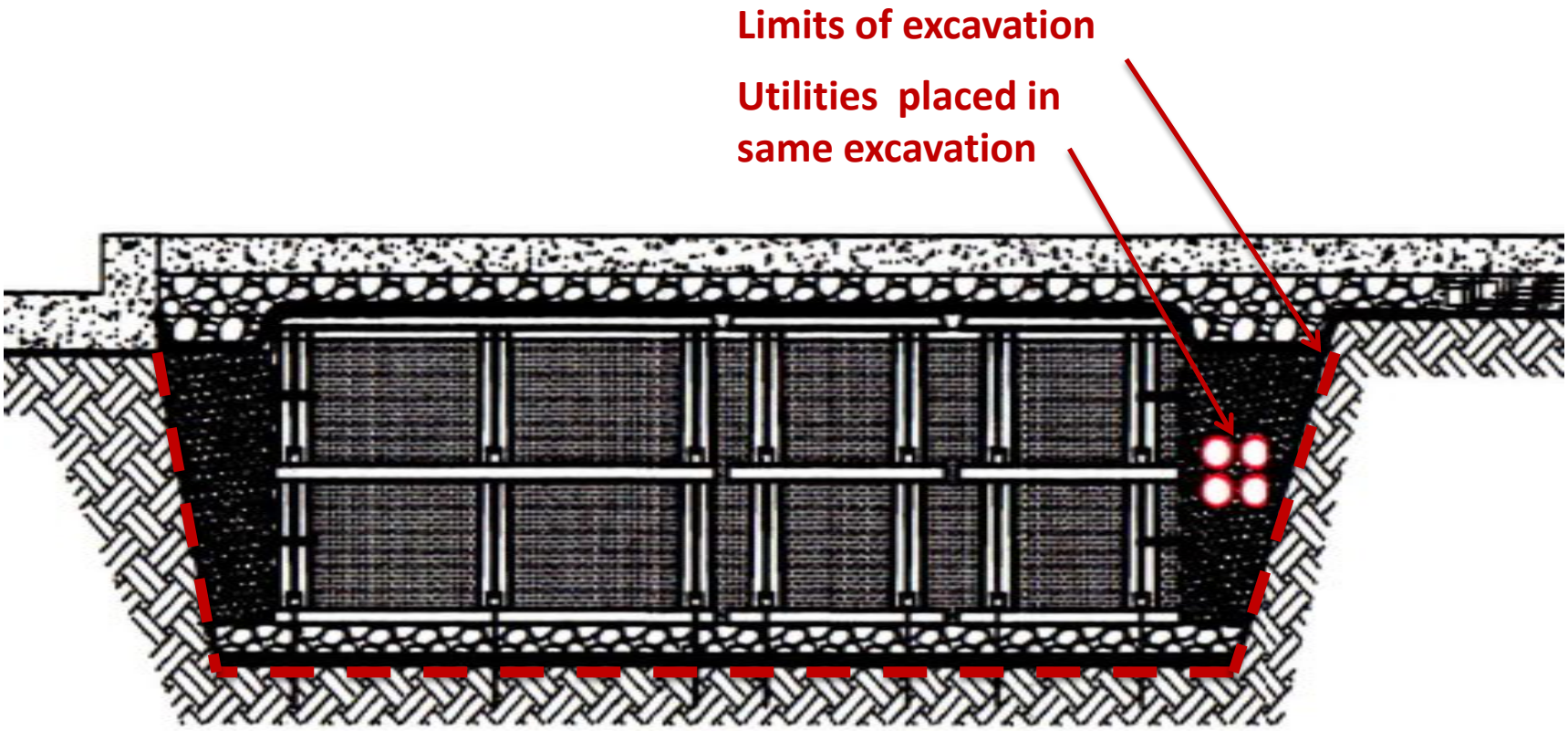
Running Utilities Outside of the System but in the Same Trench

When utilities cannot be run through the frames, integrating them into the same excavation is an effective option



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Running Utilities Outside of the System but in the Same Trench

Telecommunication lines being installed as the Silva Cells are backfilled

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Running Utilities Outside of the System but in the Same Trench

New electrical duct bank installed along with the Silva Cells

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Planning for the Future

Establish Utility Corridors for Future Expansion

Corridor between areas of Silva Cells for future utility expansion

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Add Future Capacity Where Possible

Extra ducts are added to an electric duct bank for future use

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Add Future Capacity Where Possible

Planning can be as simple as adding a PVC sleeve for future use

PVC sleeve for future use

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Mark Utility Locations

Marking where utilities run through the Silva Cell makes locating them in the future easier

Marking tape laid on top of the Silva Cells marks the location of lines running through the system

Use Locating Equipment

Locating equipment can still be used to locate utility lines once Silva Cells have been installed

Electromagnetic style locators have been used successfully to locate utilities running through Silva Cells

Ground-penetrating radar can also detect the limits of the Silva Cell system.

Make Silva Cells Part of the Local One-Call Network

Make Silva Cells a permanent part of the local underground utility notification network for future protection.

United States

Canada

United Kingdom

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Directional Boring

Directional boring can be used for future utility installations

Silva Cells

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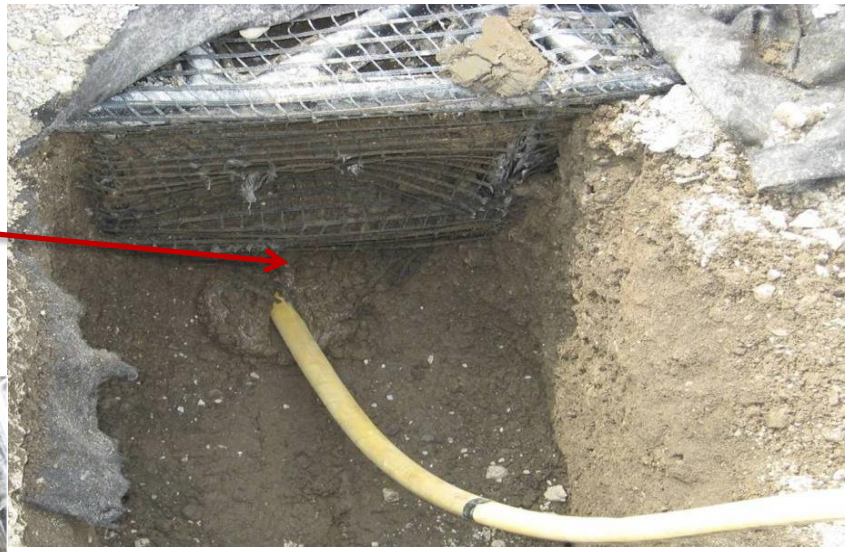
Make Silva Cells Part of the Local One-Call Network

Boring head or Pneuma – gopher going in on one side



Boring head or Pneuma –gopher coming out the other side

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Future Utility Installations and Repairs

Recommended Protocol For Utility Repairs and New Utility Installations

1. Locate
- Call Local One-Call Agency

2. Excavate
- Excavate to level of geotextile
- Expose geotextile fabric, cut and fold back, then remove decks
- Use a Hydro-Vac or hand dig out soil from area of excavation

3. Repair or add service (lateral)

4. Replace Silva Cells
- To replace Silva Cells follow Operations Manual procedures (see www.deeproot.com)

5. Replace permanent surfacing
- Replace or patch paving

for further details, see www.deeproot.com or call 415-781-9700

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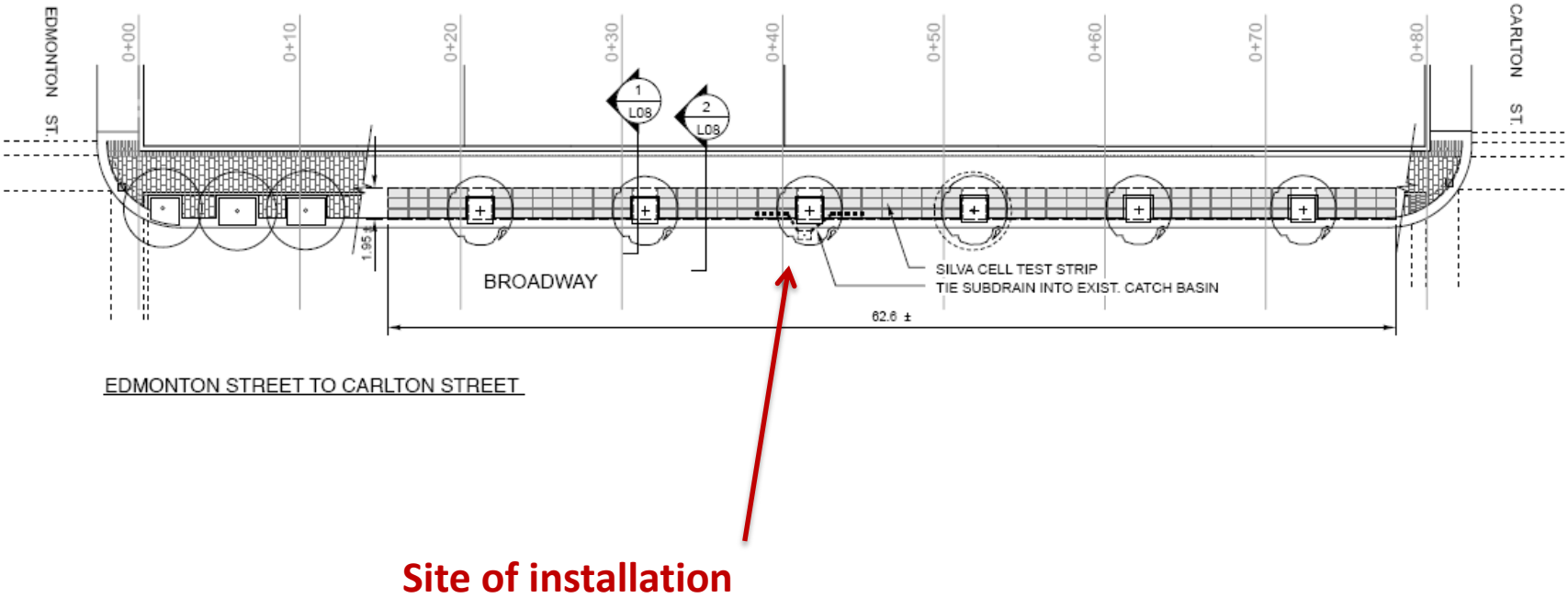
Repair: Planned Water Service (Winnipeg, MB)

Planned water service installation Broadway Ave – mid block between Edmonton and Carlton Streets in Winnipeg, MB



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Repair: Planned Water Service (Winnipeg, MB)

Area of excavation

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Repair: Planned Water Service (Winnipeg, MB)

The existing pavement is removed. In this case the existing pavers were salvaged for re - installment

The aggregate base is removed and the fabric covering the decks is cut and removed

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Repair: Planned Water Service (Winnipeg, MB)

The Silva Cells are removed and the existing watermain exposed where the new connection will be

Adjacent stacks of Silva Cells remained in place

Existing watermain

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Repair: Planned Water Service (Winnipeg, MB)

Once the new service is installed, the excavation is backfilled to the bottom of the Silva frames

Silva Cells

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Repair: Planned Water Service (Winnipeg, MB)

The Silva Cells frames are re-installed and the existing irrigation and drain lines are run back through the cells

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Repair: Planned Water Service (Winnipeg, MB)

The Silva Cell frames are filled with soil , the decks are attached and the geotextile fabric is patched

Silva Cell decks

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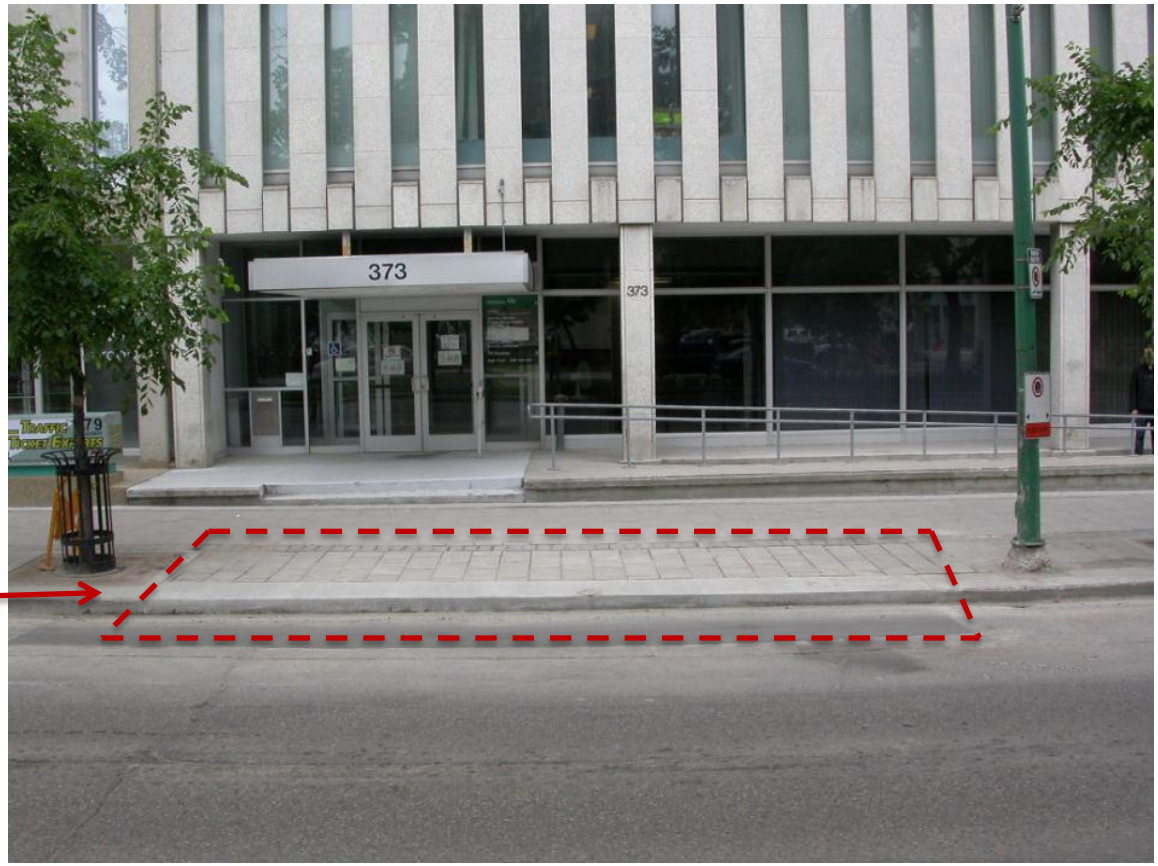
Repair: Planned Water Service (Winnipeg, MB)

The aggregate base is replaced, a new curb is installed, and the salvaged pavers are reinstalled to complete the restoration

Area of installation after restoration



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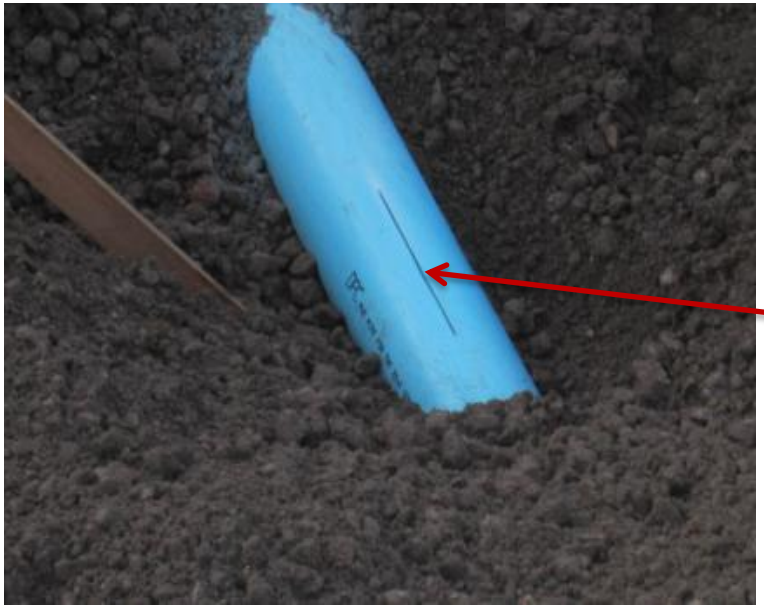
Repair: Simulated Emergency Water Main (Toronto, ON)

DeepRoot, along with the City of Toronto and Toronto Water, participated in a demonstration project that simulated an emergency water main repair scenario.

Repair: Simulated Emergency Water Main (Toronto, ON)

Prior to constructing the Silva Cells, a PVC pipe was buried below the level of the Silva Cells to act as a watermain



A saw cut was made into the pipe to act like a break in the pipe

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Repair: Simulated Emergency Water Main (Toronto, ON)

A typical Silva Cell system is constructed over the buried pipe

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Repair: Simulated Emergency Water Main (Toronto, ON)

The planned “break” occurred on a bitterly cold day in January

Silva Cell system with concrete pavement now over the top

Riser pipe and hose connection to the pipe buried under the Silva Cells

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Repair: Simulated Emergency Water Main (Toronto, ON)

A fire hose from a nearby hydrant was connected to the buried pipe via the riser pipe. When the hydrant was turned on, it flooded the area with water

*Due to the soil in the Silva Cells being loosely compacted, the water came to the surface very near to the location of the break rather than traveling underground

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Repair: Simulated Emergency Water Main (Toronto, ON)

The pavement over the repair area was sawcut into panels and removed with a backhoe

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Repair: Simulated Emergency Water Main (Toronto, ON)

The aggregate base was removed and the geotextile fabric over the Silva Cells cut out of the way, exposing the top of the Silva Cells

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Repair: Simulated Emergency Water Main (Toronto, ON)

At this point, an effort could be made to salvage the Silva Cells for re use. However, since this simulated an emergency repair, time is of the essence. Therefore, the crew doesn't stop and just digs right through the Silva Cells

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Repair: Simulated Emergency Water Main (Toronto, ON)

Remember, Silva Cells are designed with a 1” to 3” gap between the frames and do not interlock horizontally. Therefore, the adjacent stacks of Silva Cells were not disturbed during the excavation.

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Repair: Simulated Emergency Water Main (Toronto, ON)

The pipe was exposed and ready to be repaired in essentially the same time as it would be during a traditional repair.

*Note that the lightly compacted soil in the Silva Cells generally puts less downward pressure on the sides of the excavation than traditionally compacted soil which helps the excavation stay open better

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Restoration Options

There are two ways to approach restoring that area depending on the time frame in which the work must be completed and the available materials:

1. Restore the area temporarily at the time of the repair and do the permanent restoration at a later date.

2. Restore the area permanently at the time of the repair using one of three permanent restoration options.

Restoration Options

When time is limited, the area can be quickly restored by backfilling the excavation with a lean concrete mix like U-fill or compacted aggregate and temporarily patching the pavement …

… Then at a later the date the area can be re excavated and restored permanently using one of three permanent restoration options.

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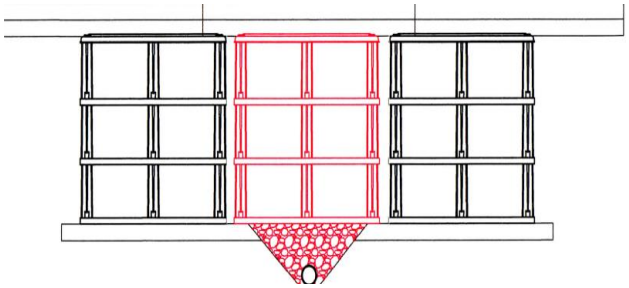
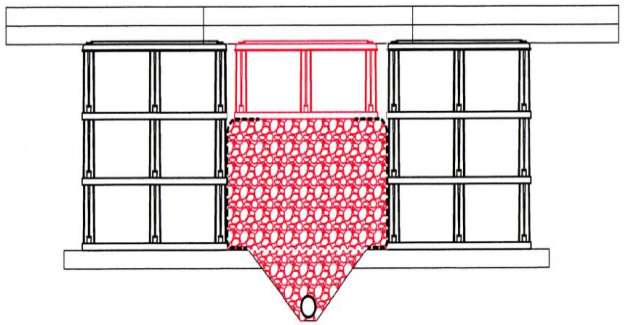
Restoration Options

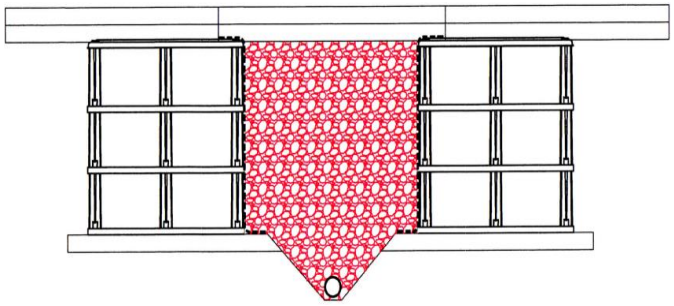
Option 1 – fill/compact the excavation to the bottom of the Silva Cells and re install new or salvaged frames and decks



Option 2 – fill/compact the excavation up to the bottom of the uppermost layer of Silva Cells and re install a single layer of frames and decks



Option 3 – fill/compact the excavation to the bottom of the Silva Cells, install geogrid around the perimeter of the remaining opening and fill with compacted soil, clear stone or flowable fill/U-fill (in the case of flowable fill, try to establish some link between adjacent soil volumes)



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Conclusion

Conclusion

There are many options for integrating Silva Cells with both new and existing utilities.

Plan for the future wherever possible.

Planned and emergency repairs are not much different with Silva Cells and there are different restoration options available depending on the circumstances.

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Questions?

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