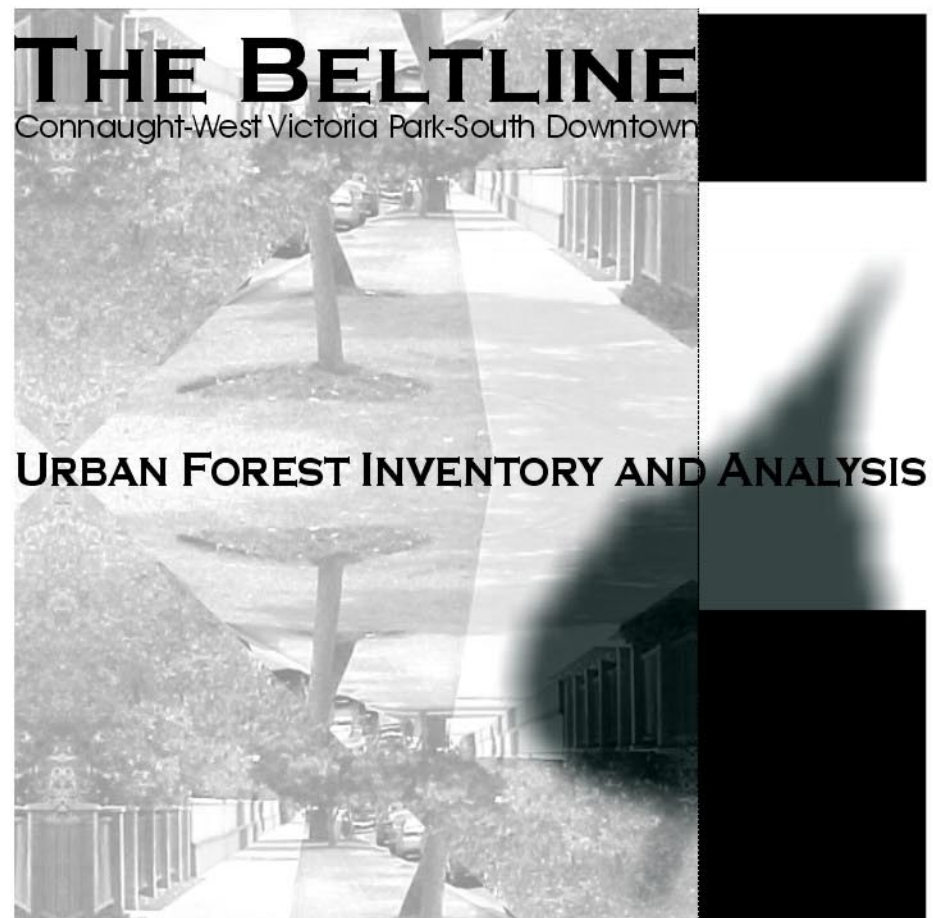




THE URBAN STUDIO
Faculty of Environmental Design
University of Calgary
and
THE INNER CITY FOREST COMMITTEE
Connaught Community Association



CD and Report prepared by

Dr. Bev Sandalack
Julio Marcé-Santa

with funding assistance from

the Calgary Community Lottery Board
the Faculty of Environmental Design

January 2002

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URBAN FOREST INVENTORY AND ANALYSIS the Beltline

INTRODUCTION

The Connaught Community Association Inner City Forest Committee and the Urban Studio, Faculty of Environmental Design prepared an urban forest inventory and report. The study area consists of an area approximately 14 blocks by 7 blocks bounded by the CPR tracks to the north, 17th Avenue to the south, 14th Street to the west, and Macleod Trail (north) to the east. This is the district Calgarians call 'the Beltline' and is composed of the neighbourhoods of Connaught, West Victoria Park and South Downtown.

The Inner City Forest Committee had tried to obtain an up to date inventory of the trees on public property for use in tree planting programs and as a management tool, however, the available maps, photos and inventories were not adequate. The City neighbourhood maps show some tree locations, but this information is inexact. Tree locations are taken from air photos, and are therefore subject to interpretation, and are only as current as the air photo that the map is based on. Trunk locations are not shown on the neighbourhood maps, only canopies, and the canopies may refer to groups of trees as well as individual specimens. The tree information does not include species, nor does it differentiate between trees and shrubs. The City of Calgary urban forest inventory consists of a list inventory (by street address) of all plant material (i.e. trees and shrubs) in the public right of way, based on the last City inventory. It is not map-referenced, and is unwieldy to use.

The Inner City Forest Committee identified a need for an up to date and easy to use mapped inventory in its efforts in developing a plan for the neighbourhood urban forest. The Committee and the Urban Studio, EVDS agreed to collaborate on an inventory and analysis.

The following is a summary of the process and methodology that was used in the Beltline study. It has been recorded so that other community groups can utilise a similar process in developing tree inventories and master plans. the participants feel more comfortable about participating in the project.

PROCESS AND METHODOLOGY

Background materials included

- base map of the Beltline (1:2000 neighbourhood map, City of Calgary)
- tree inventory (City of Calgary Urban Forestry)

Workshop

Dr. Bev Sandalack (EVDS) conducted a 1 1/2 hour workshop on basic tree biology, street tree information, and instruction on identification of 15 trees and large shrubs likely to be found in the neighbourhood. Illustrated identification keys were prepared which listed the common trees and shrubs. This was in the form of a laminated double sided 8 1/2 x 11 page. The volunteers practiced identification on tree samples, and were all competent in identifying the most common trees within a short time.

14 people attended the workshop at Wesley United Church (15th Avenue and 7th Street SW). Participants had varying backgrounds and degrees of familiarity with trees, but all had an interest in learning more about their community, particularly the urban forest, and in helping with this study.

Following the workshop, participants were provided lunch at Community Health Foods on 10th Avenue and 12th Street SW. This support is gratefully acknowledged.

Field Inventory

The study area was divided into sectors approximately 2 blocks wide, and extending from the railway tracks to 17th Avenue. Each team of two people received the following:

- base map (enlarged to 1:1500) for the sector they were responsible for
- recording sheets
- measuring tapes (to measure tree diameter)

Each team was instructed to inventory the trees on public land (boulevards, rights of way, parks and open spaces). The following were to be recorded:

- location (note on the map)
- species (if unable to identify species, clip a leaf sample, save in plastic bag, and note location)
- height
- diameter at breast height (dbh)
- canopy size
- general health (note if the tree has been topped, has dead branches or other damage)
- conflicts with utility lines, sidewalks, driveways, buildings







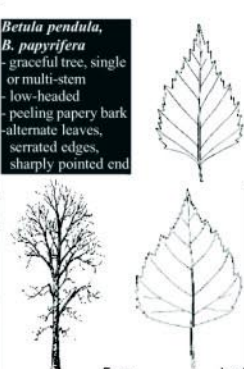

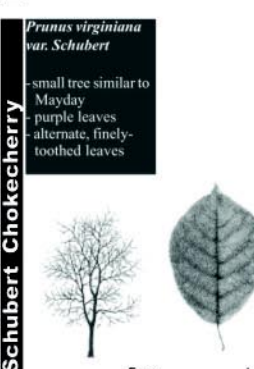



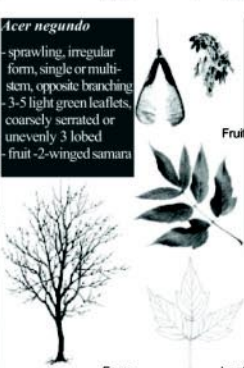


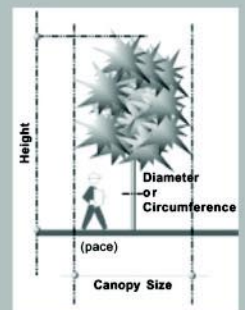
Data entry

EVDS digitised the map information and prepared an urban forest map. A simple base map was prepared which included streets, curbs, sidewalks, and building locations. The tree locations were plotted according to the inventory, and checked against the air photo, neighbourhood map and in some locations were verified by a further site visit. The tree species were grouped in four general categories:

- **Boulevard Trees** (Green Ash, Elm, Oak, Poplar)
trees that are well suited as boulevard plantings - hardy, high-headed, long-lived
- **Ornamental Trees** (Birch, Crabapple, Shubert Chokecherry, Hawthorn, Amur Cherry, Manitoba Maple, Mayday Tree, Mountain Ash, Willow and Prunus - various species)
smaller trees usually selected for decorative features such as flowers, berries, leaf colour
- **Coniferous Trees** (Spruce, Larch)
trees that produce cones. (Note - spruce are evergreen trees, larch drop their needles in the fall)
- **Shrubs** (Caragana, Cotoneaster, Lilac)
this list only includes large shrubs commonly found in boulevard plantings

The tree attributes were entered on a spreadsheet. EVDS designed and set up the spreadsheet and community volunteers entered the data.

TREE IDENTIFICATION SHEETS

Green Ash (GA) <i>Fraxinus pennsylvanica</i> - opposite branching, 5-11 leaflets - fruit - clusters of oblong keys - common street tree 	American Elm (AE) <i>Ulmus americana</i> - large tree, vase shape - alternate branching - double tooth leaf edge, unequal base, prominent veins - common street tree 	Poplar (various) (PO) <i>Populus spp.</i> - alternate branching - sticky, scaly buds (willows - one bud scale) - usually glossy green leaves 	Bur Oak (OK) <i>Quercus macrocarpa</i> - upright single trunk, heavy horizontal alternate branching - wavy leaf margin 	Mountain Ash (MA) <i>Sorbus americana</i> - single or multi-stemmed - dense white flower clusters, red/orange fruit clusters - alternate, compound leaves (11-17 small leaflets, serrated edges) 	Willow (various) (WI) <i>Salix spp.</i> - single/multi stemmed, alternate branching - one bud scale (poplars-many scales) - narrow leaves, pointed ends 
Birch (various) (BI) <i>Betula pendula, B. papyrifera</i> - graceful tree, single or multi-stem - low-headed - peeling papery bark - alternate leaves, serrated edges, sharply pointed end 	Mayday Tree (MD) <i>Prunus padus var. commutata</i> - often multi-stemmed tree - loose clusters of flowers and black berry like fruit - smooth gun-metal gray bark - leaves alternate, abruptly pointed, finely toothed 	Schubert Chokecherry <i>Prunus virginiana var. Schubert</i> - small tree similar to Mayday - purple leaves - alternate, finely-toothed leaves 	Caragana (CA) <i>Caragana arborescens</i> - 8-12 leaflets, fine texture - yellow flower, small pea-pod fruit - spiny bark, hedge or single shrub 	Lilac (LI) <i>Syringa vulgaris, Syringa villosa</i> - upright large hedge or single shrub - fragrant white/purple flower clusters - opposite branching, smooth edged leaves 	Cotoneaster (CO) <i>Cotoneaster lucidus, C. integerrima</i> - hedge or single shrub - erect round topped, compact shrub - black berry-like fruit 1 cm - dark green roundish leaves 
Manitoba Maple (MM) <i>Acer negundo</i> - sprawling, irregular form, single or multi-stem, opposite branching - 3-5 light green leaflets, coarsely serrated or unevenly 3 lobed - fruit - 2-winged samara 	White Spruce (WS) <i>Picea glauca</i> - pyramidal when young, straggly when older - 4 sided green needles, blunt ends (see Col. Spruce) - round margins of cone scales (see Col. Spruce) 	Colorado Spruce (CS) <i>Picea pungens</i> - pyramidal - 4 sided needles, pointed at ends (see Wh. Spruce) - bluish green - ragged margins of cone scales (see Wh. Spruce)  <p>Note: distinguish from Pines which have long needles in clusters and hard cones</p>	<div style="display: flex; align-items: center;"> <div style="flex: 1;">  </div> <div style="flex: 1; padding-left: 20px;"> <p>GA 01 ← Map reference example (Green Ash)</p> <ul style="list-style-type: none"> - Location (street address) - Tree Species - Height (meters) - Diameter / Circumference (centimeters) - Canopy Size (meters) - General Health </div> </div> <div style="margin-top: 20px;"> <p>Connaught Community Association and Faculty of Environmental Design University of Calgary</p> <p>Urban Forest Inventory</p> <p>July 2001</p> <p>Prepared by</p> <p>Dr. Bev Sandalack and Julio Marce</p> <p>Drawing sources include:</p> <p>Hoag, D. (1965) Trees and Shrubs for Northern Plains</p> <p>Hosie, R.C. (1975) Native Trees of Canada</p> <p>Alberta Environmental Protection Services</p> <p>Guide to the Common Native Trees and Shrubs of Alberta</p> </div>		

Location (street address)	
Tree species	
Height (meters)	Map reference
Diameter (centimeters)	
Canopy Size (meters)	
General Health (note if dead branches, topped, damage, if spruce trees have two leaders, etc.)	
Notes (conflict with utility lines, sidewalks, driveways, buildings; other notes)	

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Recording Sheet



INVENTORY AND ANALYSIS

Tree Population Composition and Mix

Total number of trees inventoried: 1459

Macleod Trail (north) - 1st Street	41 trees
1st Street - 4th Street	138 trees
4th Street - 6th Street	290 trees
6th Street - 8th Street	238 trees
8th Street - 10th Street	288 trees
10th Street - 12th Street	271 trees
12th Street - 14th Street	193 trees

Boulevard Trees 74.43%

Green Ash	645 trees	44.21%	(also includes other Ash species)
American Elm	299	20.49%	(also other Elm species)
Poplar (various)	127	8.70%	
Bur Oak	15	1.03%	

Ornamental Trees 10.41%

Crabapple	27 trees	1.85%
Manitoba Maple	31	2.12%
Shubert Chokecherry	31	2.12%
Mountain Ash	22	1.10%
Mayday Tree	16	1.10%
Hawthorn	12	0.82%
Birch (various)	7	0.50%
Prunus (various)	3	0.20%
Amur Cherry	2	0.14%
Willow	1	0.07%

Coniferous Trees 12.19%

White Spruce	99 trees	6.80%
Colorado Spruce	74	5.10%
Larch	5	0.35%

Shrubs in Boulevards 2.70%

Cotoneaster	20 trees	1.40%
Lilac	13	0.90%
Caragana	6	0.40%

A healthy urban forest contains a mix of species, and also a proportion of coniferous trees. Monocultural plantings are vulnerable to disease and insects and should be avoided in the neighbourhood as a whole. For example, Dutch Elm Disease has ravaged the urban forests of many cities to the east of Calgary where Elm trees were a predominant species. Several cities affected by Dutch Elm Disease have replanted with other species and thus lessened the overall effect. There is still considerable debate regarding Calgary's vulnerability to Dutch Elm Disease. The disease is a virus spread mainly by insects, and tends to move with prevailing winds and water. Since the rivers and prevailing winds in Alberta flow to the east, the risk is lessened. However, diseased wood can easily be transported into Alberta and cause the virus to spread. Plant breeders have been working to develop disease-resistant varieties, and these should be planted in preference to non-resistant trees, and residents should be vigilant for signs of the disease.

Although variety of species within the neighbourhood is generally desirable, it is often appropriate to utilise only one species of tree along a street. Even-aged tree populations by block are easier to maintain and are generally more attractive. Even aged and single species population by block can also help in creating neighbourhood character (e.g. Elm trees on both sides of a street form a distinct canopy over the street and create a very positive streetscape).

The majority of the street tree plantings in the Beltline are Green Ash and American Elm (comprising approximately 65% of the street trees). These trees are among the most hardy and reliable in the Calgary region. Replanting of the same species should be done in blocks in which there is a consistent species.

The Connaught area is generally well forested, however there are many gaps in the street tree plantings. These should be also be identified as priority planting areas. South Downtown and West Victoria Park have a less consistent street tree population, and there are several areas where there are no street trees. Street improvements are evident on sections of 1st Street S.W., including street tree plantings in tree wells.

The general composition of the street tree population in the Beltline is

Boulevard Trees	74.43%
Coniferous Trees	12.19%
Ornamental Trees	10.41%
Shrubs in Boulevards	2.70%

This inventory shows the mix of trees in street tree plantings only, and not the total mix of trees in the neighbourhood urban forest. The City of Calgary Landscape Construction Development Guidelines and Standard Specifications provides guidelines for quantity and mix of species in various categories of parks. Parks tend to have a greater proportion of coniferous trees than boulevard plantings so the diversity overall is probably greater than shown in the boulevard plantings. As well, boulevards often do not have enough space to accommodate coniferous trees.

The age of the trees should be considered along with the species; the inventory of trees can provide an image of tree planting trends over time. For example, most of the poplars are very old, and young trees are seldom found. Poplars were important trees in establishing Calgary's urban forest. They were indigenous to the region and hardy, and are a fast growing tree. They provided a leafy cover very quickly, and helped to modify the city's microclimate, making it possible for other less-hardy species to thrive. Over time, other tree species were introduced as street trees.

Most of the ornamental trees are recently planted. This reflects both the gentler microclimate found now, as well as the tendency for developers to plant more decorative trees. This practice should be monitored, and integrated with an overall urban forest policy for the neighbourhood. While some ornamental trees provide colour and interest, the overall proportion should not increase. Ornamental trees are generally less hardy, require more maintenance, and are more suitable to private property planting, or to ornamental parks.

URBAN FOREST MAP

This section includes a reduced-scale complete map of the Beltline street trees, and enlarged maps of smaller areas of the neighbourhood.

Several of the map sections indicate locations of particular street types that are illustrated and analysed in the next report section.



BOULEVARD

AE	American Elm
OK	Bur Oak
GA	Green Ash
PO	Poplar (various)
SE	Siberian Elm



ORNAMENTAL

AC	Amur Cherry
BI	Birch (various)
CR	Crabapple
HA	Hawthorn
MM	Manitoba Maple
MD	Mayday Tree
MA	Mountain Ash
PR	Prunus (various)
SCH	Shubert Chokecherry
WI	Willow (various)



SHRUBS

(only includes shrubs in boulevard planting)

CA	Caragana
CO	Cotoneaster
JL	Japanese Tree
LI	Lilac



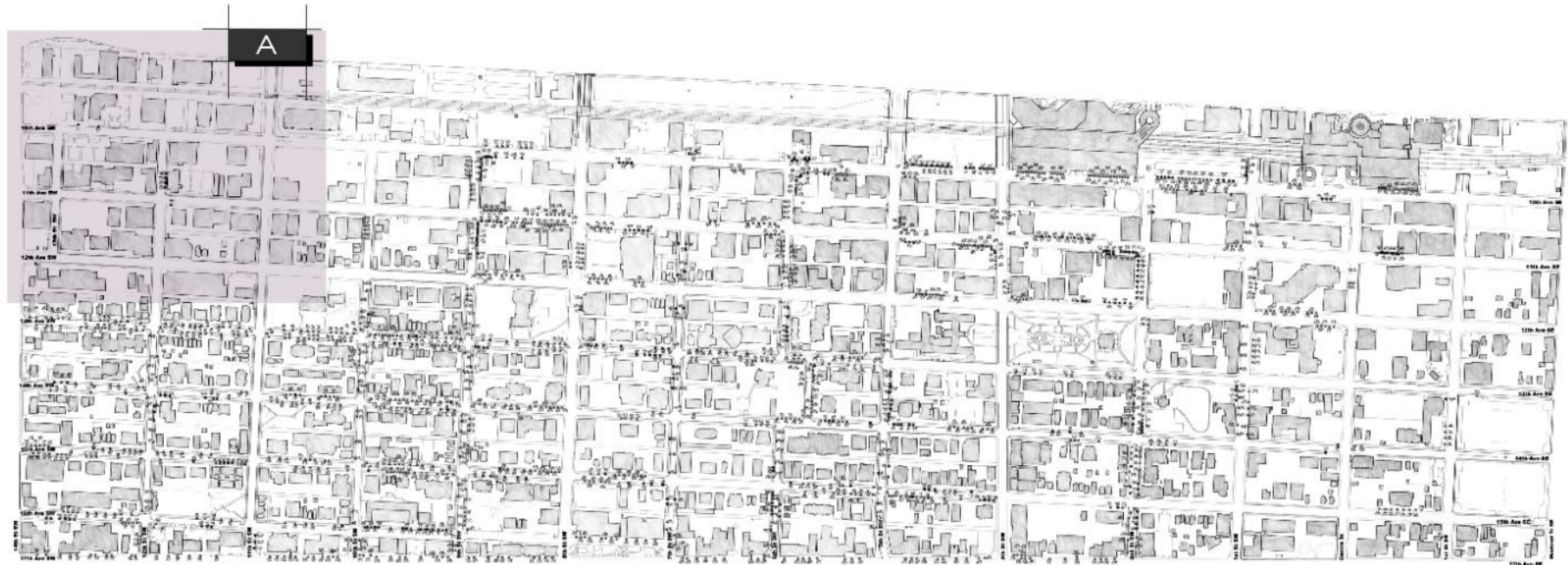
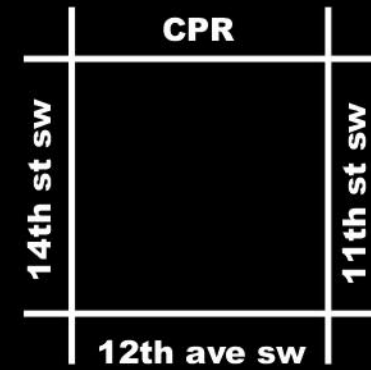
CONIFEROUS

CS	Colorado Spruce
LA	Larch
WS	White Spruce





MAP SECTION



CPR

10th Ave SW

LI
01

PO
01

11th Ave SW

MD
05
MD
06
MD
07
MD
08

MM
01

ST-3

13th St SW

12th Ave SW

PO
02

14th st sw

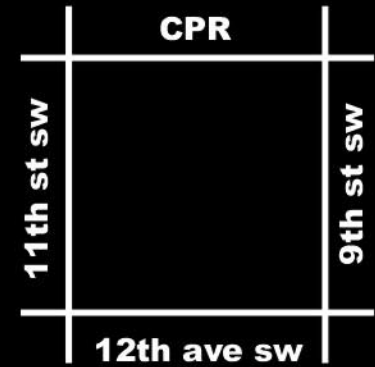
12th st sw

11th st sw



B

MAP SECTION



10th Ave sw

11th Ave sw

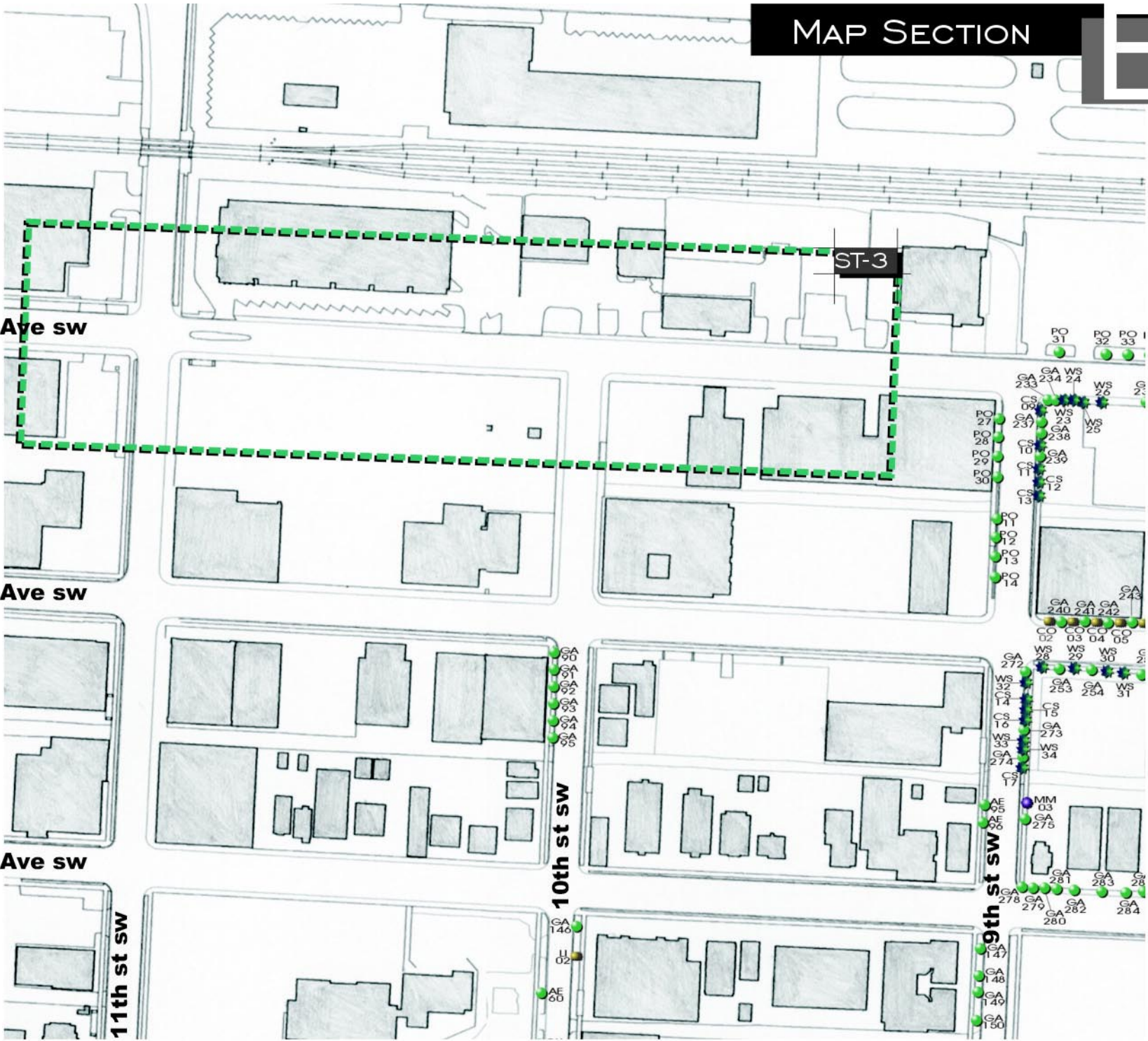
12th Ave sw

11th st sw

10th st sw

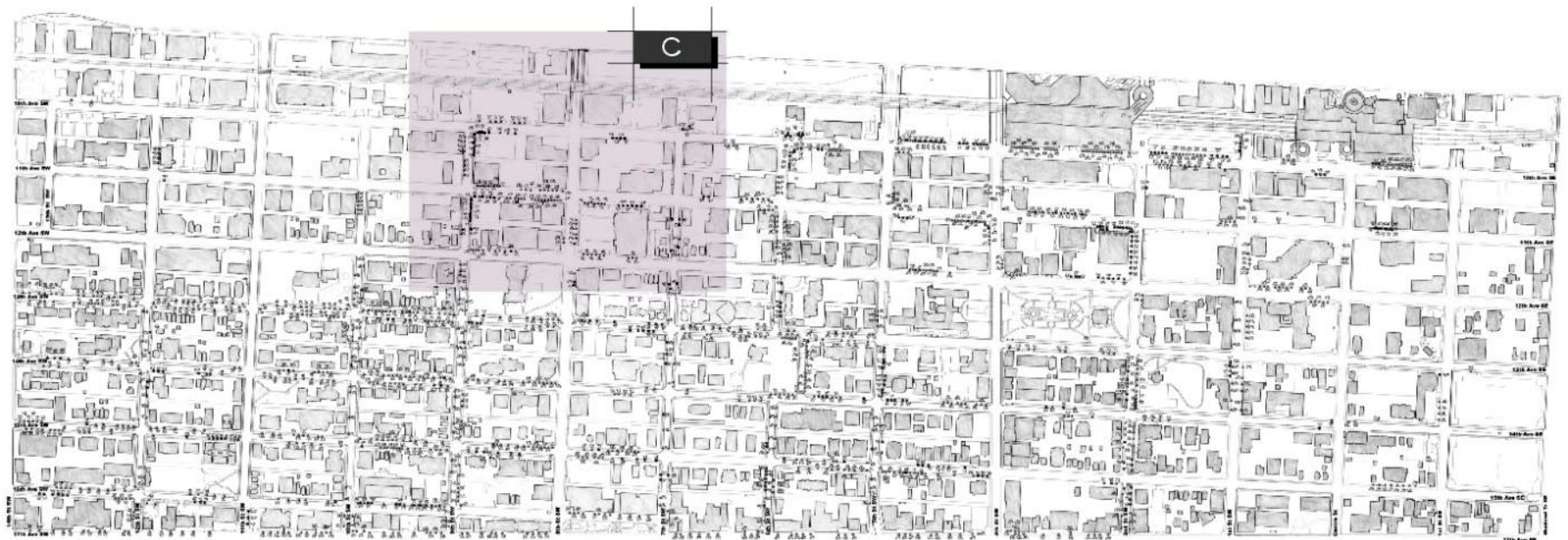
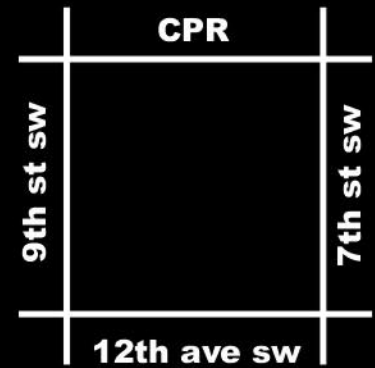
9th st sw

ST-3





MAP SECTION



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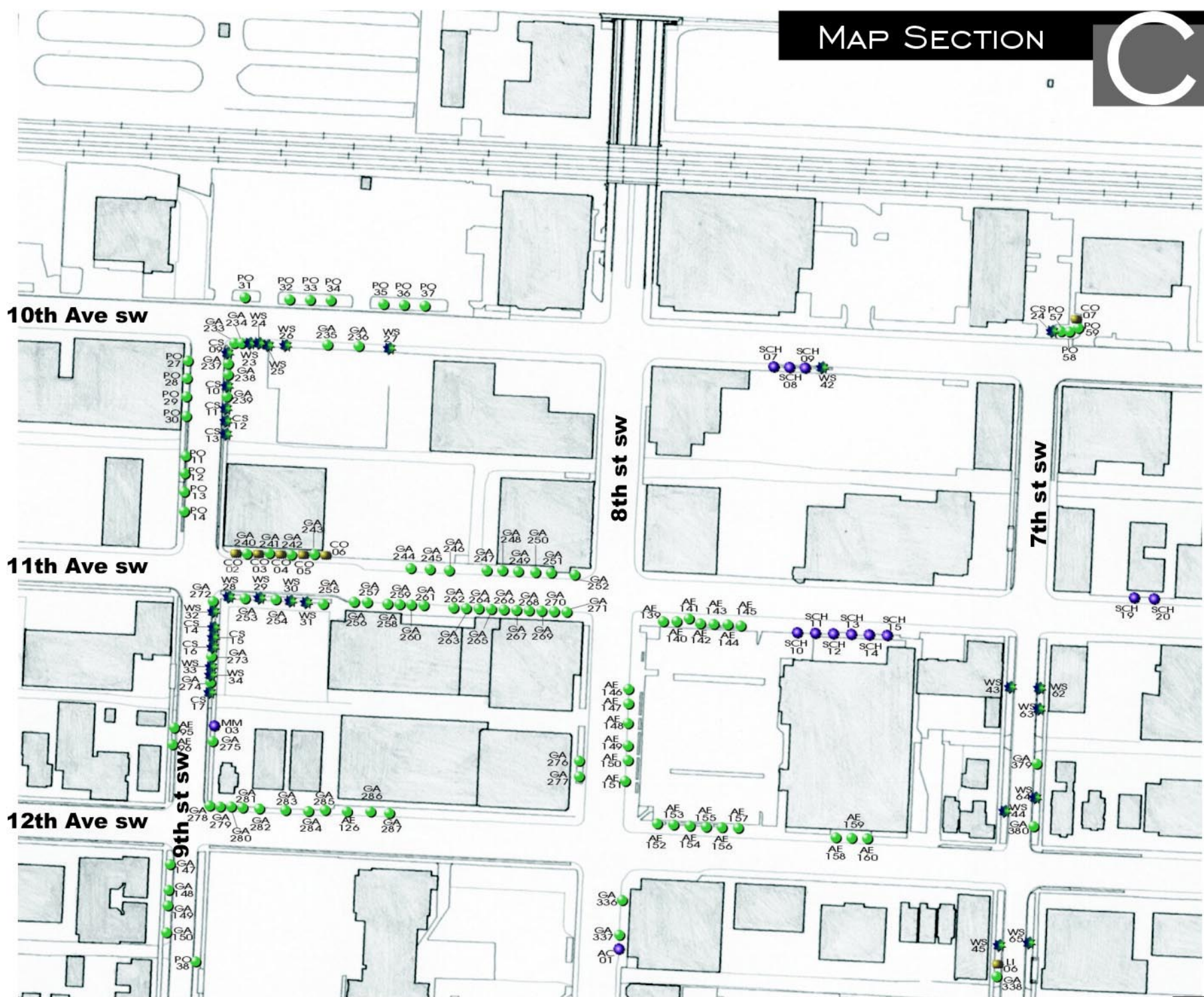
11th Ave sw

12th Ave sw

8th st sw

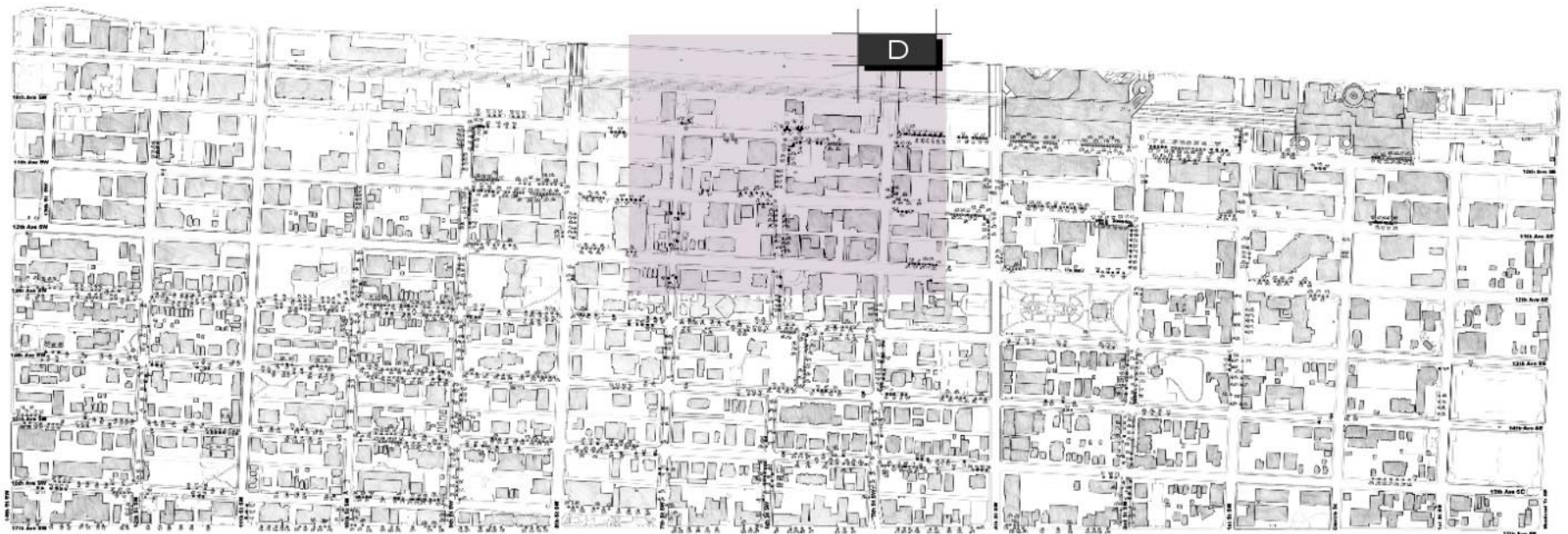
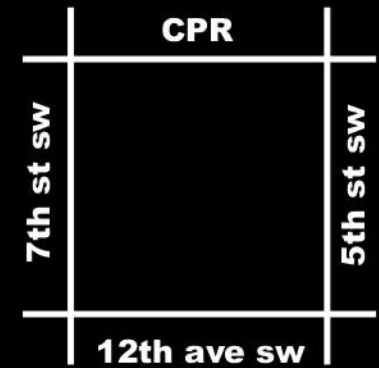
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9th st sw



D

MAP SECTION





10th Ave sw

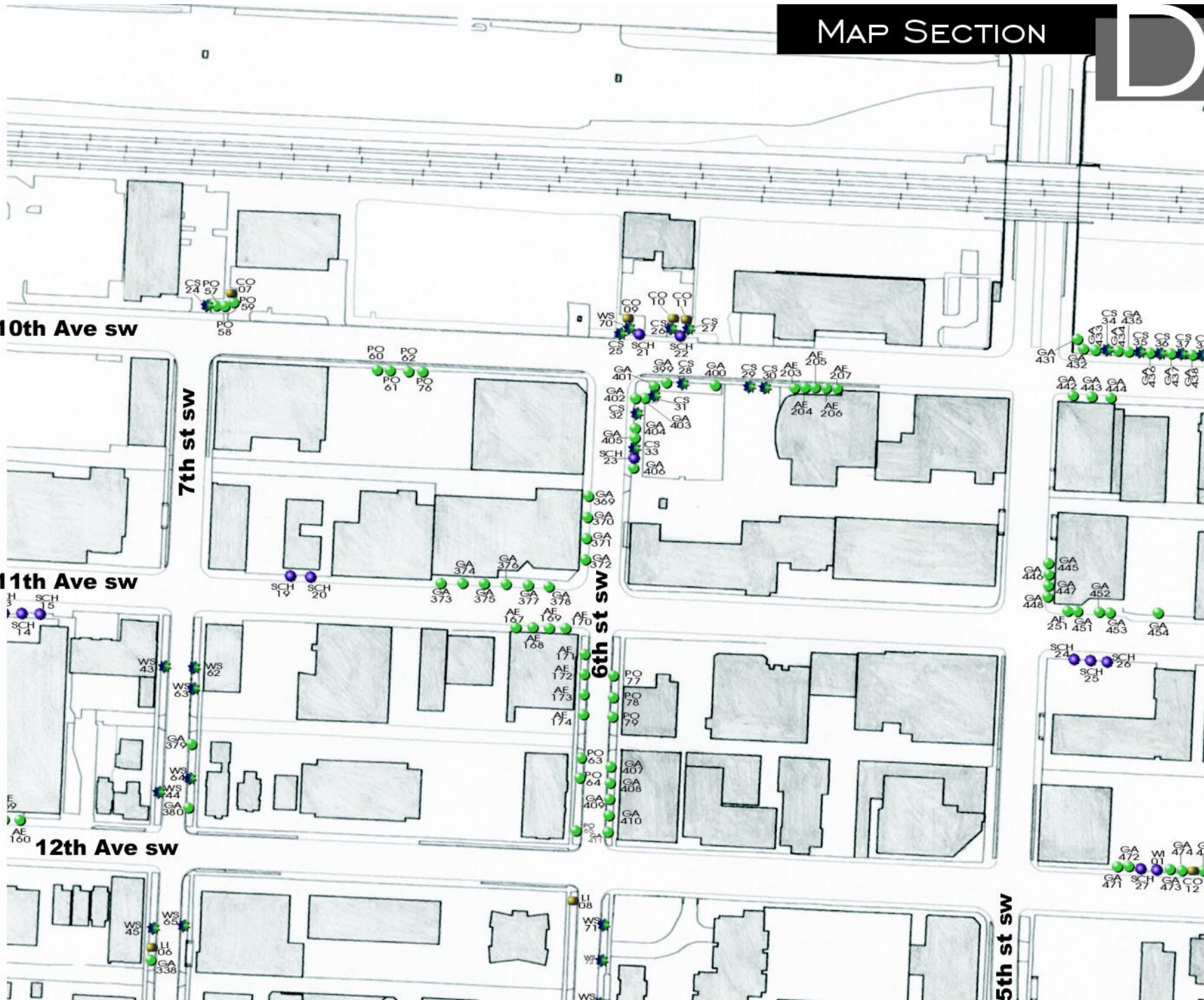
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11th Ave sw

6th st sw

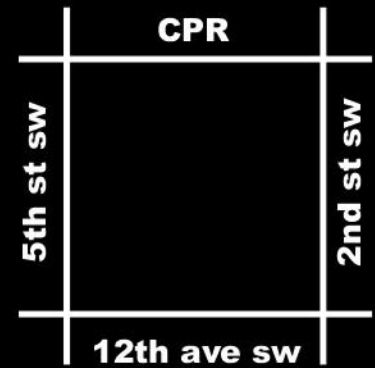
12th Ave sw

5th st sw

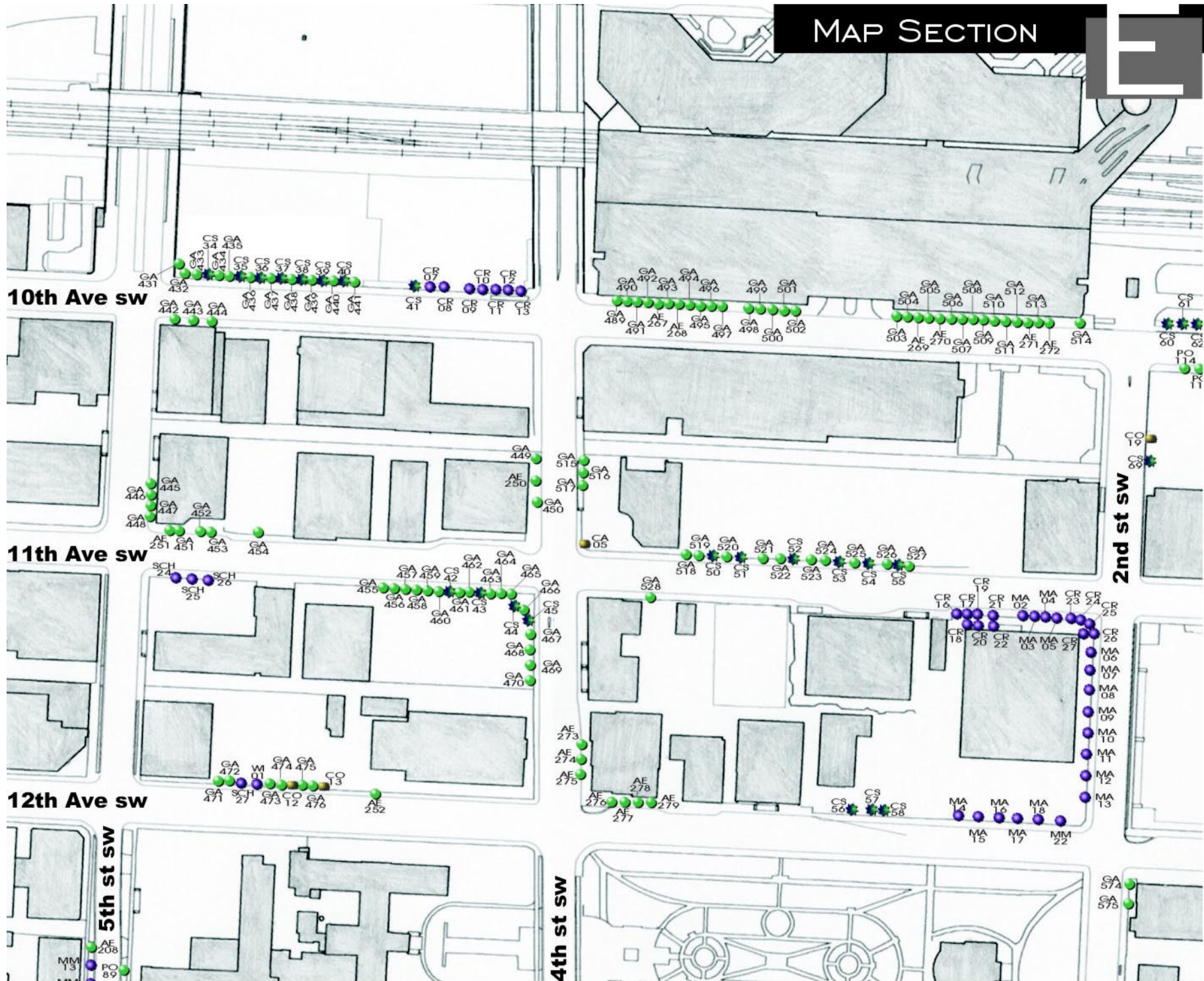




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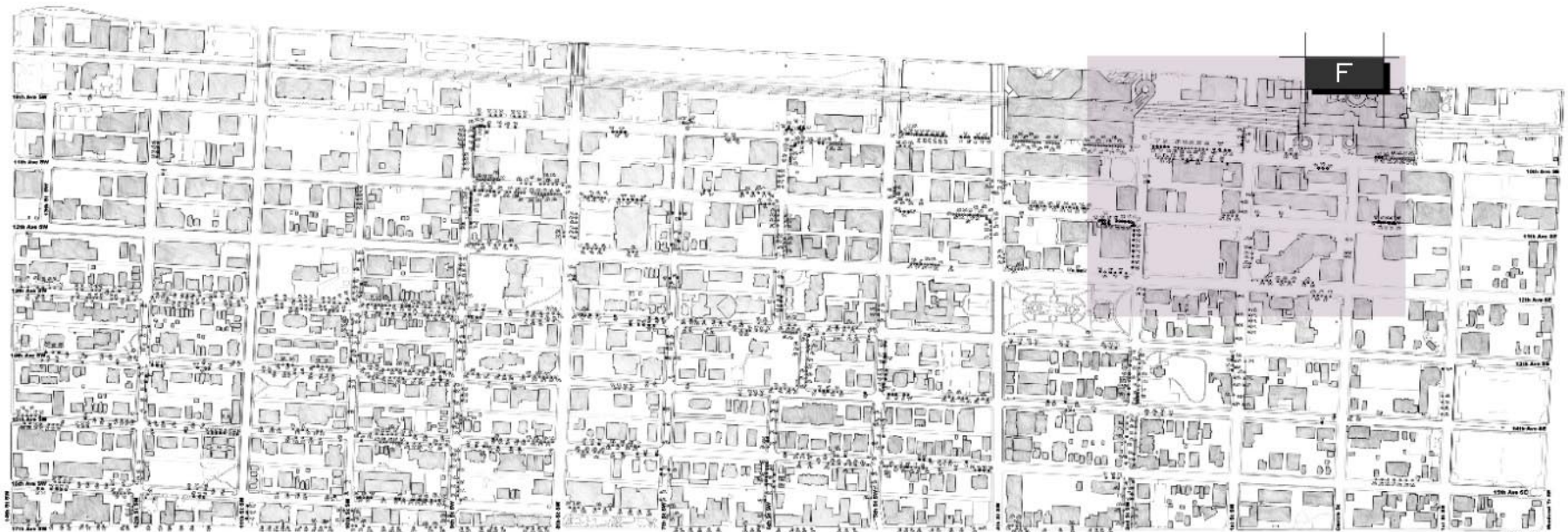
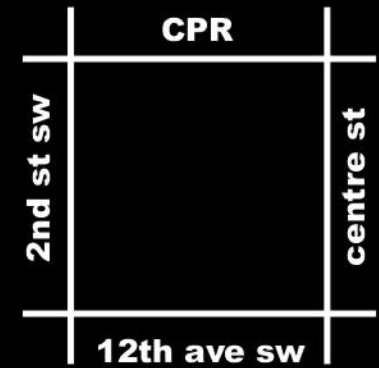


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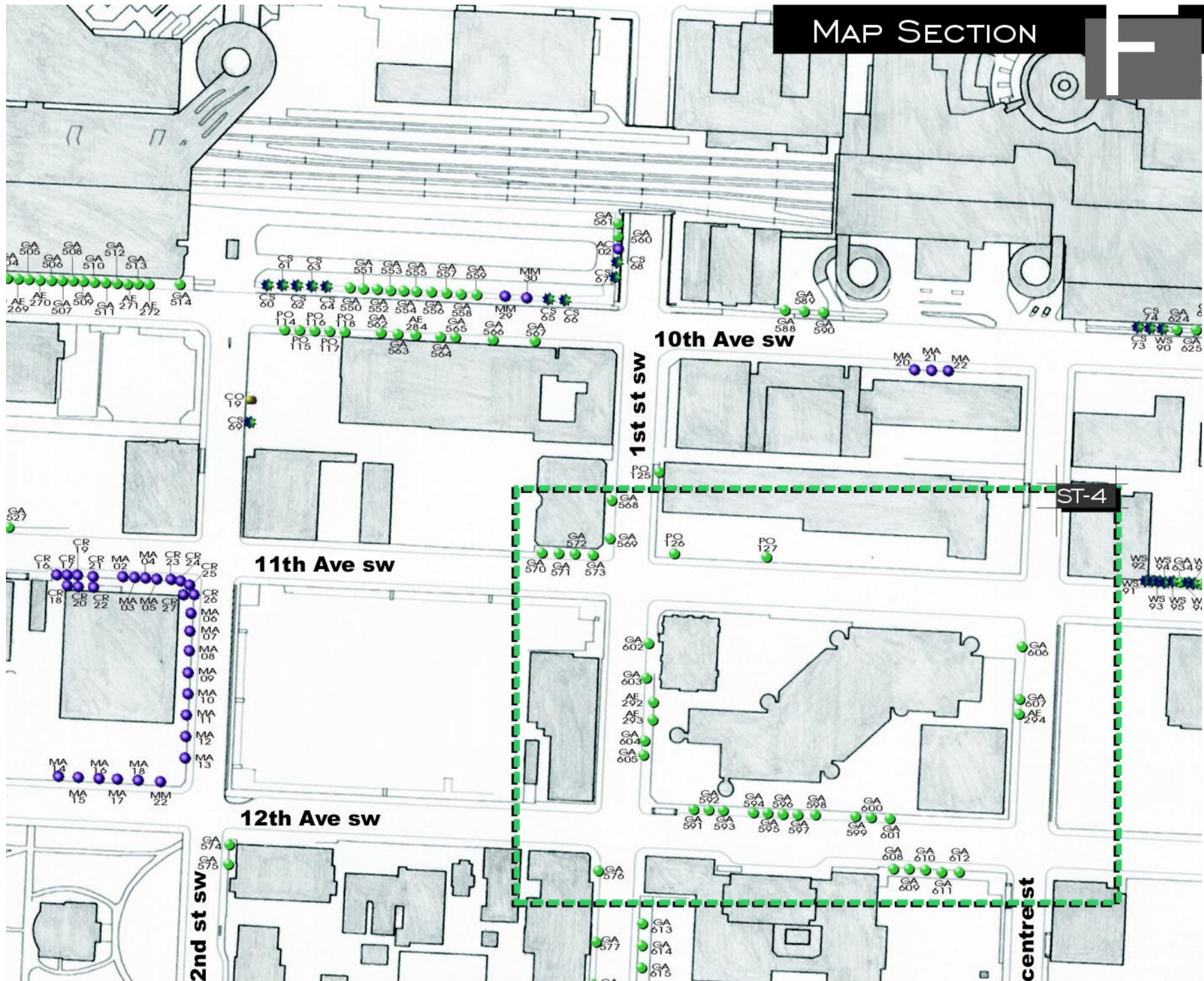




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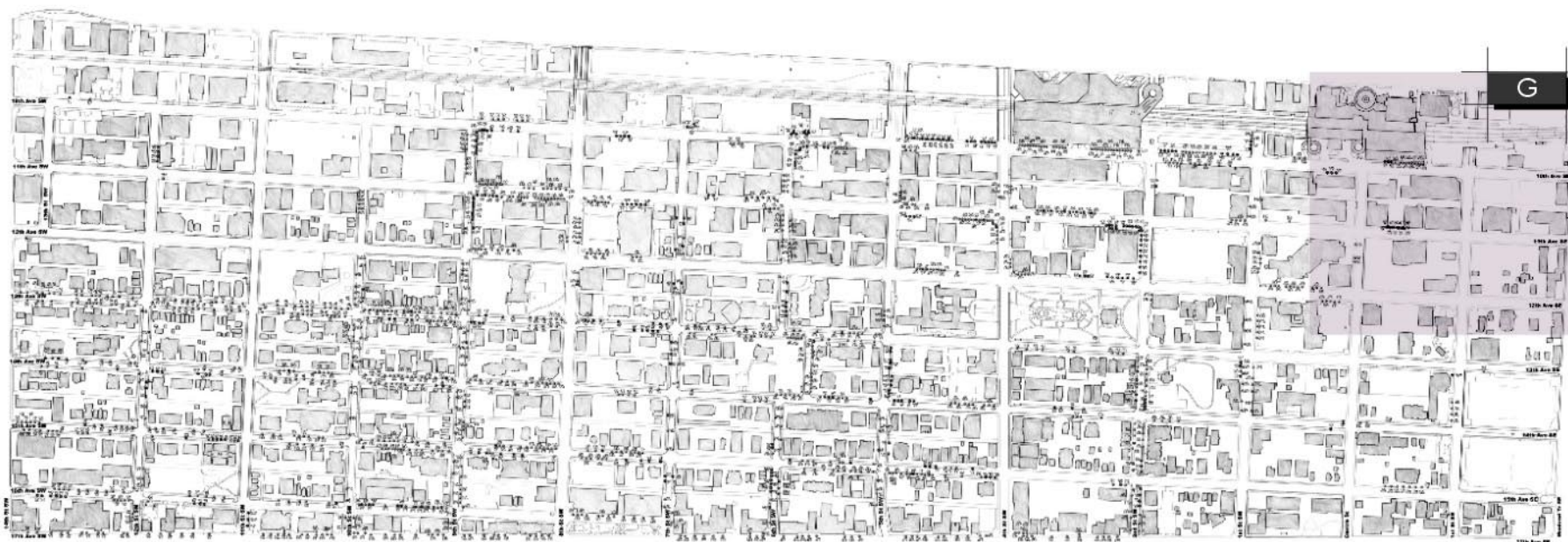
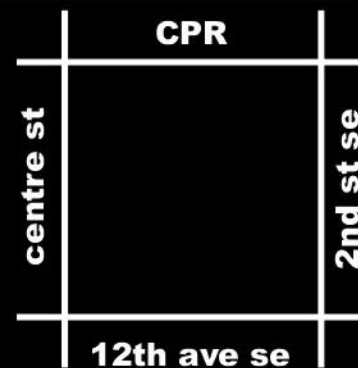


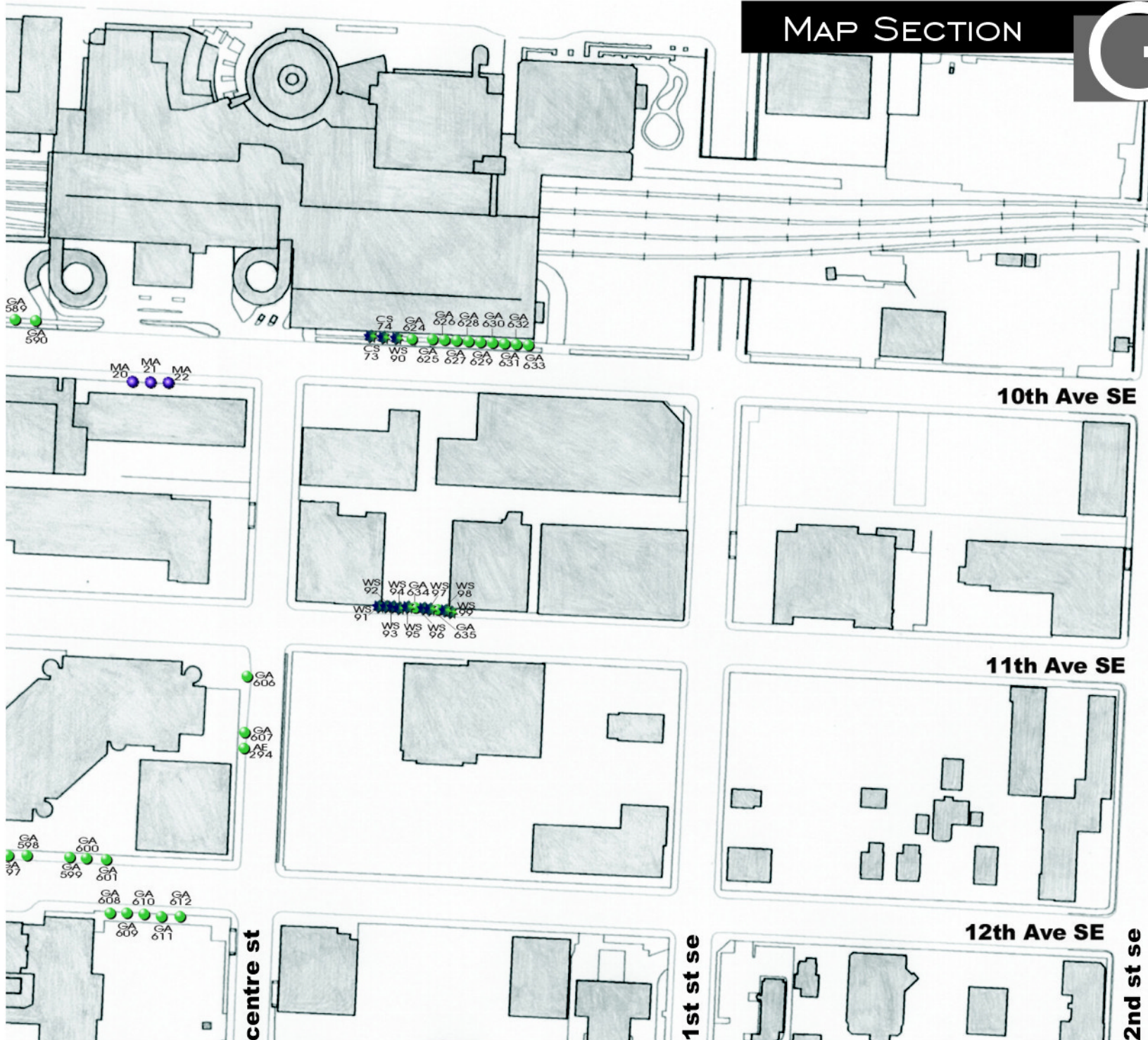
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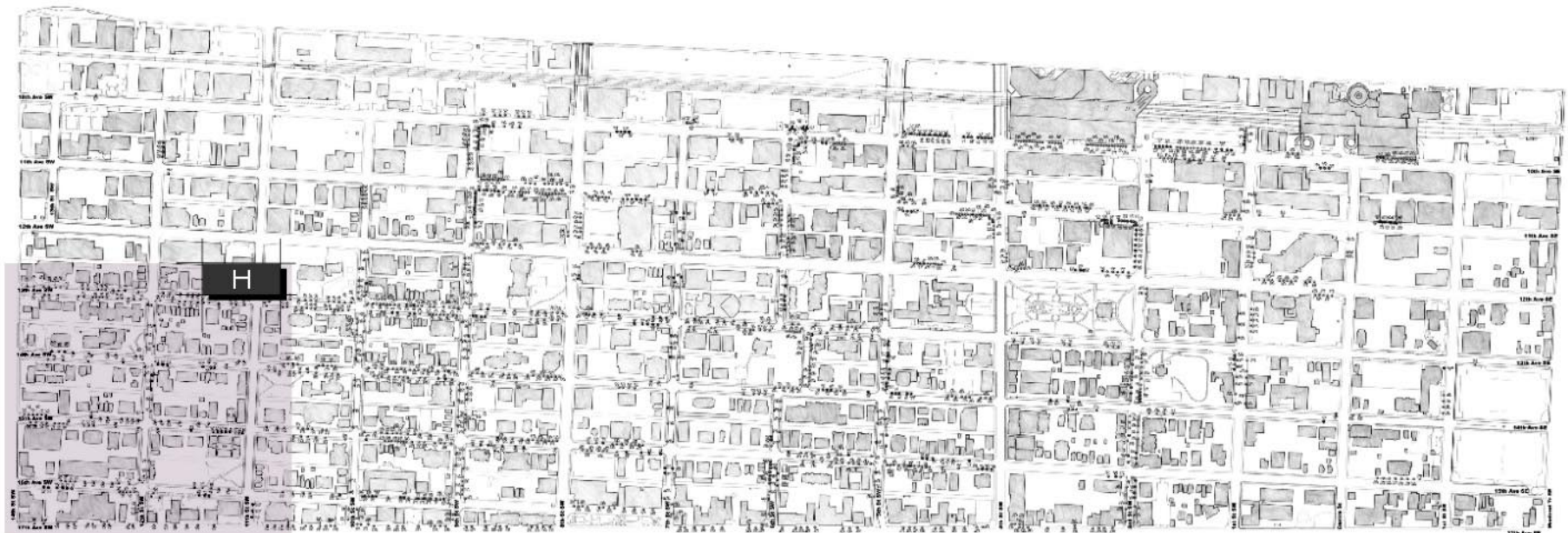
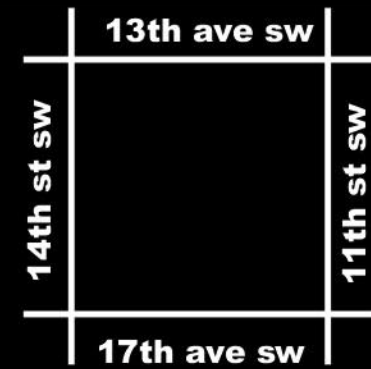
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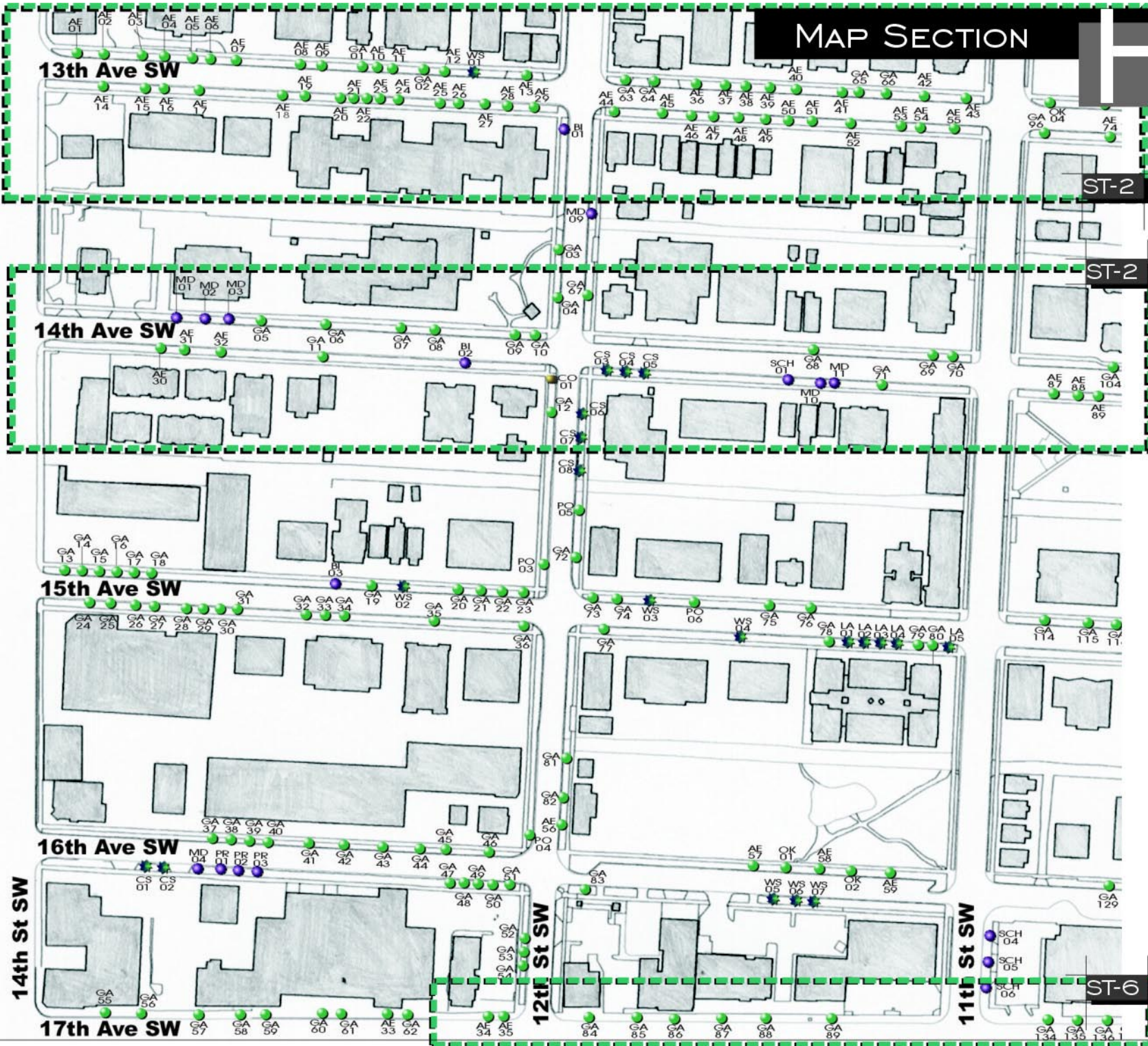




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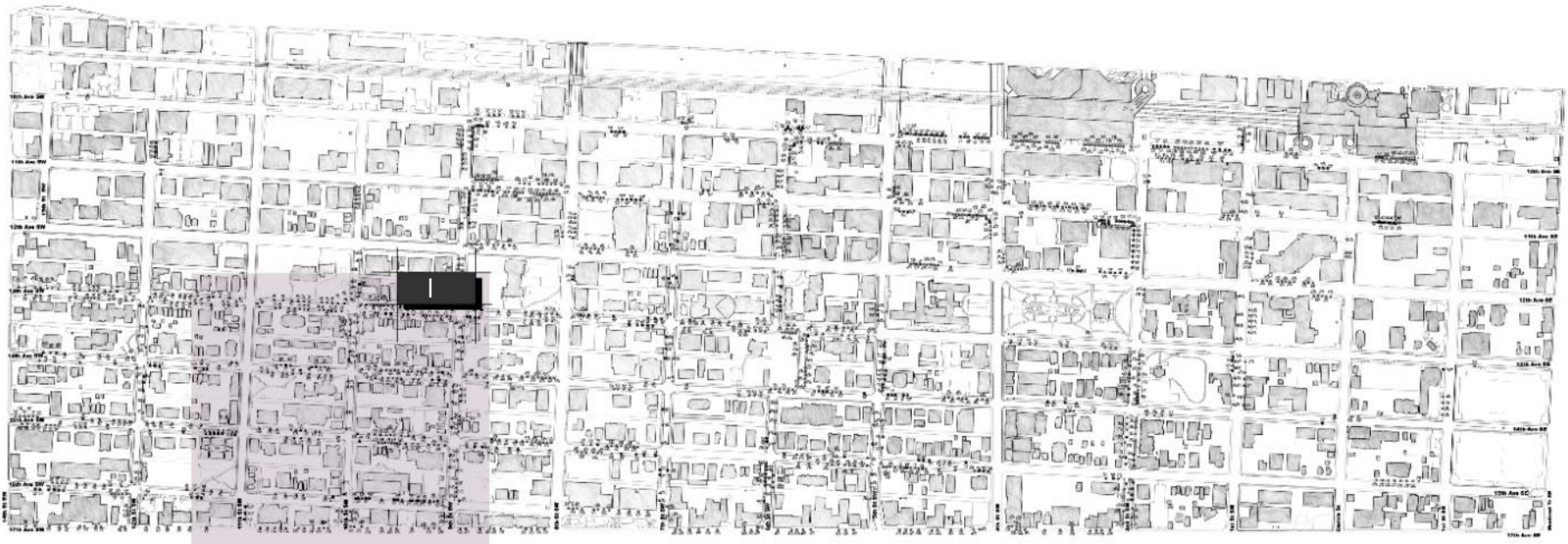
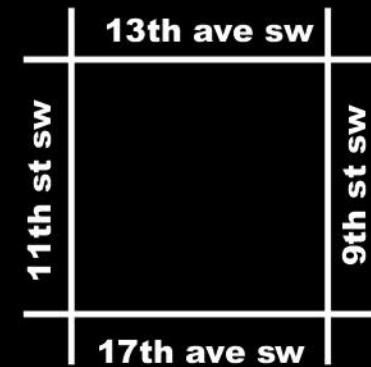


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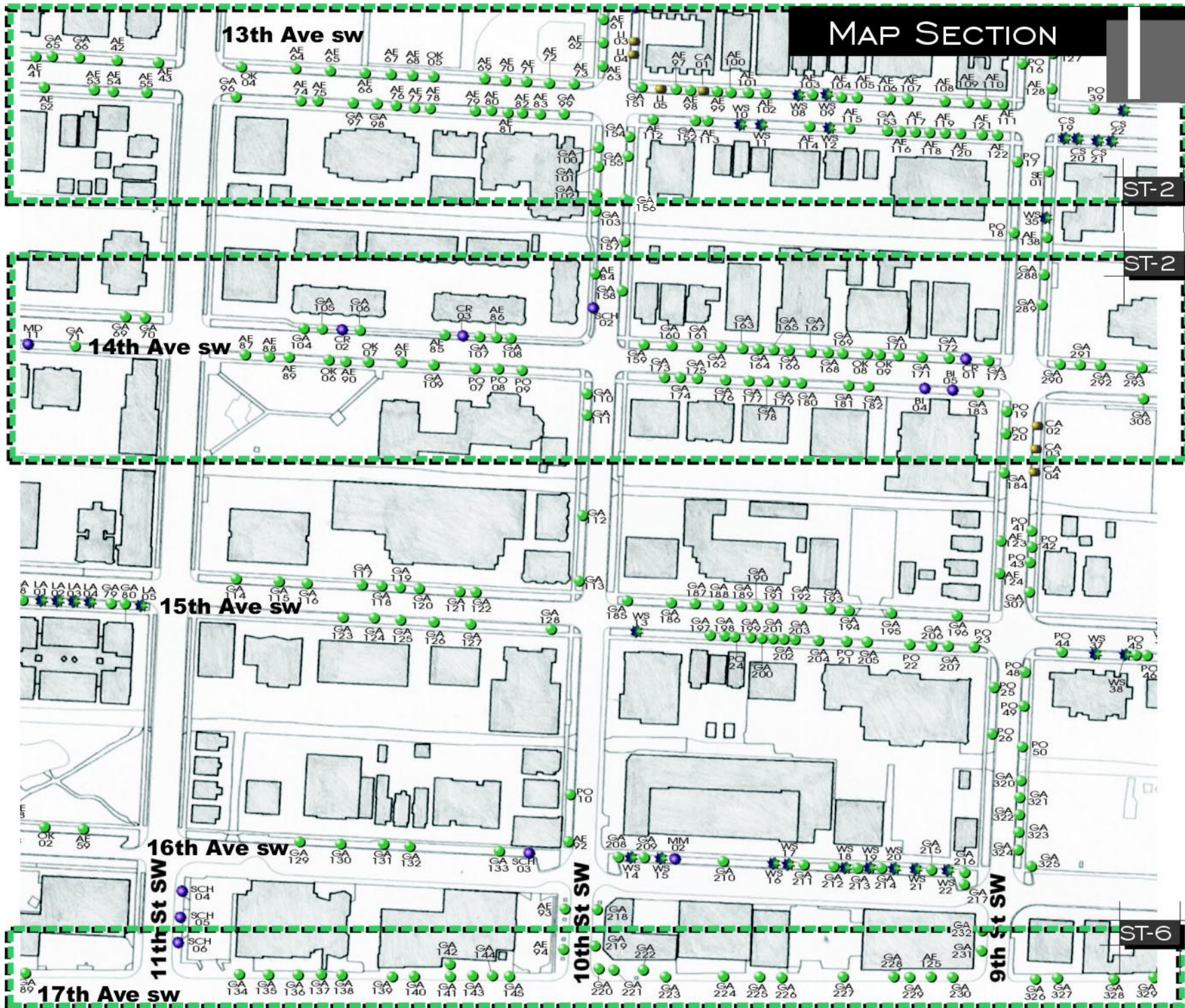




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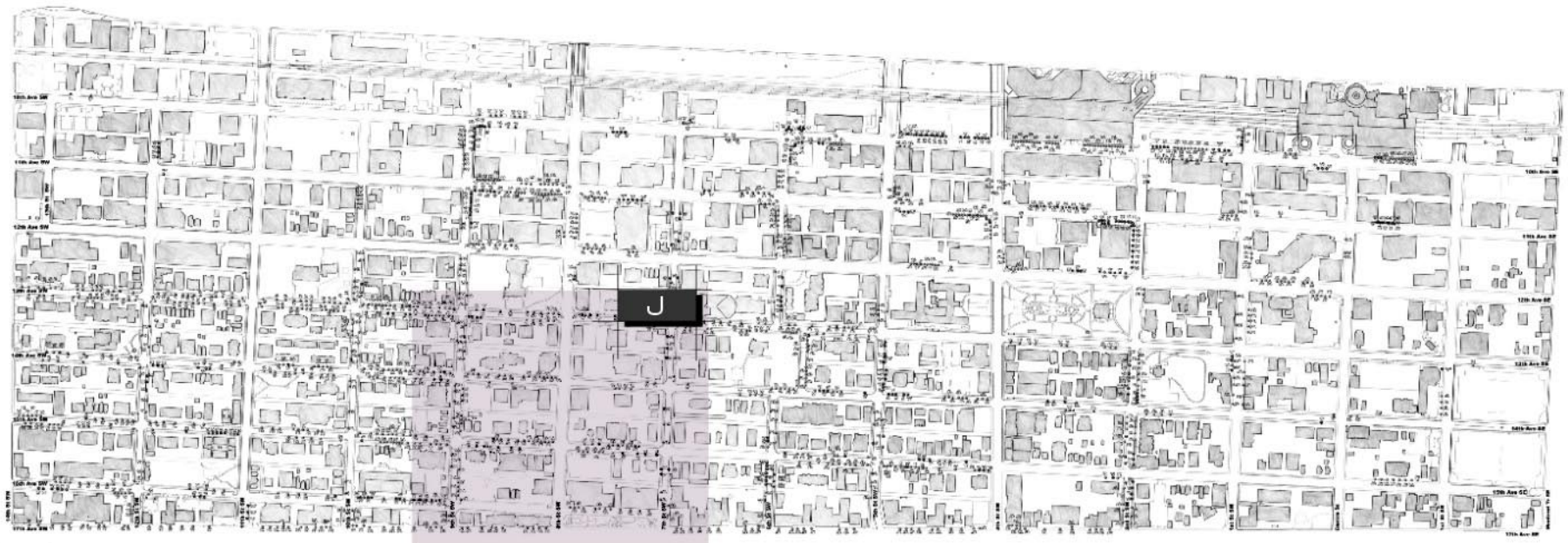
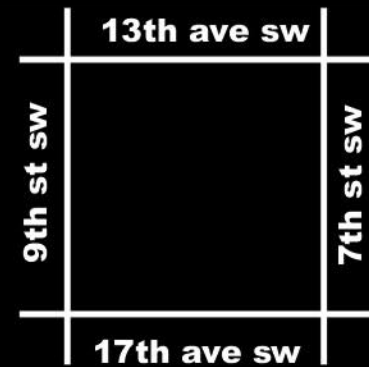


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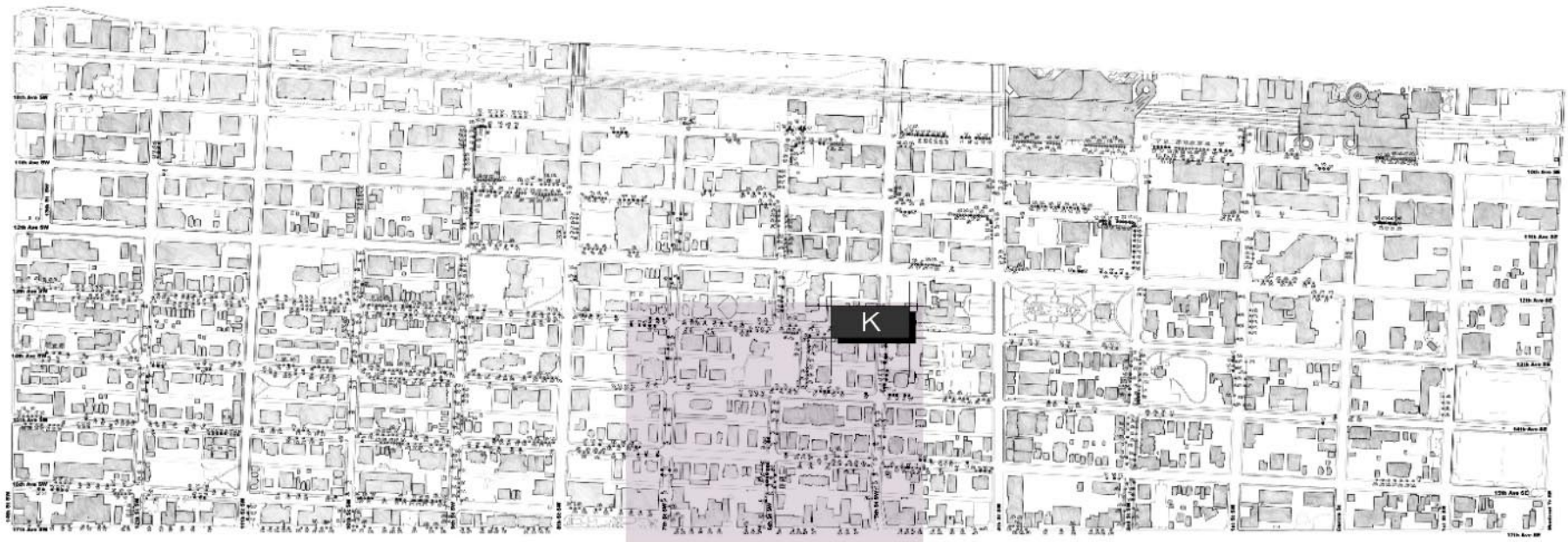
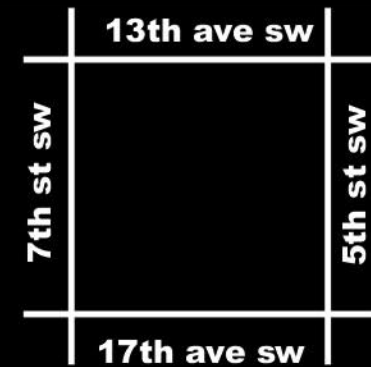
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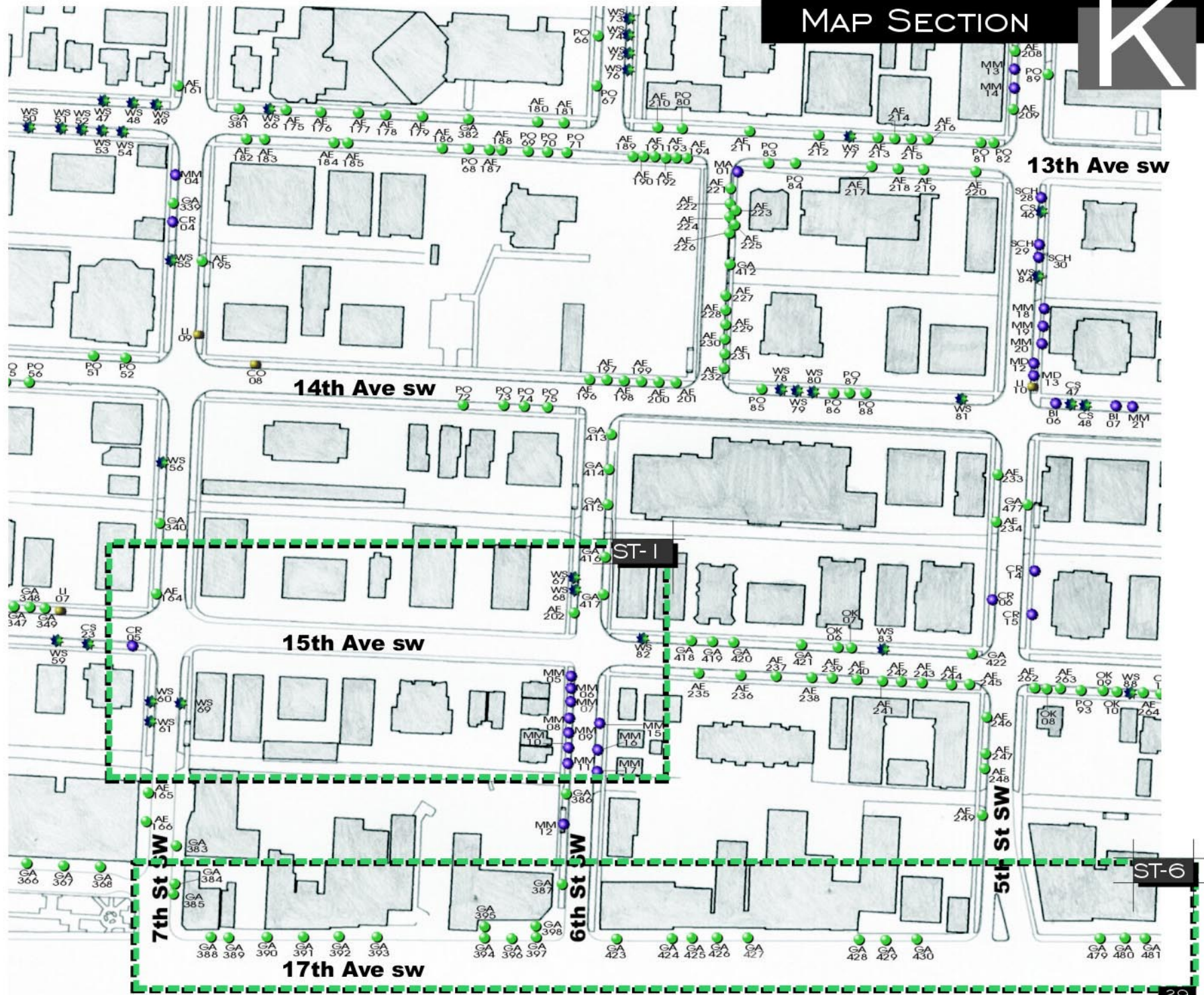


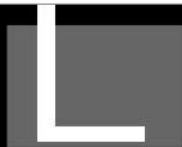


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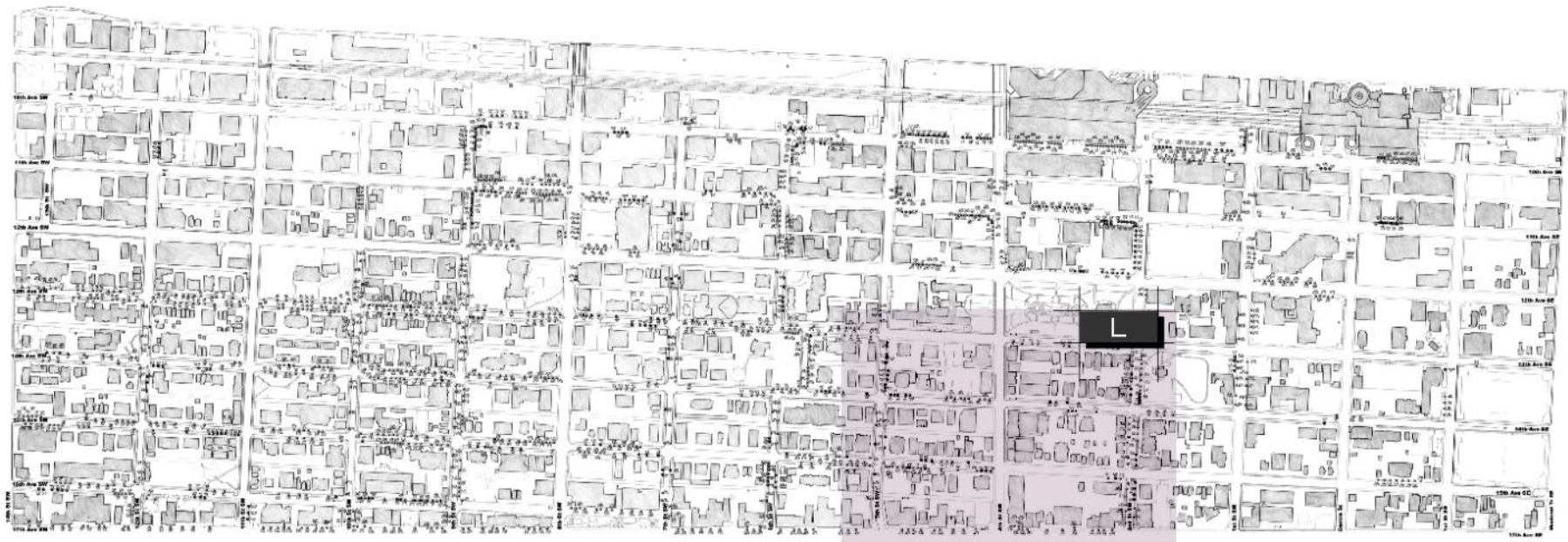
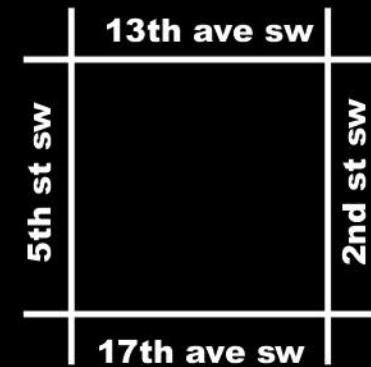


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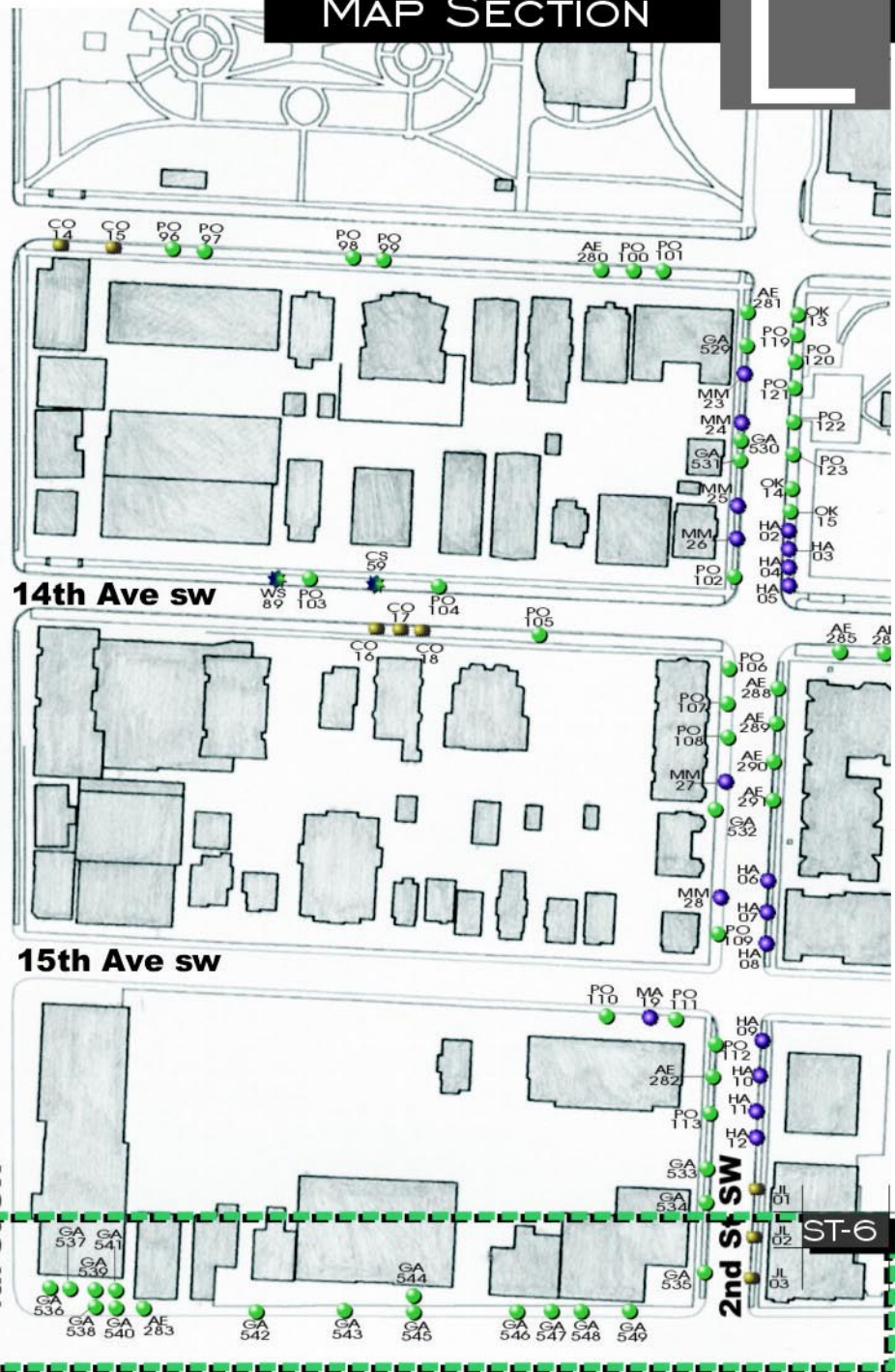
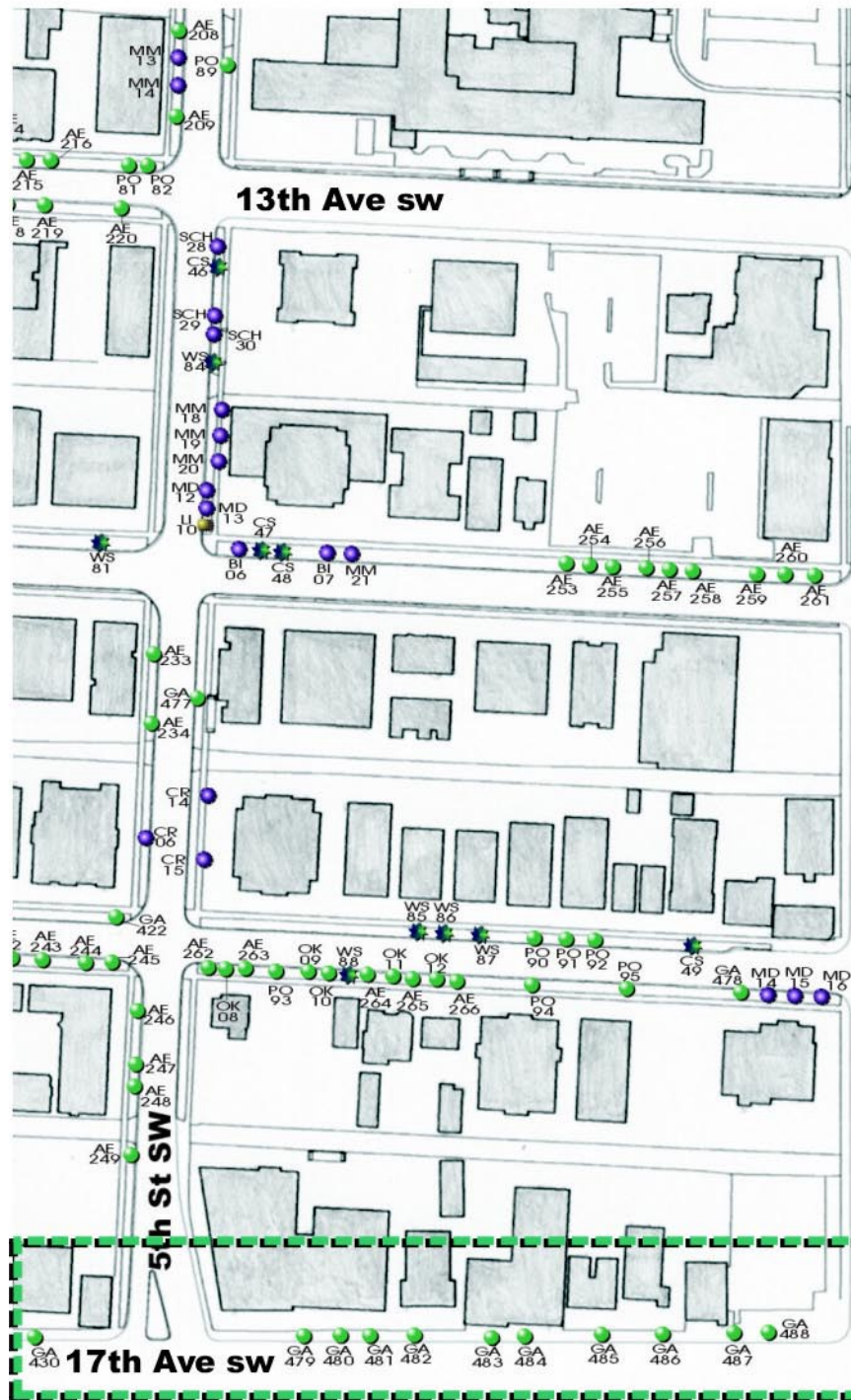




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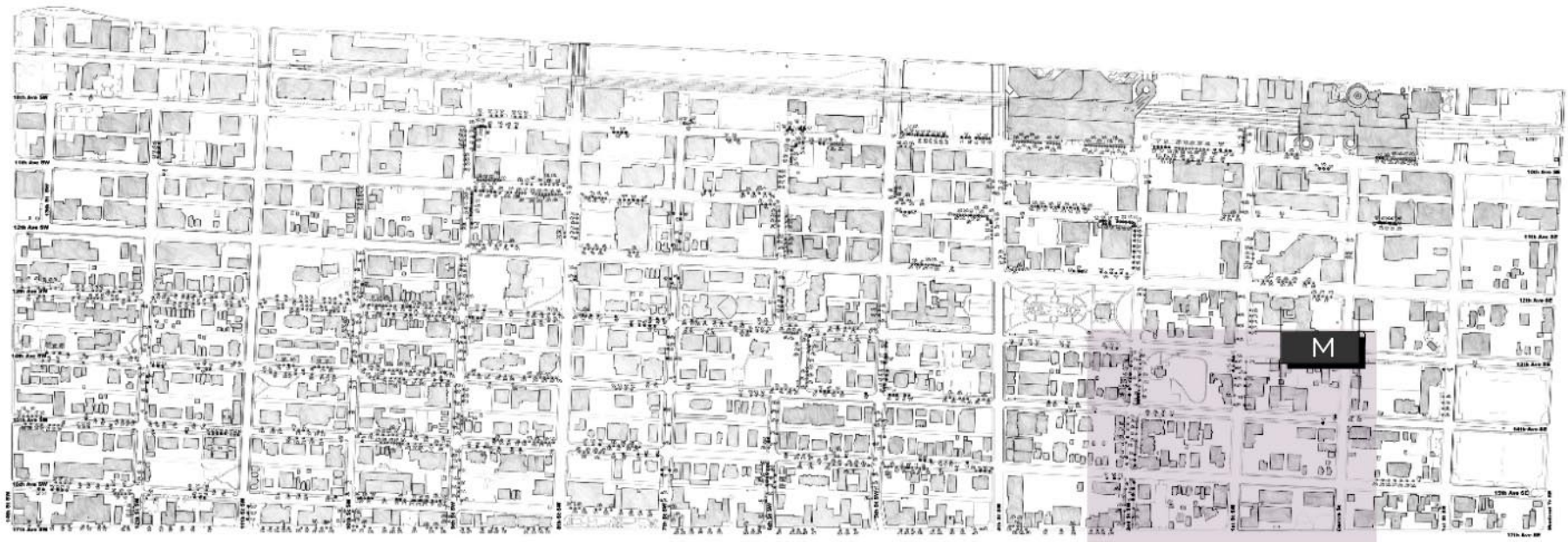
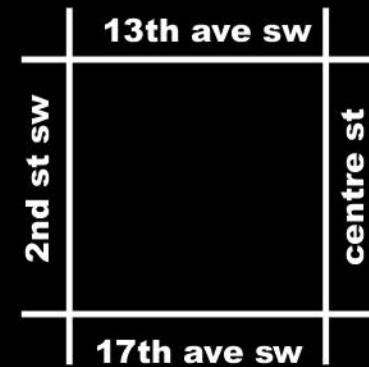


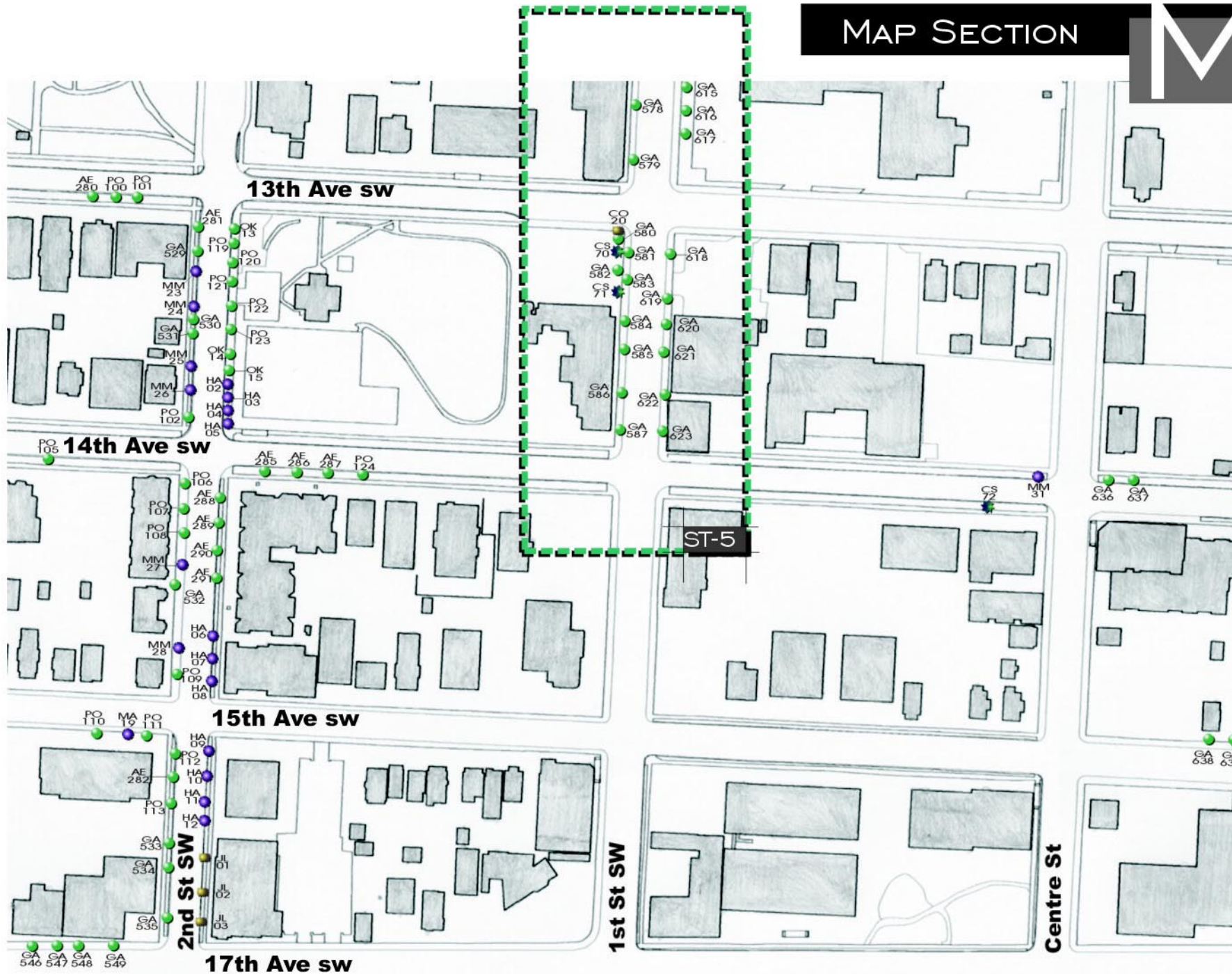
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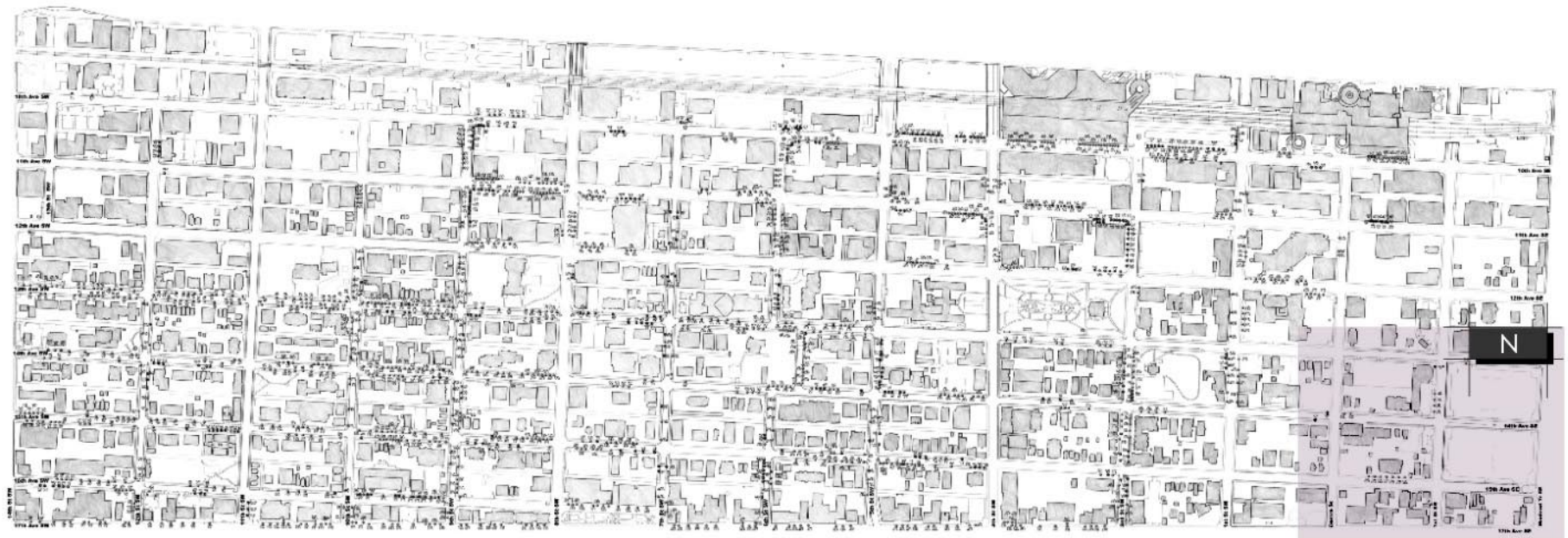
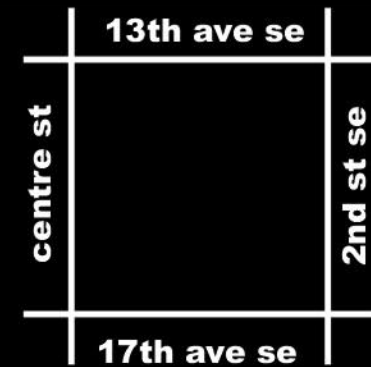
MAP SECTION

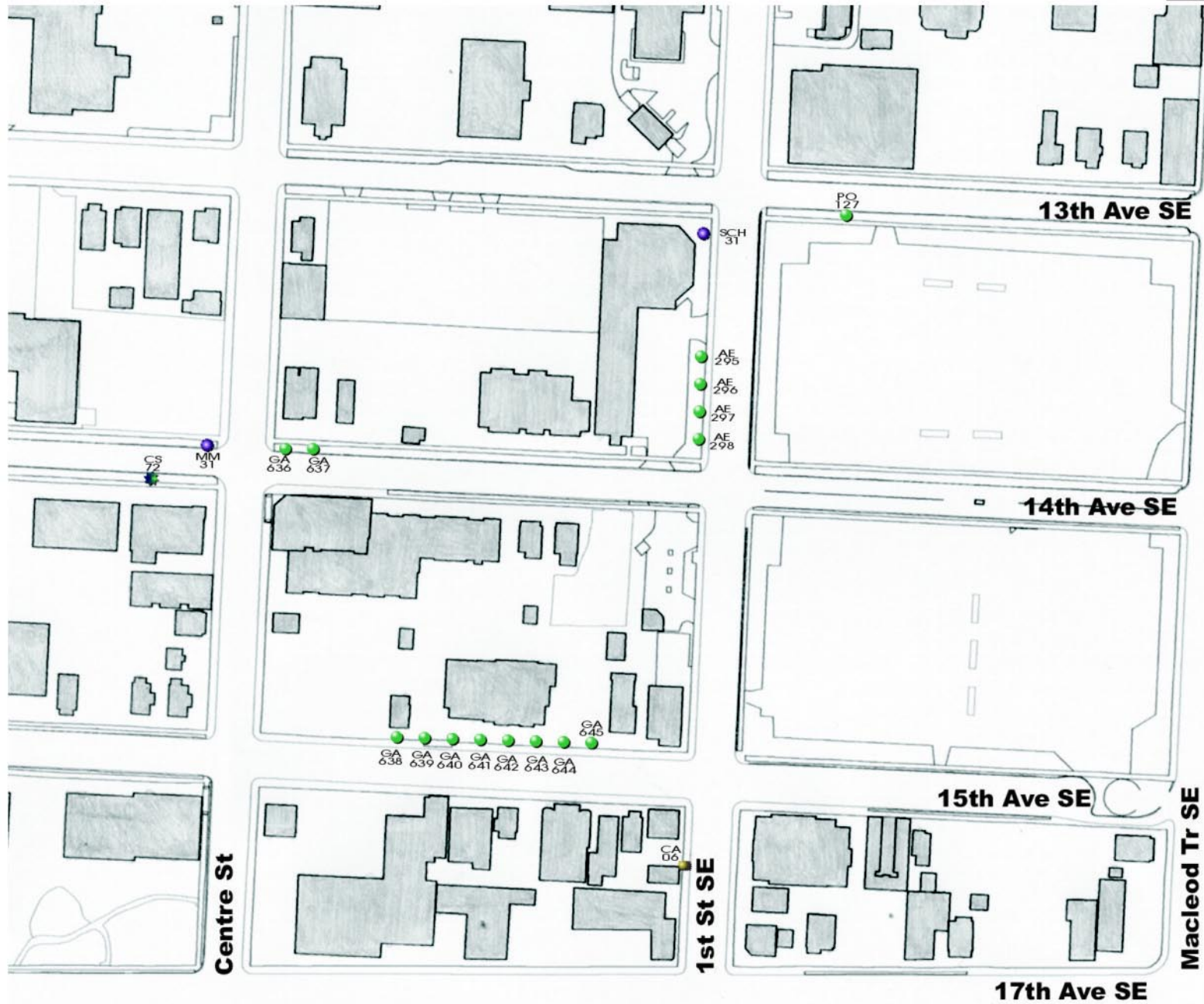


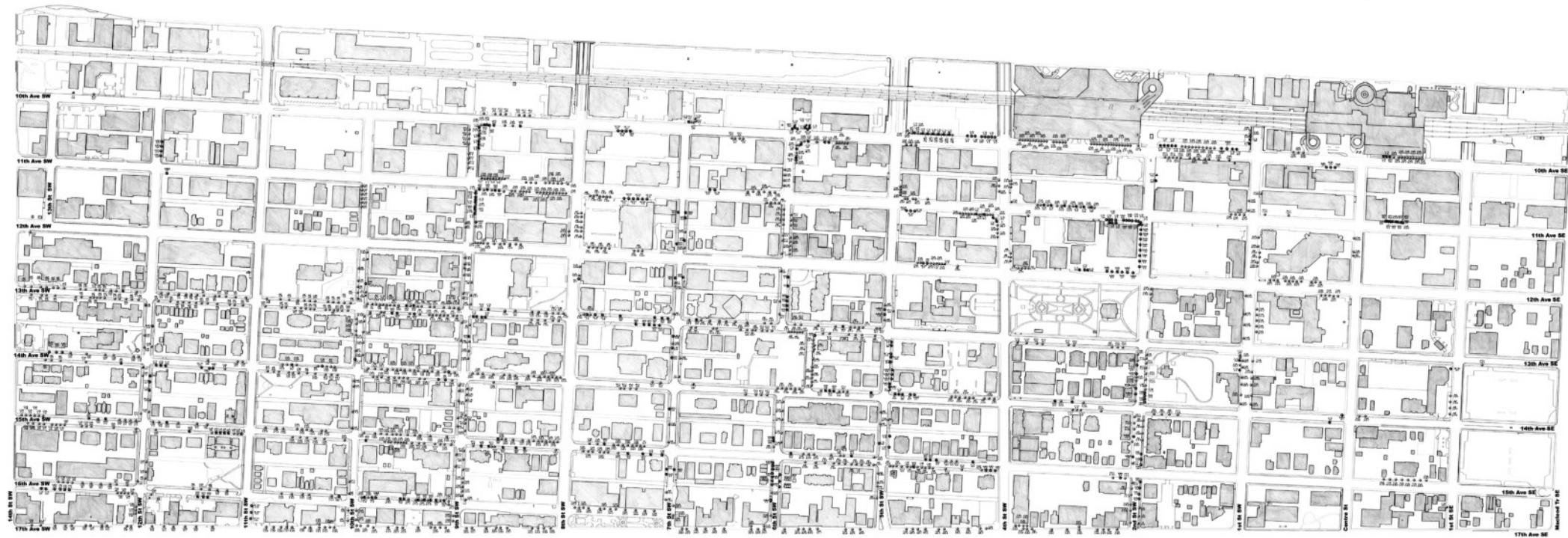




MAP SECTION





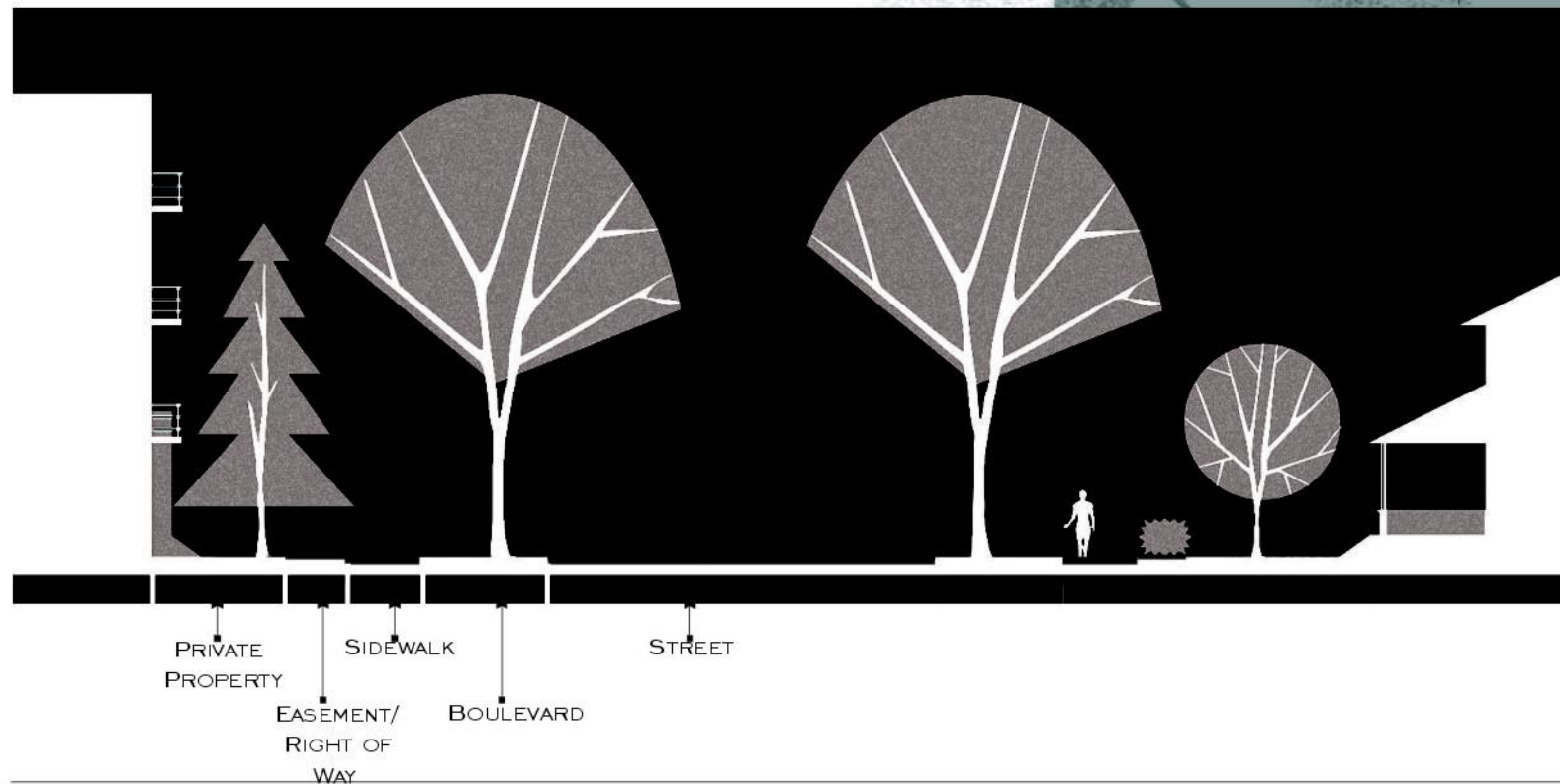


STREET TYPES

A number of street types are found in the Beltline. They vary in terms of presence of street trees and other planting, pedestrian comfort, human scale and visual quality.

Cross sections through the street show dimensions and landscape features. This analysis can be used in evaluating proposed developments and in designing streets that reinforce urban quality and support community character.

Street Type Section Diagram



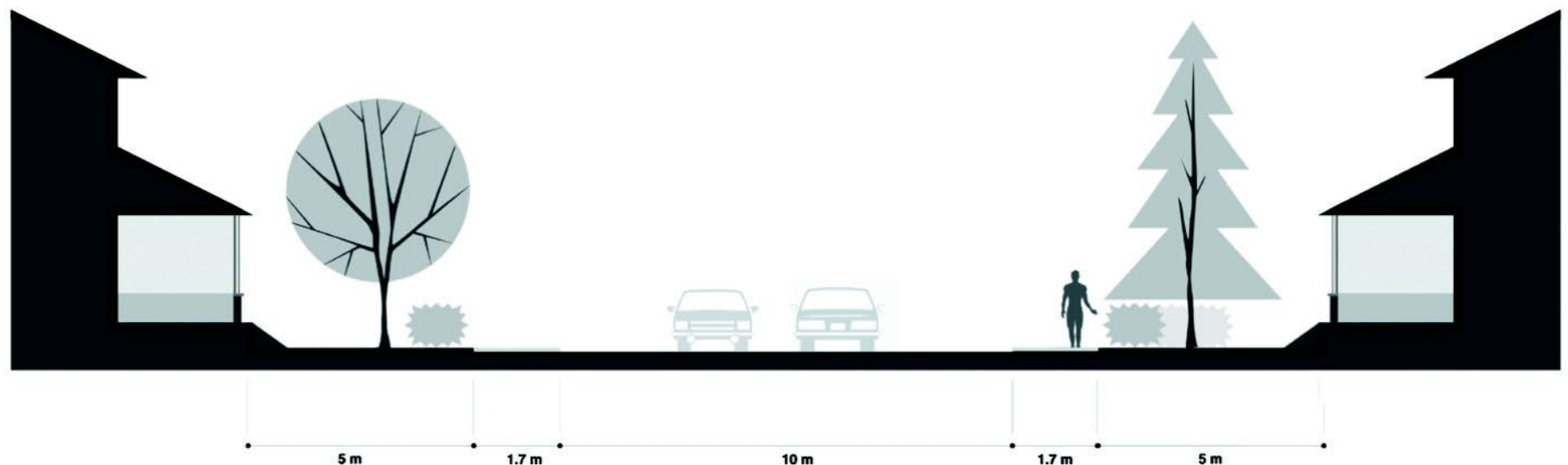
STREET TYPE ST-1

RESIDENTIAL STREET

Private landscape without public trees



There is no planted boulevard, or regular street tree plantings within a right-of-way. The only landscape is provided by private plantings. This street type provides a variable amount of overall tree cover, and the landscape is difficult to co-ordinate as it is controlled by private landowners.

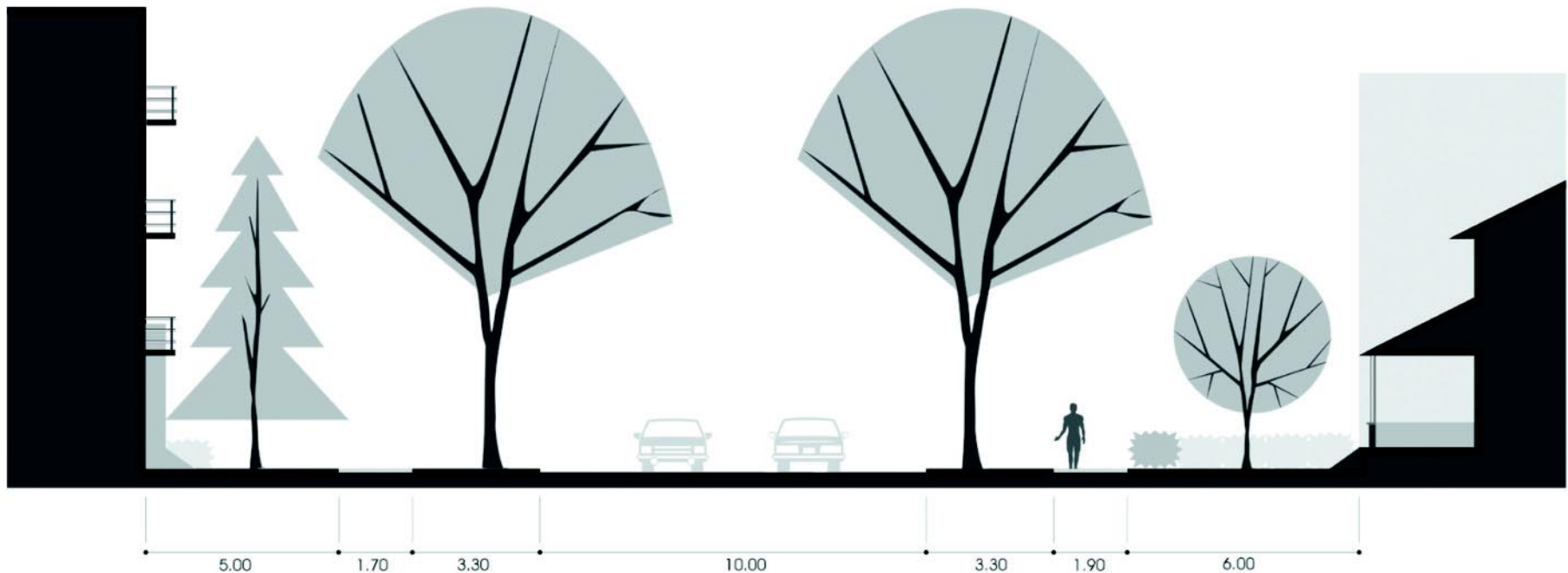


STREET TYPE ST-2

RESIDENTIAL STREET
Public trees in boulevards
and private landscape



Public street tree plantings occur on treed boulevards. This separates the pedestrian sidewalk from the street, creating a comfortable walking environment and providing shade and shelter. Private landscaping supplements the public street tree planting.



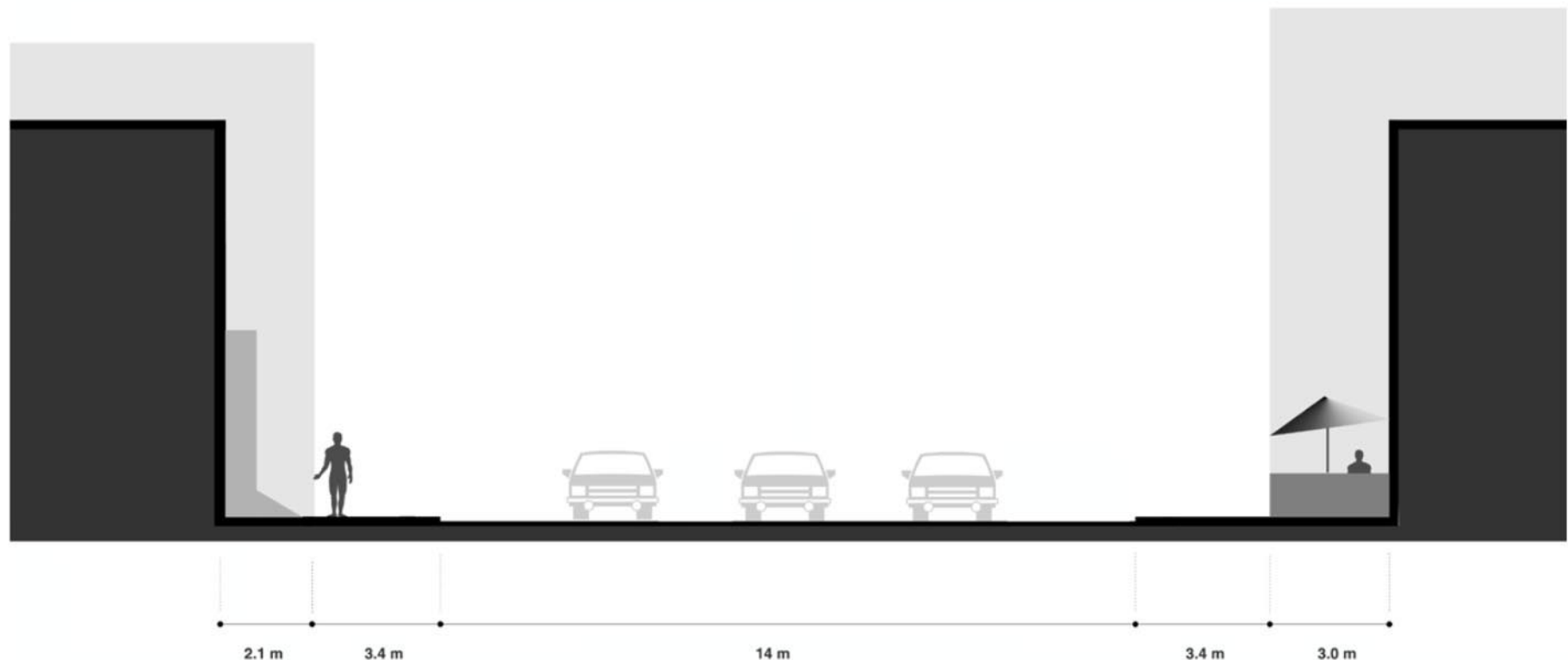
STREET TYPE ST-3

MIXED USE STREET

Without trees or public landscape



As the Beltline was developed, streets were widened, properties were redeveloped, and as a consequence, many of the boulevards and boulevard trees were destroyed. There is a noticeable lack of tree cover.



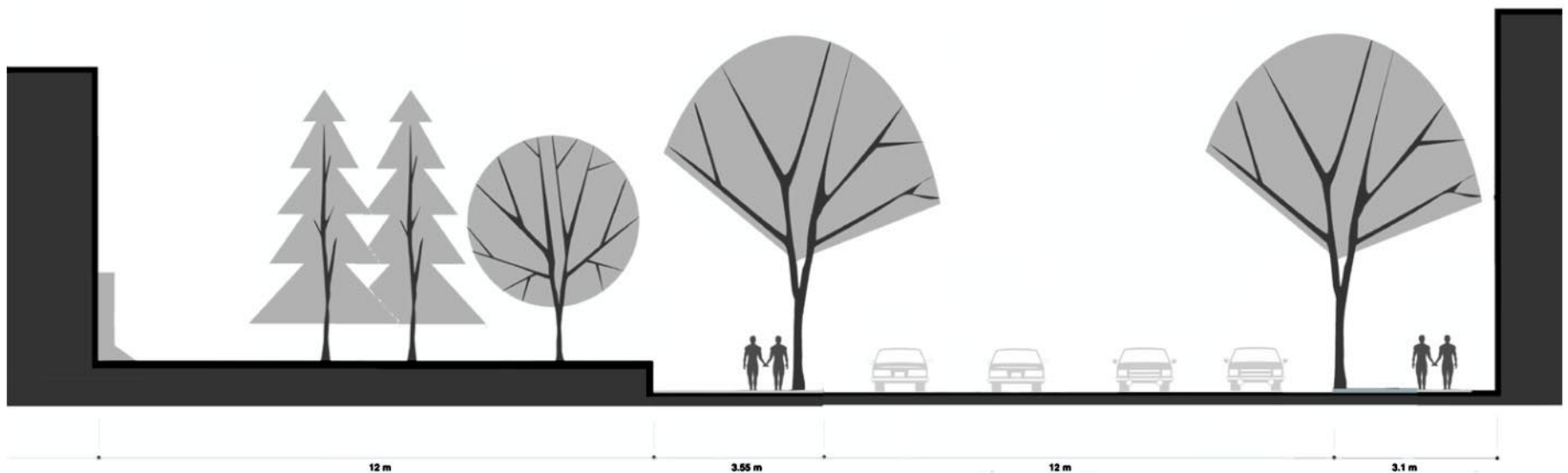


STREET TYPE ST-4

MIXED USE STREET

Public trees in treewells and private landscape

There are several examples of where public street tree plantings combine with private property landscape. Private - public partnerships may become more important, but co-ordination within an overall street tree plan is essential.



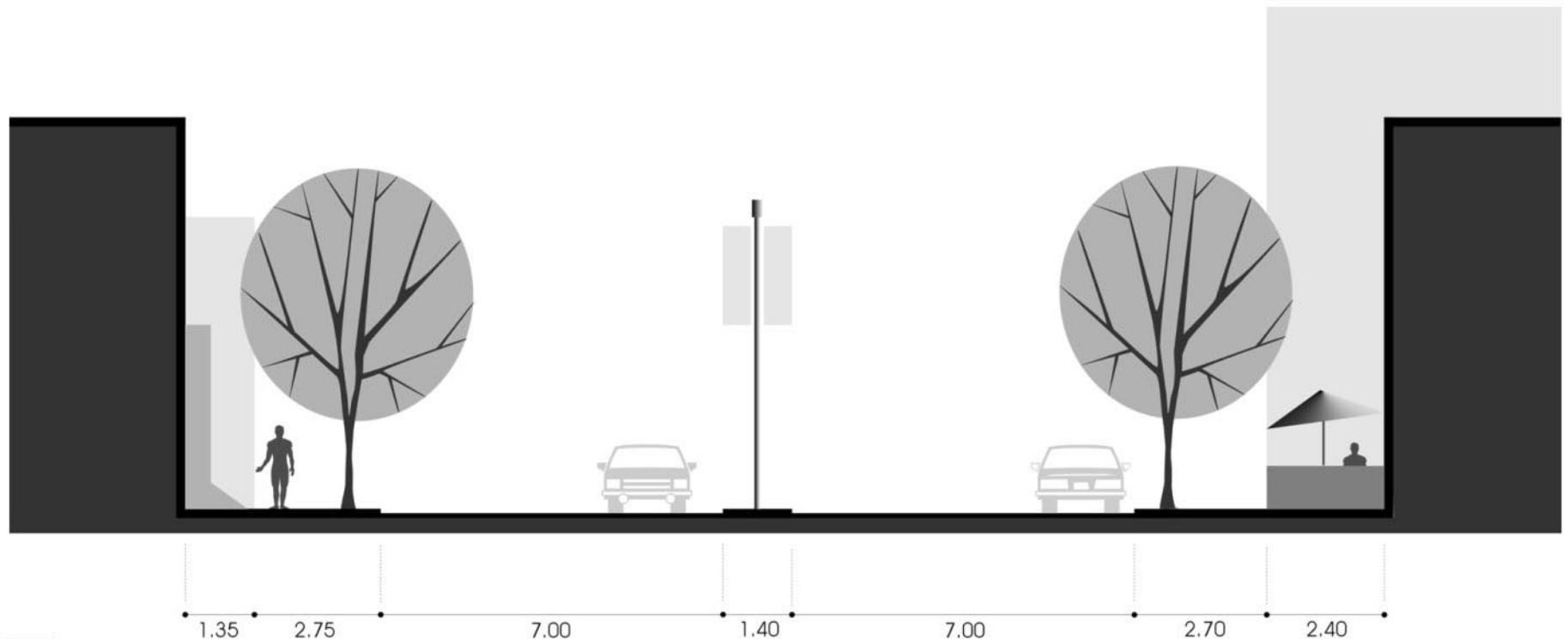
STREET TYPE ST-5

COMMERCIAL STREET

Streetscape improvements
with public trees in treewells



Street trees are part of a comprehensive streetscape improvement plan. As part of a Business Revitalisation Zone, these trees are usually well maintained and contribute to pedestrian comfort and visual appeal.



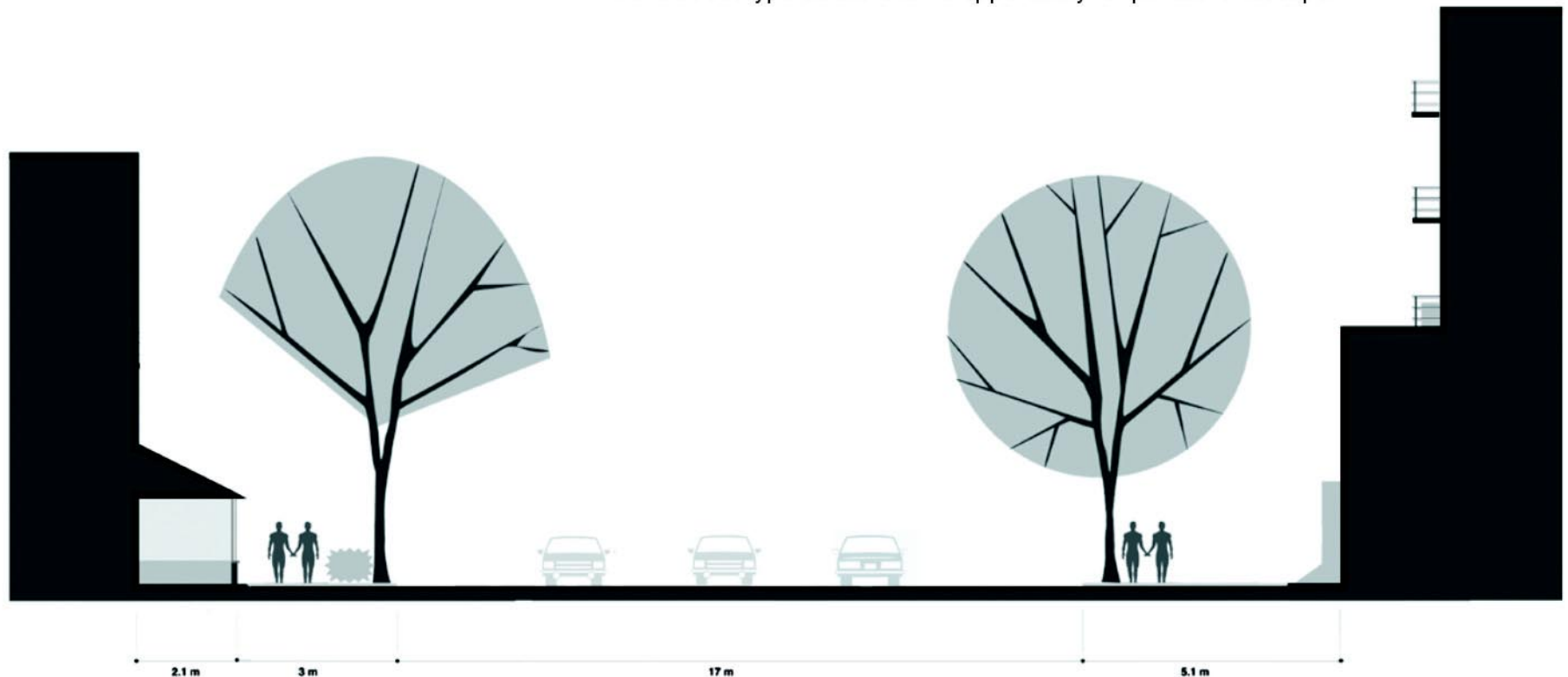


STREET TYPE ST-6

COMMERCIAL STREET

Public trees in tree wells
without private landscape

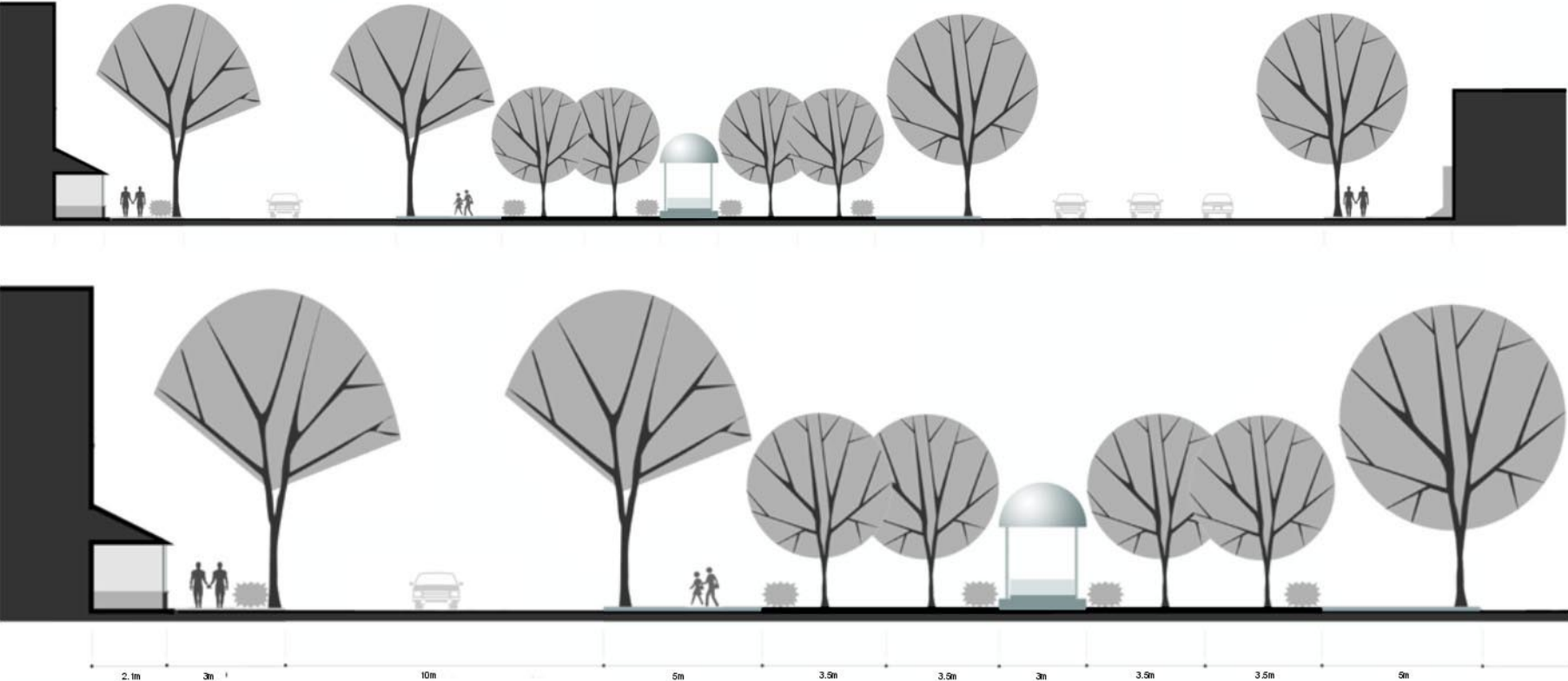
Commercial street with street trees in tree wells provides a good pedestrian environment with shade and shelter. Regular public street tree plantings are essential in this street type as there is no opportunity for private landscape.



STREET TYPE ST-7

COMMERCIAL STREET

Public trees in treewells and public park



STRATEGIES AND RECOMMENDATIONS

A Master Street Tree Plan should be prepared for the Beltline. This may be done by the Inner City Forest Committee in association with the University and the City, and should include the following:

- An overall vision of the neighbourhood urban forest in which specific short and long range goals and objectives are outlined. (Experiences of inner-city neighbourhoods in comparable cities may provide useful precedents.)
- Development of planting plan, and development of schedule of removals. Different strategies will probably be necessary for the existing well-forested areas and the areas where redevelopment and consequent loss of street trees has occurred
 - Existing well forested areas:
 - identify the gaps and unplanted areas
 - identify aging, damaged and diseased trees
 - determine exact location for replanting
 - determine species
 - develop planting schedule
 - develop re-planting schedule that anticipates loss of aging trees
 - enlist resident involvement in watering and maintenance
 - Areas of redevelopment and loss of street trees
 - develop a plan and standards for these areas (this may include desirable overall number of trees and species composition, and desirable street standards)
 - integrate with Connaught Community Association Planning Group to identify future redevelopment plans and proposals
- attempt to work with the City, developers and property owners to re-establish the urban forest to the desirable standards
- since many of the street trees in South Downtown and West Victoria Park are not adjacent to residential development, agreements should be sought with property owners or managers to assume responsibility for maintenance
- Develop a plan for updating the inventory and maintain a current map and records. This could be done on a project-by-project basis, or could be a yearly activity that the Community Association assumes.
- Develop educational material regarding the neighbourhood urban forest. This may include a 'tree walk' identifying tree species, and highlighting special trees (e.g. heritage trees).
- Develop an 'Adopt a Tree' program. Street trees are vulnerable to drought, and could benefit from residents taking on the responsibility of watering them through the growing season. This may also be a method of maintaining an accurate and up-to-date tree inventory.

Notes and recommendations for future workshop and inventory

The inventory is believed to be reasonably accurate. The volunteer participants became quite competent in identifying the most common trees, and also were able to recognise trees that were not on the plant ID sheets. There were some discrepancies in how teams interpreted which were public trees and which were on private property, and it should be recognised that the inventory was performed by volunteers with varying amounts of previous experience identifying trees and recording mapped data, therefore some inaccuracies are possible.

The map scale that was used was too small to record the trees neatly - a scale of 1:1000 or 1:500 would be preferable in future inventories.

The neighbourhood sector (approximately 14 blocks per group) was too large. Most groups did not complete the inventory in the afternoon, and needed several additional hours. In the future, it is recommended that the inventory include more participants and smaller survey areas. In this way, more community members will have the opportunity to learn about trees and participate in the exercise, possible volunteer fatigue will be reduced and the inventory can be completed in less time.

There was some difficulty in determining if some trees were on public land, particularly the trees around City parking lots. In the Beltline, these trees constitute a large portion of the tree canopy, and most groups recorded these trees. This took a considerable amount of time - in the future these area should be noted as a mass planting, and not as individual trees, since these plantings are temporary and not part of the public street tree plantings.

In future sessions, identification tags should be given to each participant. This would make it easier for the participants to be recognised as performing an authorised inventory and might make the participants feel more comfortable about participating in the project.

Tree calipers should be obtained in advance from the City or a tree nursery to make measurement of tree diameter easier. Also, some participants had difficulty estimating tree heights - this should be covered in the workshop.

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