Reducing Tree (and Soil!) Damage during Construction

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Ecosystem Services

-- Stormwater Reduction
Water and Air Quality Improvement
Energy Conservation
Carbon Sequestration
Urban Heat Island Mitigation
Habitat for pollinators /animals

Tree Preservation Concepts

- Tree protection is soil and root protection
- Planning the construction
- Critical root zone and no cut zone
- Tree protection zone and tree protection fencing. Directional boring.
- Site remediation and tree treatment

Three easy ways to kill a tree in five years or less:

- Soil Compaction in the Critical Root Zone
- Cutting the Roots
- Backfilling over the Roots

Compacted soil showing loss of structure.

Planning the Construction

- How much will be excavated? How will it be removed or used on site?
- Where will the utility/curb trenches be?
- How will the crews get materials to the site?
- What type of equipment do they have? How big is it?
- Where will they store their materials?
- How much room do they need to work?
- Parking?

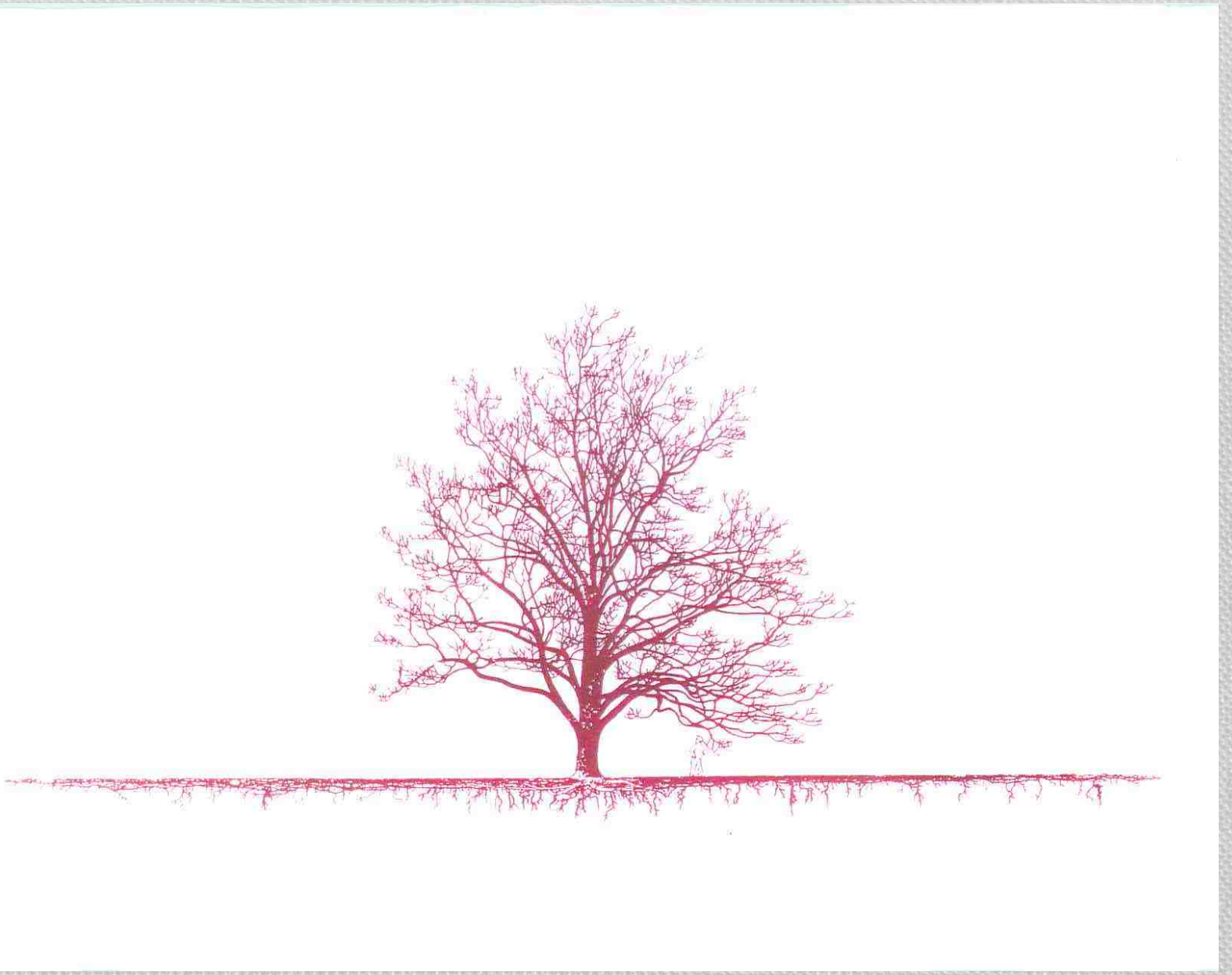
The Development Team


CAT
CCC

Soil compaction on construction site

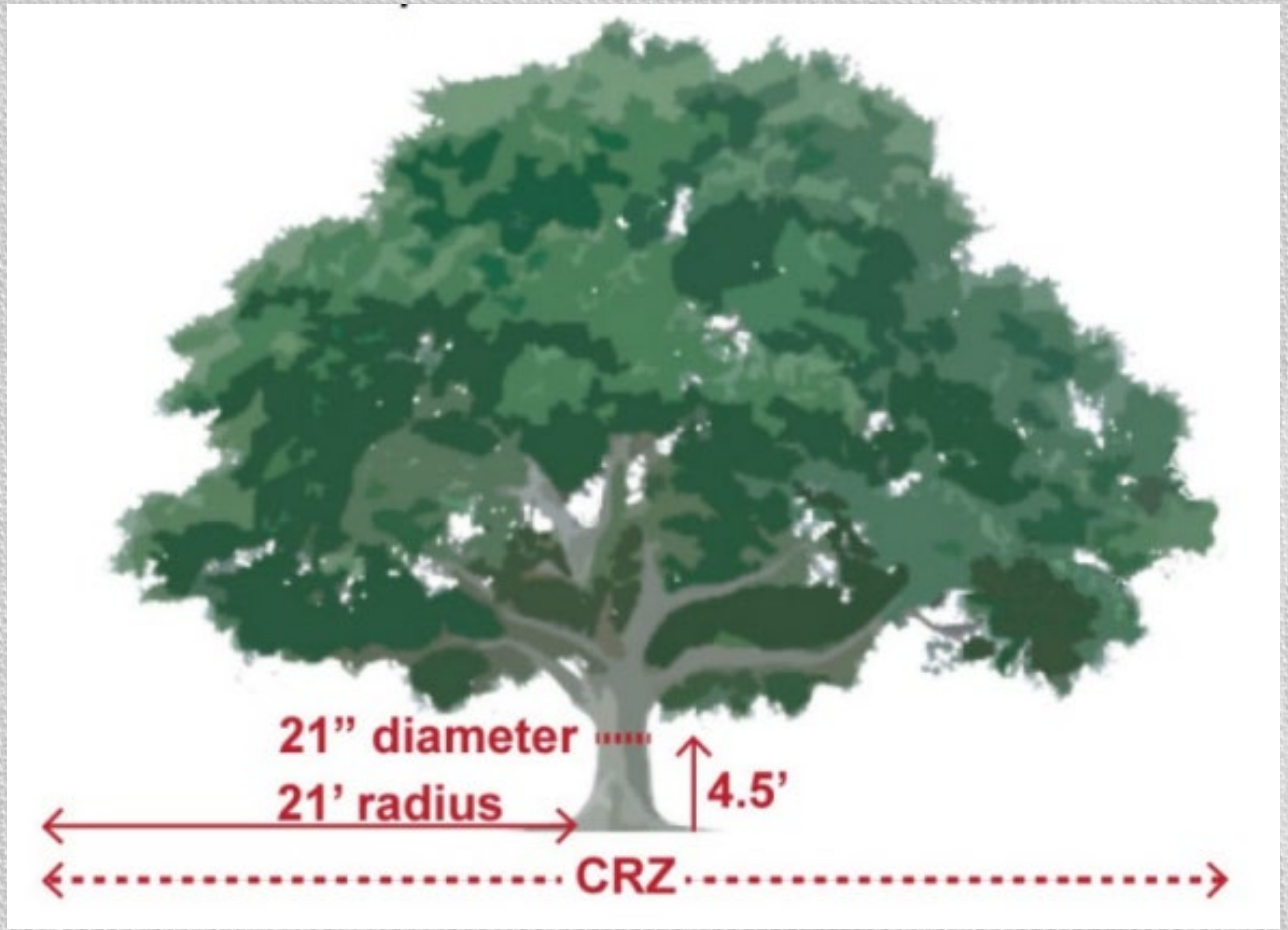
General Root Morphology

- Roots extend 2.5-3 times the crown radius
- Most roots (>60%) located outside the drip line
- Tap roots rarely present in mature trees
- >95% of roots are found in the top 3’ of soil



Critical Root Zone (CRZ)

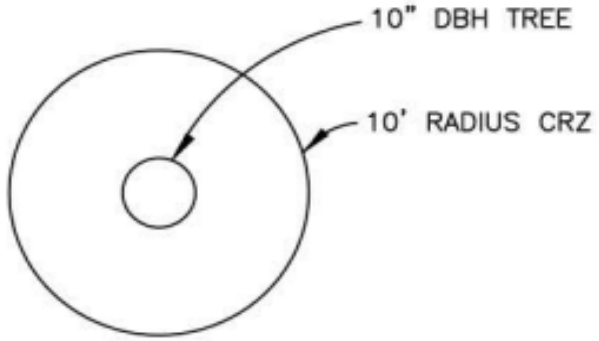
- Typically, 1 foot radius protected for every 1” dbh
- Check your local jurisdiction for CRZ requirements



Red Oak ‘protecting’ construction materials

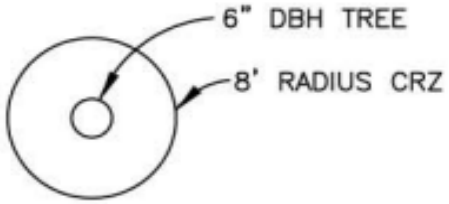
TREES GREATER THAN 8" DBH (DBH=DIAMETER BREAST HEIGHT):

1" DBH OF THE TREE= 1' RADIUS OF THE CRITICAL ROOT ZONE (CRZ)



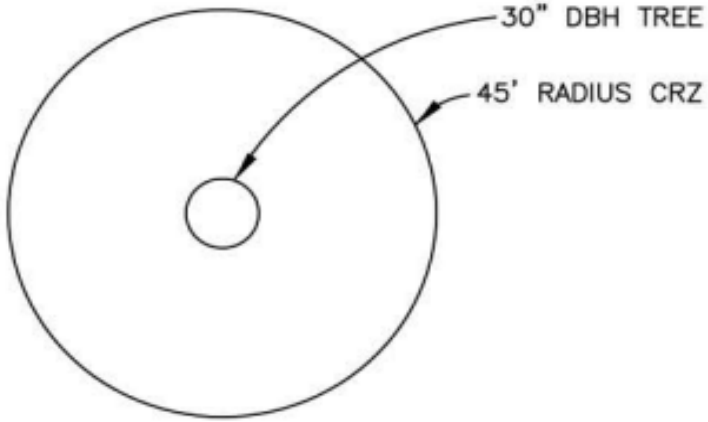
TREES 8" DBH AND SMALLER:

8 FT. RADIUS CIRCLE AROUND THE TRUNK OF THE TREE.



SPECIMEN TREES

1" DBH= 1.5' RADIUS OF THE CRITICAL ROOT ZONE.



TREE PROTECTION DETAIL FOR DETERMINATION OF CRITICAL ROOT ZONE

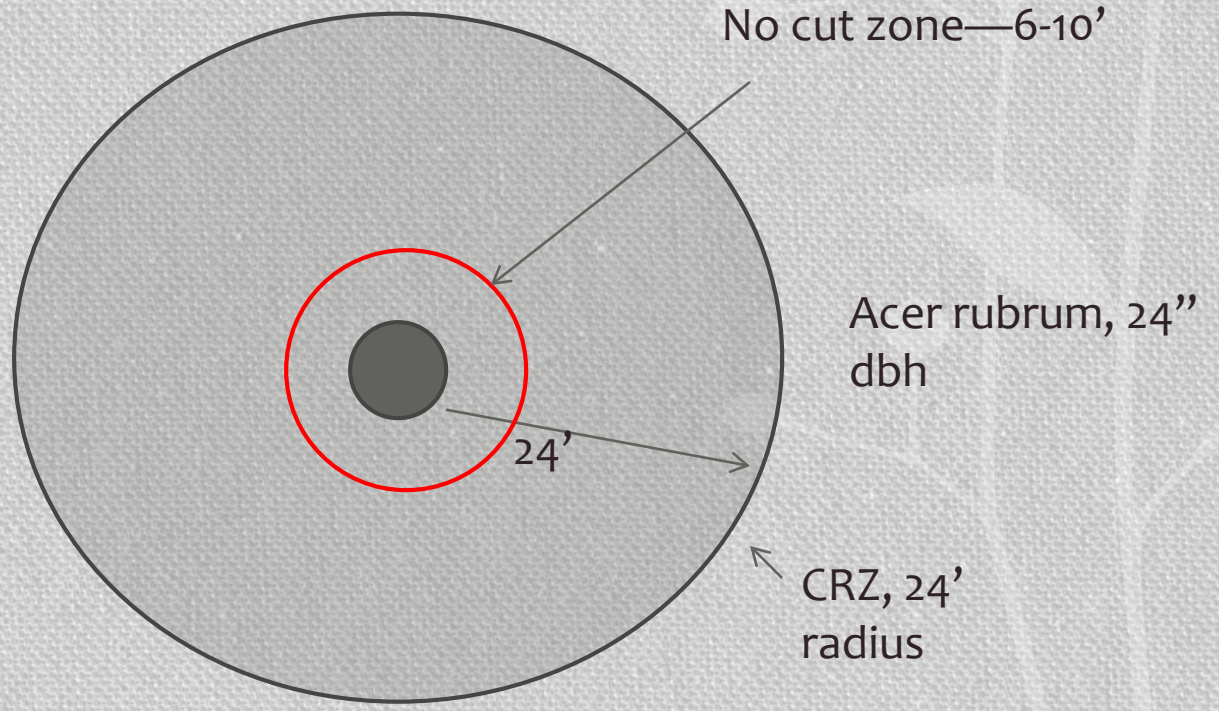
DIRECTOR DATE

ARLINGTON COUNTY, VIRGINIA
DEPARTMENT OF PUBLIC WORKS

DRAWING NO.
R-7.7

No Cut Zone (Structural CRZ)

- Typically within 6’ – 10’ of a mature (24” dbh) tree
- Cutting within this radius can destabilize the tree
- Design so there will be no root severance within 6-10’ of a mature tree



- Destabilizing the tree
  - Root severance within the zone of rapid taper (or no cut zone)

What Goes on a Tree Preservation Plan Sheet

- Tree inventory
- Trees labeled and CRZs noted
- Trees to be removed labeled
- Tree protection fence
- Mulched areas for access spaces inside the CRZs of trees
- Access route
- Storage areas, parking areas
- Tree protection specifications
- Details

Tree Inventory

- Code or number
- Tree species—scientific and common name
- DBH
- Condition Rating (Good, Fair, Poor)
- Notes—Include trees that will be removed

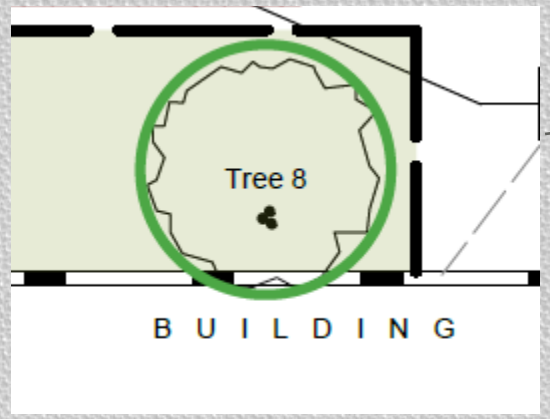
Tree Inventory					
No.	Scientific Name	Common Name	DBH	Condition	Notes
1	Acer campestre	Hedge Maple	6"	Good	
2	Quercus phellos	Willow Oak	24"	Good	
3	Quercus phellos	Willow Oak	26"	Fair	canopy dieback
4	Acer negundo	Boxelder	13"	Good	included bark in main fork
5	Cornus florida	Dogwood	5"	Good	
6	Acer platanoides	Norway Maple	18"	Good	invasive

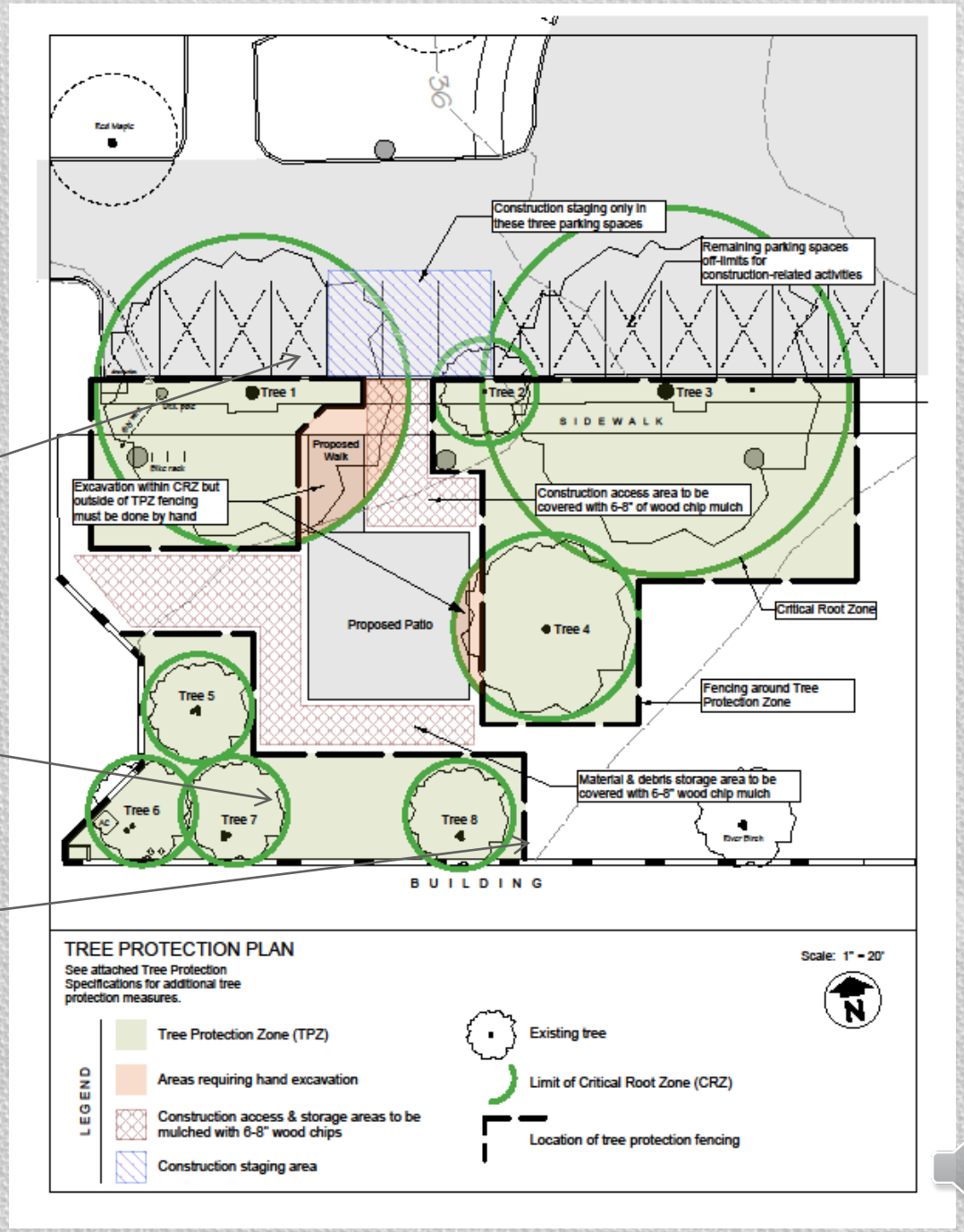
How Do We Manage the Tree Resources?

- We Can Move the Tree/Trees?
- We Can Go Under the Tree/Trees?
- We Can Go Around the Tree/Trees?
- We Can Remove the Tree/Trees?

Trees Labeled and CRZs Shown

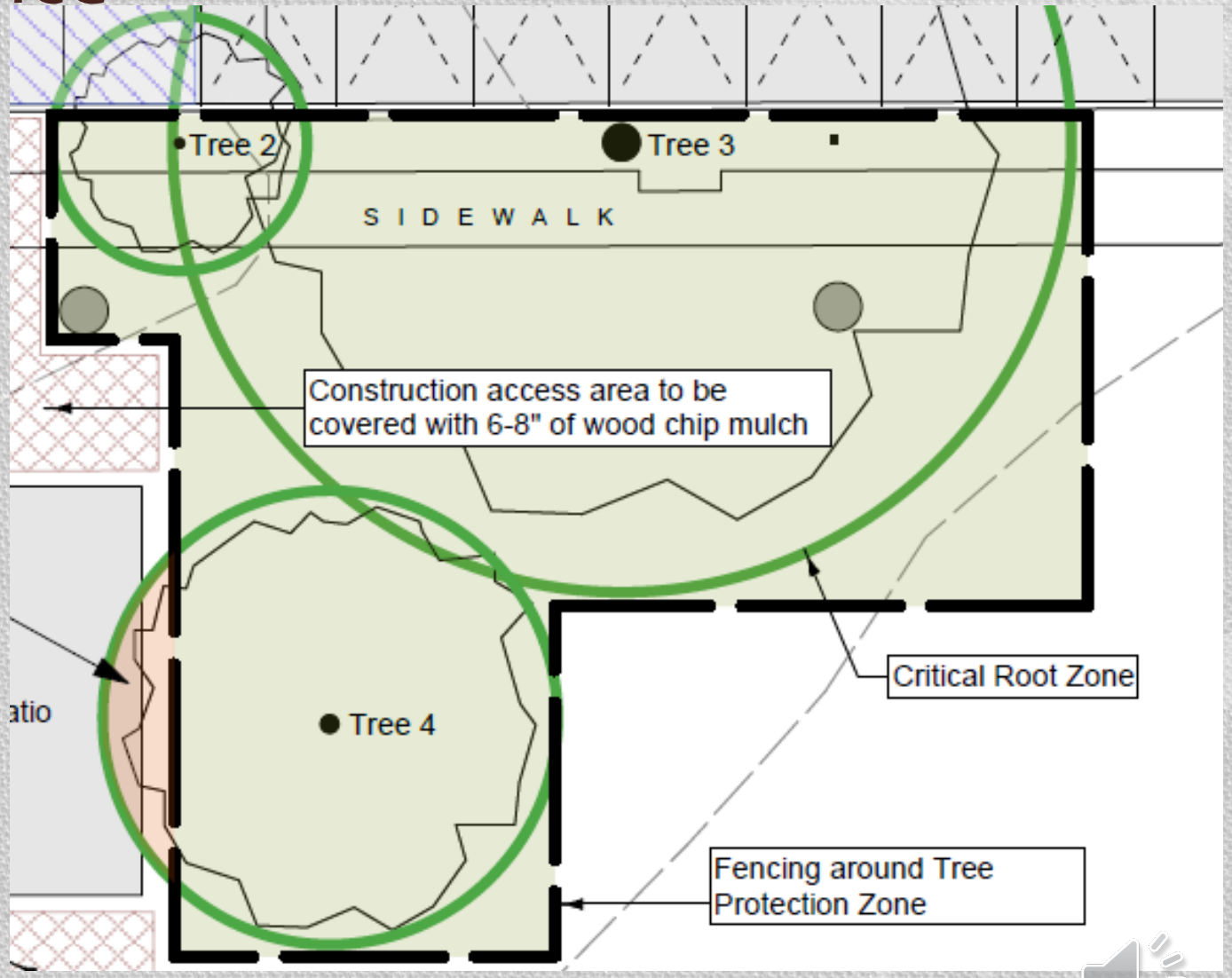
CRZs



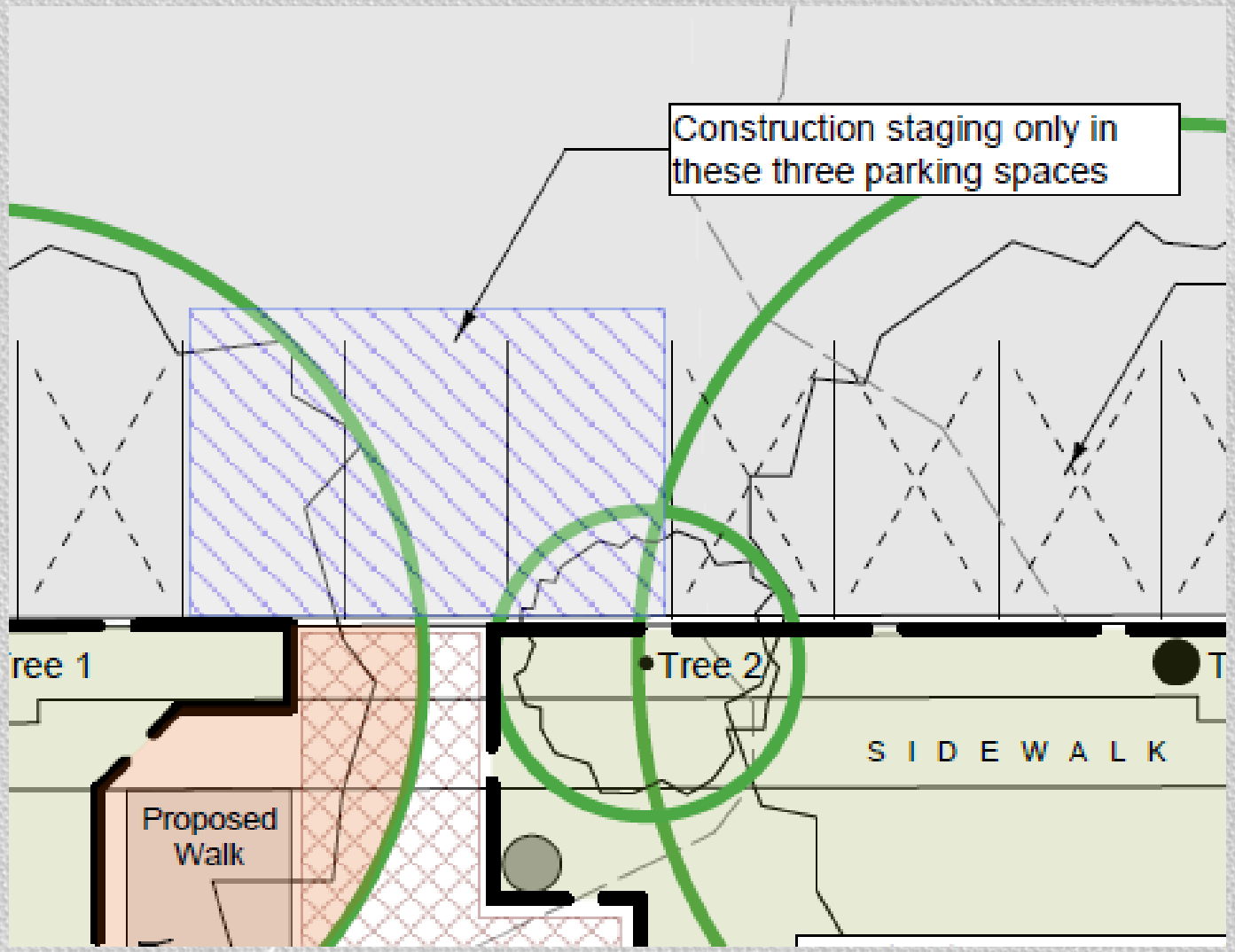


Tree Protection Fence

- Should be the most clearly communicated graphic on the plan
- Better to group trees within a fence than fence each individually
- Completely enclose all tree protection zones
- Don’t forget to protect street trees
- Ideally, all work is done outside the CRZs of the trees
- Keep as work on hard surfaces as much as possible



Access Routes and Storage Areas



Site Specific Specifications

TREE PROTECTION SPECIFICATIONS

Definitions: Shall be according to ANSI A300 (Part 5)-2012 Tree, Shrub, and Other Woody Plant Maintenance—Standard Practices (Management of Trees and Shrubs During Site Planning, Site Development, and Construction)

The following tasks shall be completed prior to commencing construction work:

1. The lower branches from trees 2, 5, and 6 will be removed to elevate the canopy. This work will be done prior to construction and should be completed by an ISA Certified Arborist under the direct supervision of the landscape architect/designer.
2. A protective layer of wood chip mulch, 9" thick, shall be laid down on the access ways as noted on the plan. The chips will be spread using hand tools only, such as shovels and wheelbarrows.
3. Tree protection zone barriers shall be placed as shown on plan. The barriers shall be 6' tall chain link continuous fencing that is easily visible and is marked by protective signage in both English and Spanish. The tree protection zone shall conform to the specifications outlined in *Tree Preservation Methods, City of Oakville, VA*. The tree protection zone barriers shall not be attached or anchored to the tree or trees to be preserved.

Reduce Compaction

- Temporary thick (8-12” deep) mulch layer (wood chips) over root zone
- Plywood sheets or mats over mulch for additional weight dispersal

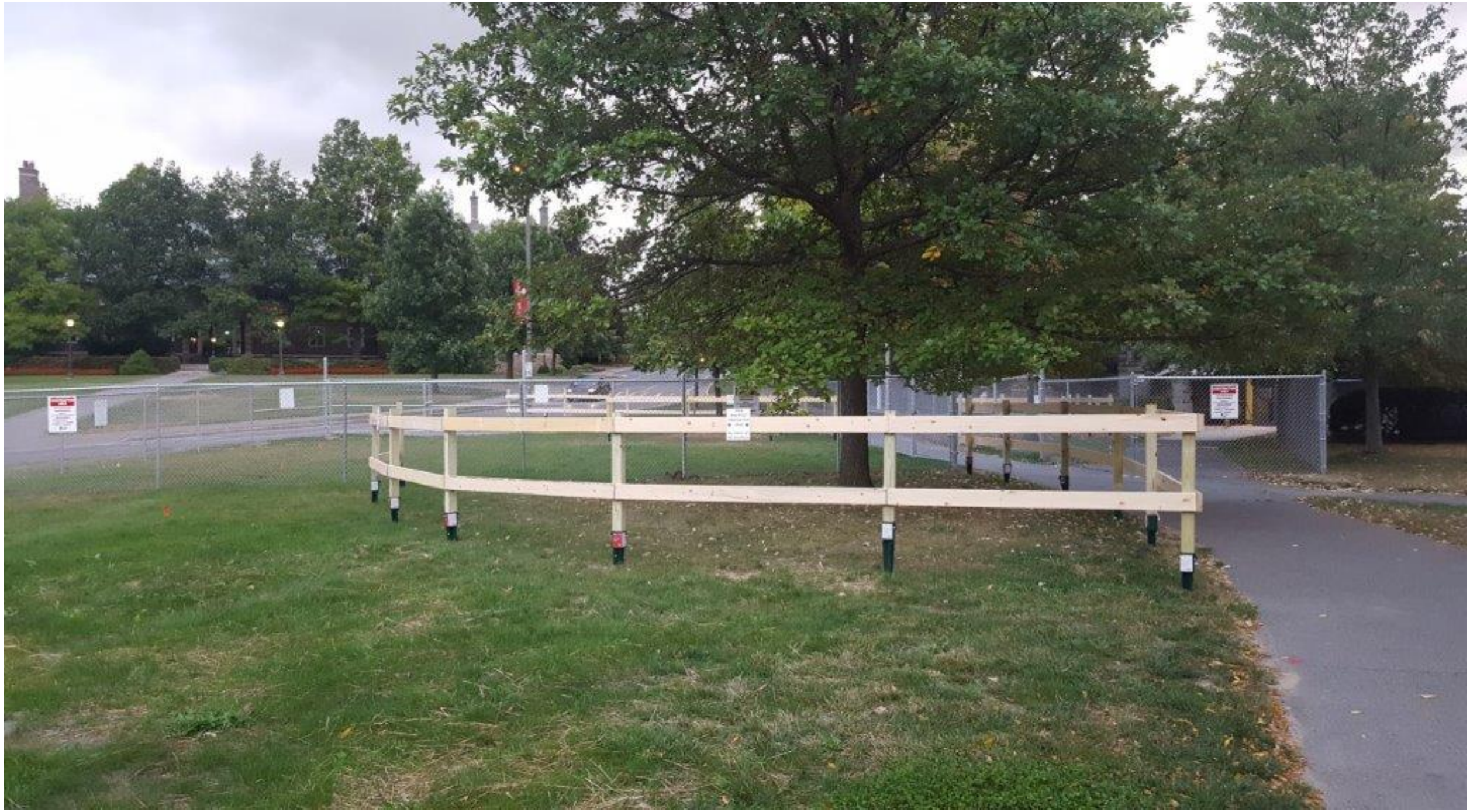
Mitigating Work Inside a CRZ

- Work has to be done inside at least some of the trees' CRZs

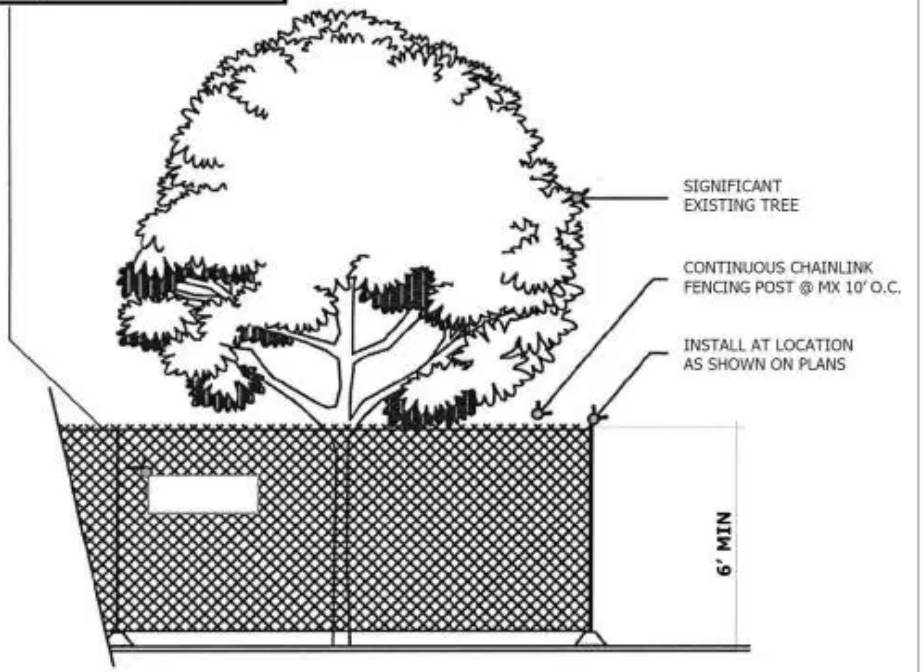
Protecting Tree Roots From Construction Damage

Poor or no root protection

Good root protection



Tree Protection Area, Entrance Prohibited
To report violations contact
City Code Enforcement
At [redacted]



1. MINIMUM SIX (6) FOOT HIGH TEMPORARY CHAINLINK FENCE SHALL BE PLACED AT THE CRITICAL ROOT ZONE OR DESIGNATED LIMIT OF DISTURBANCE OF THE TREE TO BE SAVED. FENCE SHALL COMPLETELY ENCIRCLE TREE(S). INSTALL FENCE POSTS USING PIER BLOCK ONLY. AVOID POST OR STAKES INTO MAJOR ROOTS. MODIFICATIONS TO FENCING MATERIAL AND LOCATION MUST BE APPROVED BY PLANNING OFFICIAL.
2. TREATMENT OF ROOTS EXPOSED DURING CONSTRUCTION: FOR ROOTS OVER ONE (1) INCH DIAMETER DAMAGED DURING CONSTRUCTION, MAKE A CLEAN STRAIGHT CUT TO REMOVE DAMAGED PORTION OF ROOT. ALL EXPOSED ROOTS SHALL BE TEMPORARILY COVERED WITH DAMP BURLAP TO PREVENT DRYING AND COVERED WITH SOIL AS SOON AS POSSIBLE.
3. NO STOCKPILING OF MATERIALS, VEHICULAR TRAFFIC, OR STORAGE OF EQUIPMENT OR MACHINERY SHALL BE ALLOWED WITHIN THE LIMIT OF THE FENCING. FENCING SHALL NOT BE MOVED OR REMOVED UNLESS APPROVED BY THE CITY PLANNING OFFICIAL. WORK WITHIN PROTECTION FENCE SHALL BE DONE MANUALLY UNDER THE SUPERVISION OF THE ON-SITE ARBORIST AND WITH PRIOR APPROVAL BY THE CITY PLANNING OFFICIAL.
4. FENCING SIGNAGE AS DETAILED ABOVE MUST BE POSTED EVERY FIFTEEN (15) FEET ALONG THE FENCE.

CITY OF KIRKLAND WASHINGTON

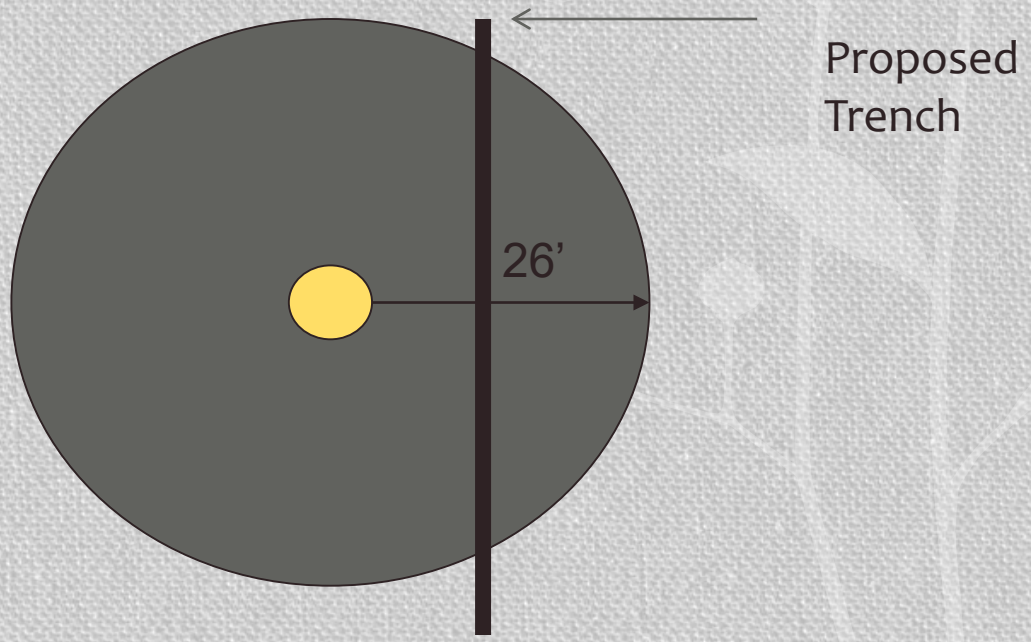
TREE PROTECTION FENCING DETAIL
(for public and private trees)

Managing the Site

Mitigating Work Inside a CRZ

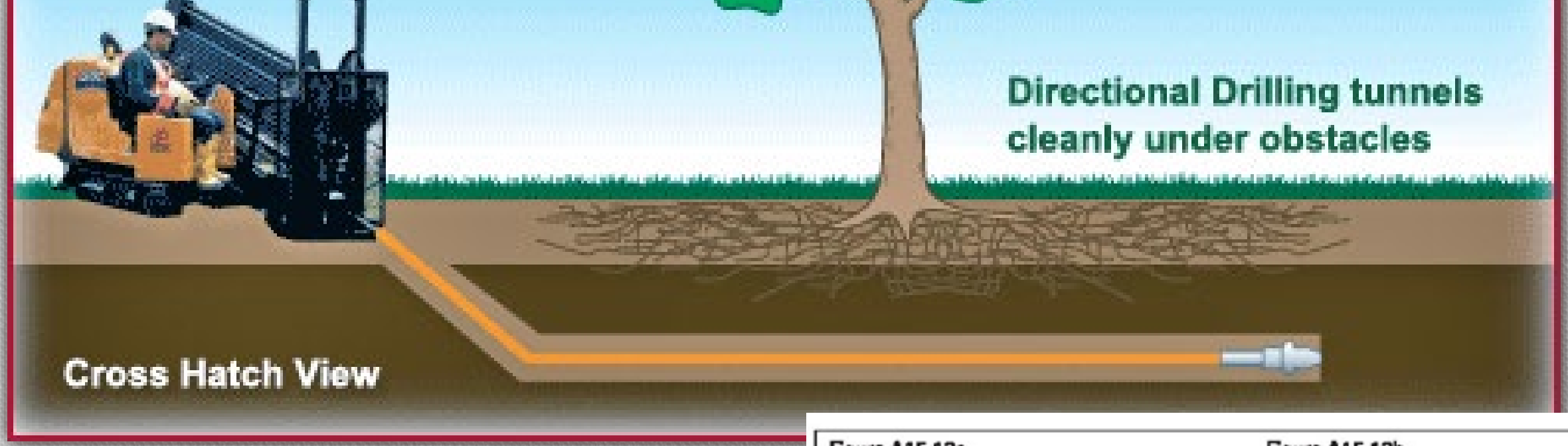
- Avoid impacting more than 30% of the CRZ total area and NONE of the No Cut Zone

Red Maple tree, 26” dbh
2122 sf CRZ, 30% is 636 sf

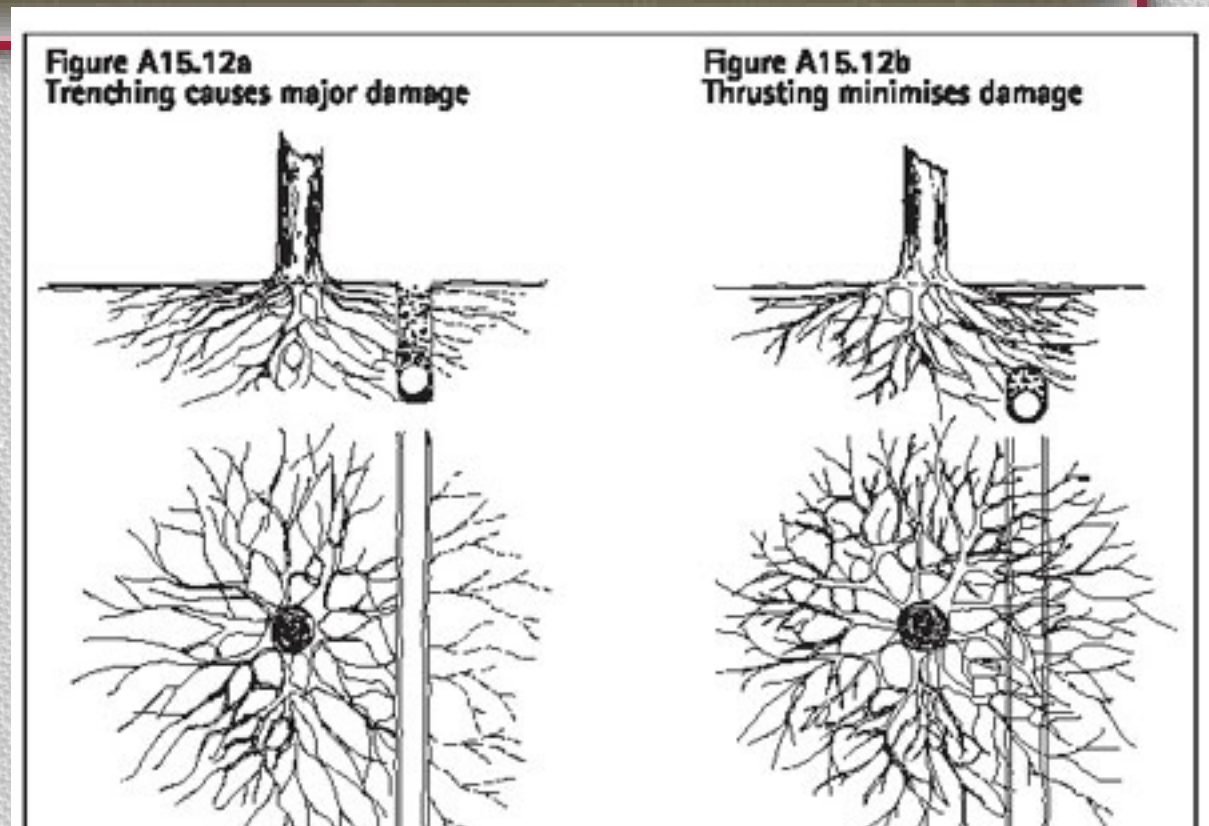


The area inside a circle is pi times radius squared.

3.14 (26 x 26) = 2,122 sf



Boring (HDD Horizontal Directional Drilling)

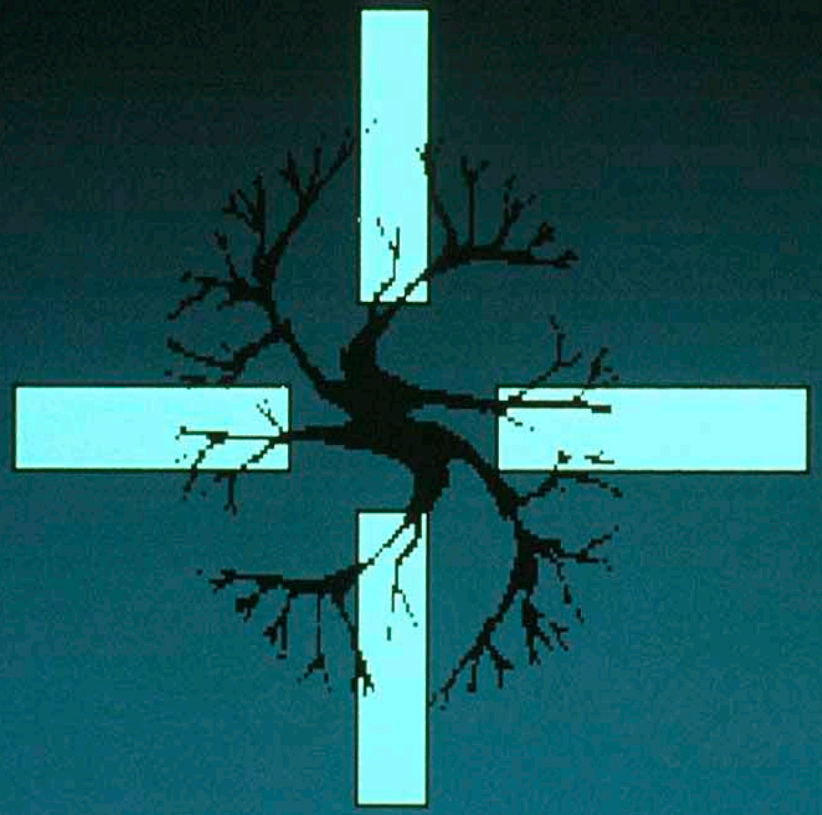



Tree dieback post construction

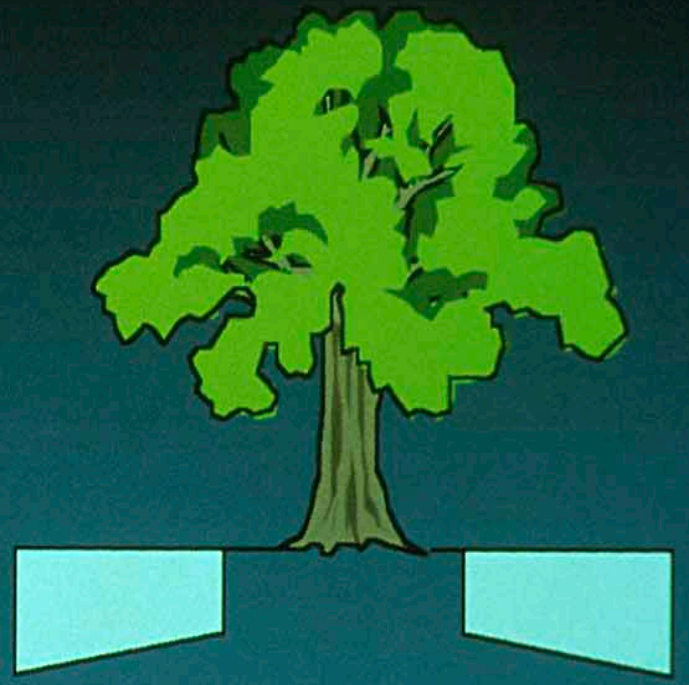
Remediation

- Berms, planters, landscape beds, radial trenching
- Air spade decompaction and compost incorporation
- Scoop and Dump technique
- Structural Soil backfill

Radial Trenching



Radial trenching--plan view



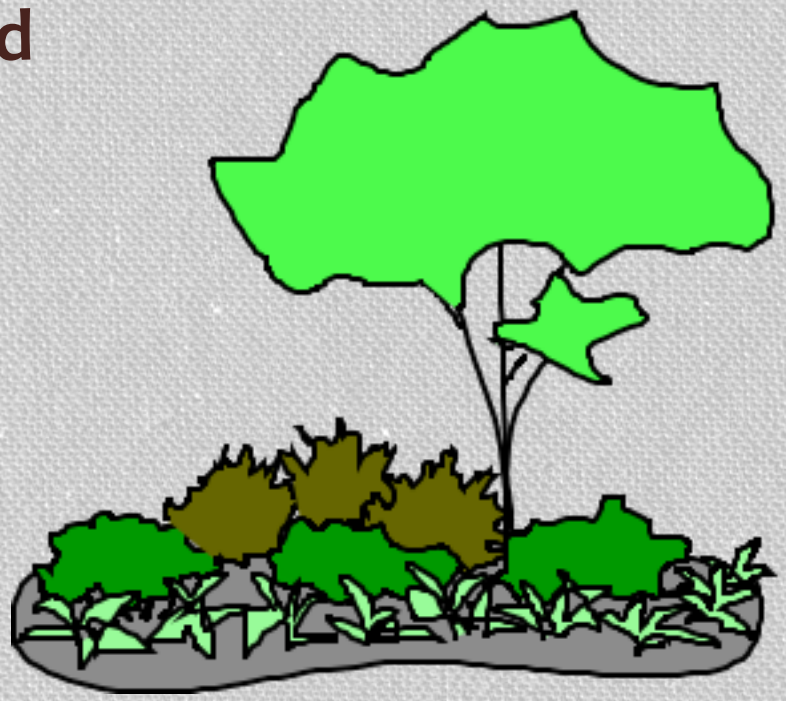
Radial trenching--section

Air-Spade Excavation

Air-Spade large scale trenching

Benefits of Preparing a Landscape Bed

- **provides greater rooting volume for plants**
- **easier for plant roots to establish**
- **more consistent water movement into bed**
- **easy to plant once bed is prepared**




555E
FORD


AACK


TRUCK SUPPLY
ITHACA, N.Y.

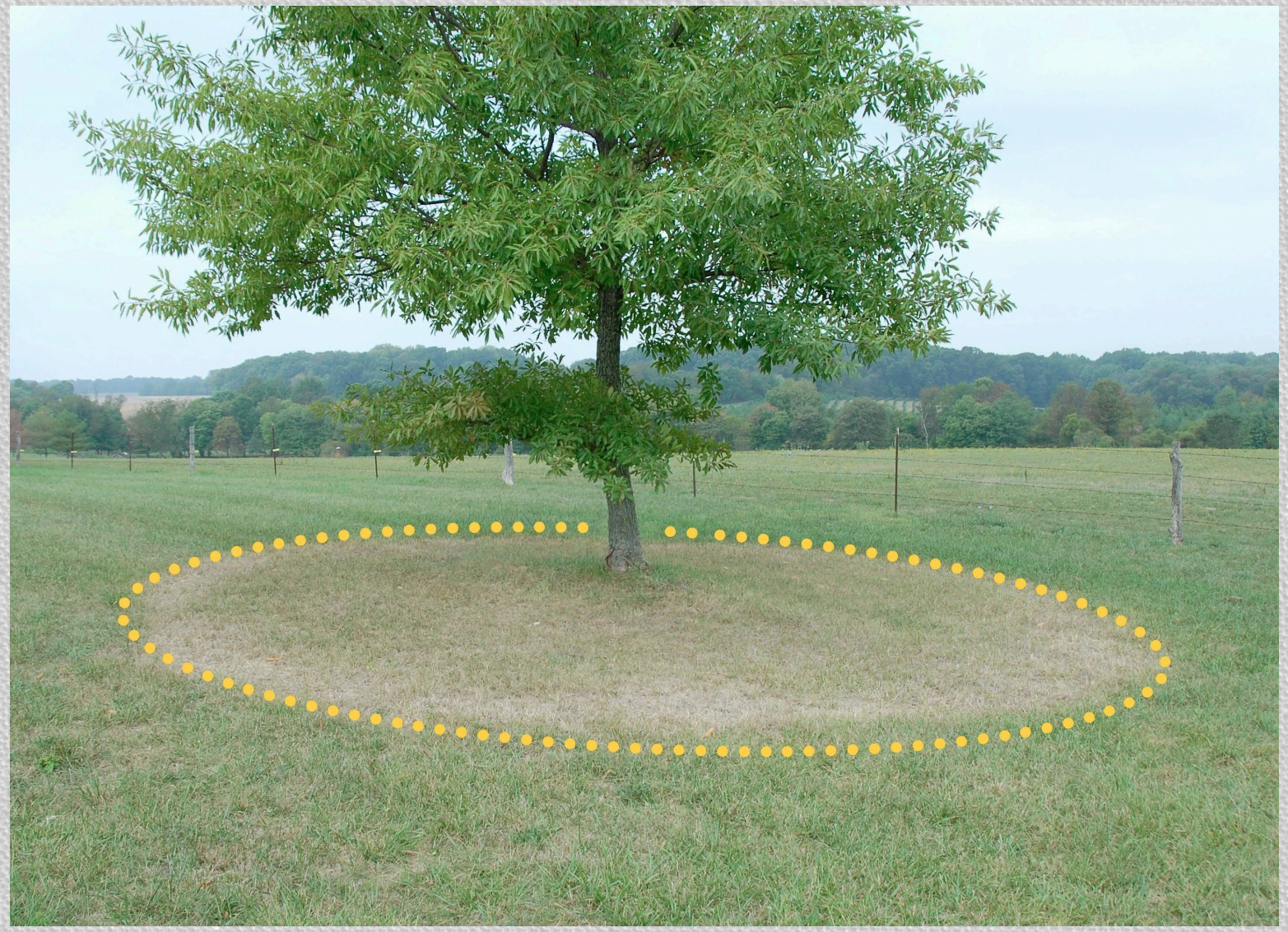

Bobcat
873

Scoop & Dump method of soil remediation

- Apply a layer 6-8” of compost to compacted soil
- Use backhoe bucket to dig down to 18”
- Bucket is lifted with topsoil / compost mix 3 feet into the air
- Soil/compost mix is dropped onto the ground
- Landscape plants are directly planted in the soil
- Surface mulch added every year to replenish organic matter


CALDWELL HALL
Bobcat
5699
04 . 22 . 2013

S&D not done under existing trees

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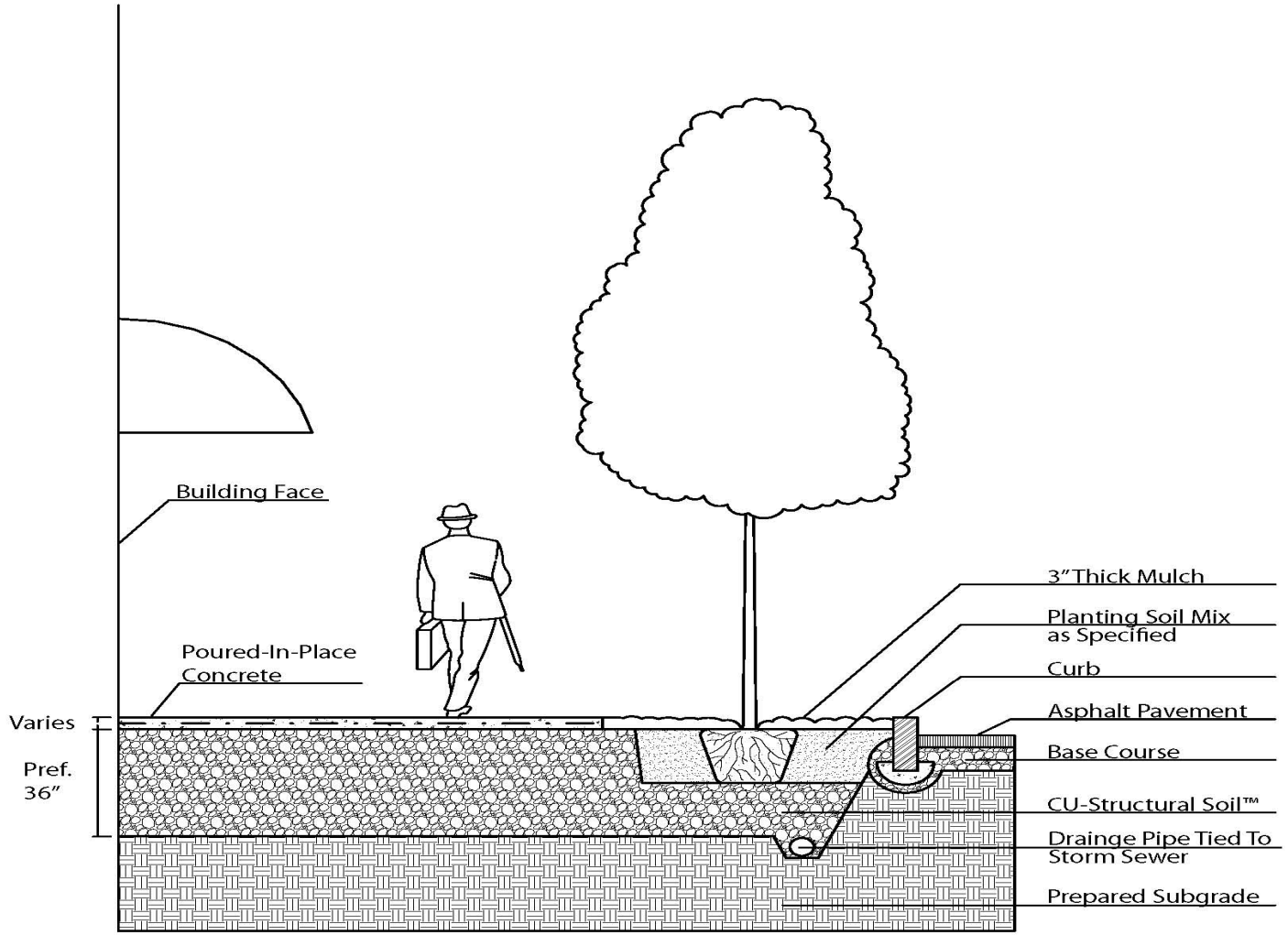
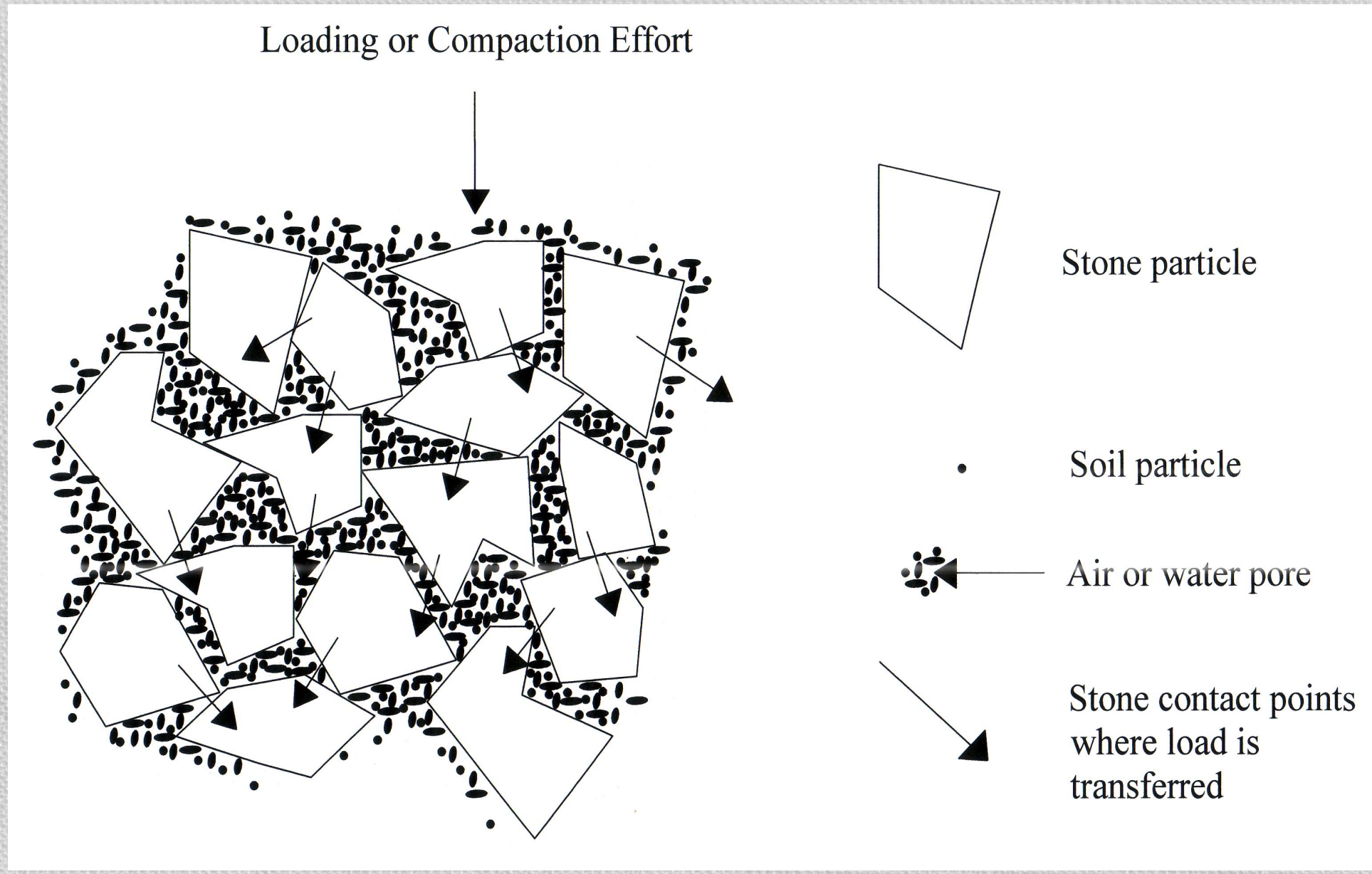
Required compaction prior to laying pavement.

Honeylocust in Lawn and in Pavement


Building Face
Poured-In-Place
Concrete
Varies
Pref.
36"
3"Thick Mulch
Planting Soil Mix
as Specified
Curb
Asphalt Pavement
Base Course
CU-Structural Soil™
Drainge Pipe Tied To
Storm Sewer
Prepared Subgrade


Loading or Compaction Effort
Stone particle
Soil particle
Air or water pore
Stone contact points where load is transferred

How do we Keep Trees Alive on a Typical Construction Site?

- Early involvement of an International Society of Arboriculture Certified Arborist is critical for success
- Architects must consider tree biology in the design phase
- Civil Engineers must respect the trees' Critical Root Zone
- The field personnel must understand and respect the commitment of the ownership team to protect the trees
- Communication at all levels of involvement is critical

Website:

WWW.HORT.CORNELL.EDU/UHI